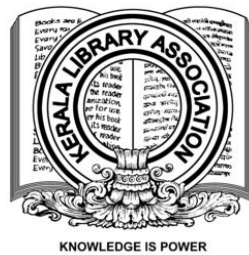


# THE INCLINATION OF LIBRARY PROFESSIONALS TO MODERN TOOLS IN THE KNOWLEDGE ERA

Edited by  
**Dr Vimal Kumar V.**  
**Savithry T.K.**



**KERALA LIBRARY ASSOCIATION**  
**KOTTAYAM REGION**

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## FOREWORD

Kerala Library Association-Kottayam region has live with a wide variety of activities since its inception. We regularly organise various programmes for the benefit of library professionals, students, and academicians. All the events organised by the Kottayam region have received good responses from the participants. I express my gratitude to all the Committee members of the Kerala Library Association-Kottayam Region for designing, planning, and effectively organising various professional development programmes. Some of the senior committee members who collaborated with us have retired from their official positions recently. Although they have retired from their official positions, they have been cooperating with the various activities of KLA and guiding us. Kerala Library Association-Kottayam Region had duly honoured them at the time of retirement. The Committee of Kerala Library Association-Kottayam Region unanimously decided to publish a book as a memento to honour the founder members, retired from the official positions during the last five years. Their services have always been indispensable to the KLA-Kottayam Region. This book titled ***The Inclination of Library Professionals to Modern Tools in the Knowledge Era*** dedicated to our pioneers.

Kottayam  
August 2020

Tomy Joseph  
President  
KLA-Kottayam Region



## PREFACE

We are happy to present the book ***The Inclination of Library Professionals to Modern Tools in the Knowledge Era***, published to honour the library professionals, who were part of the Kerala Library Association-Kottayam region and were recently retired from their official service. Their guidance has made the functions of the Kottayam region commendable. They remain our beacons in the profession, and we pursue the paths laid down by them.

The book consists of ten articles reflecting the innovative practices of libraries in the digital working environment. The book includes ten papers dealing with various innovative topics that can influence the work-life of the library professionals and the academic community. The subjects discussed in the book are library network, e-resources, scholarly publishing, digital libraries, knowledge management, Web 2.0, and blockchain technology etc. This book is published under *Creative Common License* for the free flow of knowledge.

We express our gratitude and thanks to all the authors for their valuable contributions to this book. Extend our gratitude to Kerala Library Association Central Committee for their support in this endeavour.

Editors





## **KERALA LIBRARY ASSOCIATION**

Kerala Library Association (KLA), the premier professional society in the LIS domain of the region founded in 1971. The Association secured registration as a society under the Charitable Societies Act on 8.12.1972 and became the first lawful body of professional librarians in Kerala. KLA has its head office at Thiruvananthapuram and four regional centres at Kottayam, Ernakulam, Thrissur and Kozhikode. Since its inception KLA has been able to represent the interests of the qualified librarians working in different libraries, always with due foresight and objectivity, keeping in view the proper development of the libraries and library services in the state. The Association has played a pivotal role in the scientific management and quality improvement of Library and Information system (ILS) in the State. For creating necessary public opinion in matters of policy relating to library and library services in the state, the Association so far held several seminars and conferences which in turn helped the Government to formulate policies on different aspects of library services. The achievement of KLA, spanning over a period of more than four decades of steady progress, is well reflected in the development history of Library Movement in Kerala. The role played by KLA in various Reforms Committees, especially in the academic sector needs special mention. It has recently started KLA-CPD centre to impart training to the library professionals to equip them in the modern line. The home page of Kerala Library Association, [www.keralalibraryassociation.org](http://www.keralalibraryassociation.org).



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# A PROPOSAL FOR MODERNIZATION AND NETWORKING OF ACADEMIC LIBRARIES IN KERALA: AN UNFINISHED DRAFT

**K. Ravindran Asari**

**Abstract:** *Libraries possess learning resources and scholarly literature to meet the information requirements of the user community. Procuring all resources required for the user community is not practical. A single library alone is not in a position to meet the information requirements of the users. Initiatives for sharing of resources among libraries and collective procurement of e-resources is the need of the hour. Therefore, library cooperation is highly necessary. Library networks initiatives at the local level can do a lot of things to make uniform availability and collective procurement of information resources by wisely utilizing public money. This article enquires the possibility of the development of an information network for college libraries in Kerala state to facilitate cooperation and resource sharing.*

**Keywords:** *Resource Sharing, Library Networks, E-resources, Document Delivery Service, Consortium.*

## **Introduction**

When we consider the development of various types of libraries, such as the public libraries, academic libraries and the special libraries, we can see that the developments are not uniform. Coming to academic libraries, which mainly consists of school libraries, college libraries and university libraries, lack of uniform development is visible here also. Thanks to the guidelines issued by the University Grants Commission (UGC), there is uniform development among university libraries. But between them, there is no cooperation and coordination. The Information and Library Network (INFLIBNET) established under the University Grants Commission (UGC) also could not go a long way in achieving the objective of setting up a nationwide network of academic libraries. The main reason being the lack of preparedness on the part of universities and colleges in the country, which have not been networked either at the State Level or at the university level.

There are more than 500 Higher Education Institutions, affiliated to various Universities in Kerala. Those institutions fall under different categories, such as government colleges, private aided colleges, private unaided colleges or self-financing institutions, training colleges, engineering colleges and management institutions. Some of these institutions are given autonomous status and enable them to plan their academic programs independently. Also, a relevant point to be considered is that the management is varied and there have been no committee or mechanism to streamline the activities of these institutions, including the act of organizing and maintaining the libraries. Further, no norms have been set either by the Director of Collegiate Education or by the Higher Education Council, which determine the nature and functions of libraries attached to Higher Education Institutions. The only insistence is that there should be a library attached to all institutions of higher learning. Consequently, the libraries attached to these institutions vary in every respect. Each library is functioning independently, without any cooperation and coordination. The resources are not shared. Each college is satisfied with whatever information resources they owned, and this is an unsatisfactory situation. The college libraries should be uniformly developed. They should come under a network, and the resources should be effectively shared to ensure optimum use.

## **Lack of uniform development**

The Universities affiliating the different types of Higher Education Institutions, the Directorate of Collegiate Education and Higher Education Council are the three major government agencies associated with the establishment, functioning and policy formulations of Higher Education Institutions. While the area of jurisdiction of the Directorate of Collegiate Education and the Higher Education Council extends to the entire State, the jurisdiction of each university is limited to specific geographic or subject areas. None of these agencies has issued a guideline that determines the form and function of college libraries. However, the Directorate of Collegiate Education has set up certain norms to determine the grade(s) of librarian(s) and the number of other staff depending upon the size of the college library. Even the Universities, affiliating colleges, have not issued any norms for organizing and maintaining the libraries in the higher education institutions under them.

As mentioned already, colleges come under different types of management, government, private individuals, organizations and societies. These differences are reflected in the organization, development, resources and services of the college library too, particularly in the absence of a general guideline concerning the library. Therefore, each

library is developing independently without any cooperation and coordination. Resource sharing between libraries is not even known to the college library management.

### **Digital information is becoming increasingly available**

The information age has become a reality, and now every human activity is influenced by it. The libraries are no exceptions. Perhaps, the entity, which has a direct influence of the information age, is the library. With electronic publishing, most of the books are now available in the digital format. When printing was invented, most of the manuscripts were converted to the printed format. Now with the development of digital technology, all the printed information sources are being converted to the digital or electronic format. The electronic format has several advantages:

- ❖ It can be shared very easily
- ❖ It allows simultaneous use by several people from different places
- ❖ Publishing is less costly
- ❖ Availability of free information is more compared with printed sources
- ❖ Information transfer is highly transparent and flexible as it demolishes the concept of space and time.
- ❖ Can be preserved permanently without damage and every time the pages will be fresh.

There are more than 200 digital libraries that provide free digital books to individuals and libraries throughout the world. The Internet Public Library ([www.ipl.org](http://www.ipl.org)), Project Gutenberg digital library ([www.gutenberg.org](http://www.gutenberg.org)), The World Public Library ([worldlibrary.org](http://worldlibrary.org)) etc. are some of the examples for the digital library.

As a result of the Open Access information movement, free journal article repositories were set up at several institutions in the world. The required information can be retrieved using standard search software. One of the most critical developments in this area is the development of the free journal portal that provides free access to more than 10,000 journals. These journals can be accessed free from the site: [www.doaj.org](http://www.doaj.org) and nearly 100,000 journals are published in the world; 60,000 which comprise of all significant journals is published in the electronic form. The number of journals available through the DOAJ portal will be sufficient at the college level.

### **UGC INFONET**

In India, the University Grants Commission has implemented a program to make available, all the essential journals to the academic community. According to this program, the UGC will subscribe to all the journals in electronic format, through the INFLIBNET (Information and Library Network). This project is called UGC INFONET. Journals from the UGC INFONET are inaccessible to all university libraries and college libraries as recommended by NAC. Now the UGC Infonet is replaced by another project called N-LIST. In the light of copyright regulations, administrative and financial problems, the UGC Infonet has been replaced with another more functional programme called N-LIST (National Library and Information Services Infrastructure for Scholarly Content).

### **N-LIST programme**

The N-LIST project is jointly initiated by the UGC-INFONET, INDEST-AICTE Consortium, and IIT Delhi. This project provides access to e-resources to students, researchers and faculty from colleges and other beneficiary institutions through a server(s) installed at the INFLIBNET Centre. The authorized users from colleges can now access e-resources and download articles required by them directly from the publisher's website once they are duly authenticated as authorized users through servers deployed at the INFLIBNET Centre.

The project has four distinct components:

- i) To subscribe and provide access to selected UGC-INFONET e-resources to technical institutions (IITs, IISc, IISERs and NITs) and monitor its usage;
- ii) To subscribe and provide access to selected INDEST e-resources to selected universities and monitor its usage;
- iii) To subscribe and provide access to selected e-resources to 6,000 Govt./ Govt.-aided colleges and monitor its usage; and
- iv) To act as a Monitoring Agency for colleges and evaluate, promote, impart training and monitor all activities involved in the process of providing effective and efficient access to e-resources to colleges.

The INDEST and UGC-INFONET are jointly responsible for an activity listed at i) and ii) above. The INFLIBNET Centre, Ahmedabad is responsible for activities listed at iii) and iv) above. The INFLIBNET Centre is also responsible for developing and deploying appropriate software tools and techniques for authenticating authorized users.

NOTE: From the Year 2014, NLIST Programme is subsumed under UGC-INFONET Digital Library Consortium as college Component. The colleges (except Agriculture, Engineering, Management, Medical, Pharmacy, Dentistry and Nursing) in India are eligible to get access to e-resources under NLIST Programme.

### **Current status**

As on Nov 11 2017, a total number of 3134 Govt. / Govt.-aided colleges covered under the section 12B of UGC Act as well as Non-Aided colleges have obtained Log-in ID and password for accessing e-resources. All e-resources subscribed for colleges under the N-LIST Project are now accessible to these 3134 colleges through the N-LIST website (<http://nlist.inflibnet.ac.in>).

### **National Digital Library of India**

The government of India has started the ambitious digital library program called the National Digital Library, aka Million Digital Book Program, which aims at digitizing all the heritage collections in Indian libraries. In addition to all these digital information sources, the Internet itself is the largest information resource in the world. A library cannot function successfully in modern times without providing access to digital or electronic resources. I have mentioned only a very few important digital information sources/centres only to stress the point that digital information sources are on the increase and that a point has reached where the digital sources outnumber the printed sources.

### **The Internet: the largest information source**

The Internet is the global network of networks and it is considered as the largest single source of information. The internet when christened in the present name in 1984, had only a few thousand connections, mostly government agencies. In 1990, the ARPANET was formally terminated. In 1991 the National Science Foundation (NSF) began to relax its restrictions on commercial use on NSFNET and commercial network providers began to interconnect. In 1991, when the WWW was launched, the Internet became a network of public domain. The final restrictions on carrying commercial traffic ended on 30 April 1995, when the NSF ended its sponsorship of the NSFNET Backbone Service and the service ended. Today almost all internet infrastructure is provided and owned by the private sector. Now the total number of hosts on the Internet crossed 200 million. The Internet has become a 'library within every library' and without which no library can function.

### **Our libraries are still traditional**

In spite of the revolutionary changes in the area of electronic information, our libraries are even today functioning in a conventional style giving more importance to printed books and journals, which now form only a fraction of the information sources. College libraries need to be attuned to the information age. This call for change in acquisition policy, Improving infrastructure, providing more computers and reading devices and training of the library staff and users about the new media and their effective use. As the print media and the digital media will go hand in hand with one another, in the foreseeable future, we have to make provisions for both. Instead of sticking on to the print media, we have to develop our college libraries to use print as well as the digital sources simultaneously. It may be necessary to provide a kind of combo facility for reading printed documents and electronic documents at one point. Now libraries require reading terminals instead of reading tables, which will be a combination of reading platforms with a computer connected to the network. This will facilitate the use of printed sources as well as digital sources. Libraries still envision collections of printed books, huge stacks and spacious displays. For at least some time from now, management of printed sources will have to be part of the library routine. But, considering a library as a storehouse of printed books alone will be an anachronism. Therefore, we have to adopt a state of the art techniques for organizing and accessing electronic information resources.

### **Need for a survey**

As pointed out already, diversity among college libraries is a very important aspect to be considered when a programme is launched to improve or modernize college libraries. In order to achieve this, we have to identify certain norms with respect to college libraries and verify how far college libraries adhere to the selected norms. So the first task is to prepare a simple questionnaire to ascertain the present status of college libraries in Kerala on the basis of the selected norms. This will help us to identify areas which need immediate attention for achieving a uniform status among college libraries.

### **Uniform organization of college libraries**

It is a known fact that many of the libraries are not organized with proper classification, cataloguing and helpful arrangement with proper guides and labels. Other factors, like, book circulation, open access and in-house reading

facility are also not uniform. The proposed survey will reveal the gaps, inadequacies and shortcomings. In some libraries, there may not be adequate qualified staff to introduce classified arrangement and cataloguing. In consultation with the college authorities, the appropriate strategy can be formulated. If necessary, trained staff from the task force can be sent to colleges upon request from the competent authority. The college will have to pay for the work at the rate as fixed by the expert committee.

## **College library automation**

Not even 50% of the college libraries have been automated in a systematic manner. Only a few libraries are automated using a common library management system. Most of the automated libraries are using a local library automation package called LIBSOFT. A few libraries are using SOUL, library management software developed by the Information and Library Network (INFLIBNET). Book Magic is another software used in college libraries. A number of such local packages are used in a few other libraries. There are also a few instances of using simple database creating software developed in the college itself, as a temporary measure to show the National Accreditation Committee (NAAC) of the UGC.

Free library management software called KOHA is now available and many libraries including university libraries have switched over to KOHA as the software can be freely downloaded from the internet and perform all the library routines. This is a welcome trend. If the management provides the necessary hardware, library automation can be instantly implemented with the help of Koha. What is promising in this context is that a few library professionals have mastered the work of downloading the different components of the package and implement automation using the package. Already half a dozen workshops have been conducted for the effective use of the software by agencies like Kerala Library Association and Universities. The availability of Koha marks the beginning of a welcome trend in library automation in Kerala.

In order to exploit the full potential of information technology, all college libraries should be automated using standardized software packages. Even if different library management systems are used, the database of information resources and library routines should follow a commonly accepted format for common accessibility and database merger. But the present situation is not conducive of any such common activities. Also, with this much of diversity, it may not be possible to network all libraries.

## **Library network**

As a very effective step of IT application in academic libraries, all the colleges in Kerala should form a network along with the university libraries. Such a network will be called the Kerala Academic Library Network (KALNET). In order to accomplish the task of bringing together all academic libraries in the State into a network, an expert committee may be appointed. The committee can function as an independent body under the Department of Higher Education, or it can be part of the IT at School program of the Kerala Government. The University Libraries can act as nodal centres, providing information sources peculiar to each university, like digitized theses, instructions to affiliated colleges and students, examination guidelines, question banks and examination results.

The Network architecture, communication link, bandwidth, etc., will be decided by experts. Shared use of information is possible only in a networked environment. In western countries, organizing libraries into networks started as early as the 1970s. In the USA all types of libraries come under a gigantic network called Online Computer Library Center (OCLC) which link together more than 16,000 libraries of all kinds from 120 countries. Its online union catalogue is called World Cat and it contains over 765 million records in 12 languages. World Cat is, undoubtedly, the biggest bibliographic utility in the world. The participating libraries input records to the World Cat and at the present rate, one record is input every second. Interlibrary Lending, shared use of digital resources and technical services and advice are provided. A new service, OCLC Classify, is providing a DDC number for any book acquired by any library in the world. Go to the OCLC website and just type the author and title of the book. You will get a DDC number for the book. If there is no author, simply type the title and one or two subject headings. OCLC is run by the annual subscriptions received from member libraries.

Another library network worth mentioning here is JANET (Joint Academic Libraries Network) This is a British venture and it links all the academic libraries of Britain. In India also a library network has been set up in Delhi linking all libraries in the Delhi metropolitan area. This network is called the Development Libraries Network (DELNET).

In Kerala, the concept of the library network is not a matter of serious concern. Not only college libraries, but other types of libraries also have not been brought under networks. No network exists even among various departments of

the Universities. Even among university libraries, there has been no network. Considering the various advantages of networking, all the college libraries in Kerala should be brought under one network.

The various benefits of the network are:

- ❖ Networking facilitates shared use of resources.
- ❖ Electronic information resources can be shared without physically sending the resources and it allows simultaneous use of the same document by several persons at different places;
- ❖ Costly reference books need not be purchased in all libraries, they can be shared from a central location.
- ❖ Intercommunication between libraries will be faster, easier and less costly.
- ❖ In a networked environment number of journals can be used at a lesser cost, especially when electronic journals are available;
- ❖ Digital repositories of research publications of college teachers can be set at a central location;
- ❖ An information portal can be created at a central place, which will link all relevant information sources, including the UGC Infonet.
- ❖ Expertise can be shared.
- ❖ Ultimately, networks provide easy access to more information to all users at less cost.

### **The network can be accomplished in three stages**

As mentioned already there are more than 500 institutions of higher learning. It is not easy to prepare all these institutions for participation in the network all on a sudden. Therefore, we can phase out the task:

**Phase I** We can choose all the government colleges which can include arts and science colleges, B. Ed. Colleges, and Engineering Colleges.

**Phase II** In phase two all the private colleges, which include all aided colleges, aided engineering colleges and B. Ed colleges can be prepared for participation in the network.

**Phase III** All the self-financing institutions, which may also consist of arts and science colleges, engineering colleges, B. Ed. Colleges and management institutions can be included in the network.

### **Need For a guideline**

With the help of data collected using a questionnaire, the present situation of college libraries can be assessed. On the basis of this assessment, a guideline can be issued to the concerned authorities. The guideline should be framed in such a manner that, if the guidelines are strictly followed, the present inconsistencies can be removed and each library will be developed in a uniform pattern, with respect to collection building, collection processing and information retrieval. The guideline should clearly state all aspects regarding this.

- ❖ Acquisition of resources may state what type of materials should be acquired; what should be the proportion between electronic and printed sources and what should be the procedure to be followed for acquiring library collections. When a uniform procedure is followed by all libraries, individual libraries can be freed from unnecessary administrative procedures.
- ❖ The guideline can clearly state the choice of Library Management Software and the classification and cataloguing systems to be followed.
- ❖ The hardware requirements such as computers, printers, servers and other accessories can be prescribed in the guideline depending upon the size of the library, particularly the size of the library collections.
- ❖ In every library collection, there exist very rare and out of print documents. Such documents can be digitized and preserved at a common location.
- ❖ The guideline can also state how the computerized catalogue of the library can be converted into an Online Public Access Catalogue (OPAC) so that the online catalogue of a library can be searched by all participating libraries and library users.
- ❖ If a library has its own digital resources, the guideline can give instructions on how such resources can be made available online.
- ❖ If e-journals are available, there should be restrictions on the subscription to print journals. The guidelines should prescribe the print periodicals to be subscribed by a library.

### **Need for a task force**

In order to ensure automation of all libraries attached to Higher Education Institutions, a very comprehensive programme of action should be chalked out for time-bound implementation. Many libraries require technical advice,

instruction on hardware and software required and in many cases personal help to do the work. In order to accomplish this task, a panel of experts may be prepared. The panel can contain persons having knowledge of computer hardware and software, librarians who are familiar with library routines, in addition to the installation and running of Library Management Systems. Depending on the work done, colleges can be asked to pay the work charges.

### **Need for an expert committee**

IT application in Higher Education Institutions is a major issue as the project is to be started from scratches. As mentioned already a lot of diversity exists and achieving uniformity in IT application in college libraries is a Herculean task. A Committee consisting of IT experts, librarians and academicians should be formed to chalk out a programme to approach the problem in a systematic manner.

### **Training of library staff**

To complete the work in a uniform manner, we have to train the library staff by conducting workshops in the IT @ School headquarters. Fees can be levied from the trainees. Already there are a few experts who can download, install and run the Koha software. A panel of such experts can be prepared. Also, librarians may need training on network setup and maintenance.

### **Conclusion**

Availability of a regional information network for library cooperation and resource sharing can improve academic and research output in the Kerala state. The network initiative can enhance the confidence level among the library professionals and the academic community by pooling information resources scattered in various libraries in the state. Libraries can procure more e-resources in less price through purchase via the consortium. In this manner, the Government of Kerala can spend the public fund on information resources in a meaningful way through networking of libraries in the state.

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# TOOLS FOR SHARING KNOWLEDGE AMONG LIBRARY PROFESSIONALS

Dr Smitha C Elayadom

Dr P. Dhanya

**Abstract:** *Knowledge management has great significance in the present-day world of knowledge economy. Information is now at our fingertips. Libraries attached to the Academic institutions deal with huge amounts of knowledge available in different formats. Technology introduced new tools to acquire and disseminate them. Library professionals are required to have the skills and competencies to handle these tools. Sharing of knowledge can enhance library services. Awareness about knowledge management and developing a knowledge sharing culture can increase the competitive advantage of the organization. All these can be feasible only if there is proper communication among professionals and enough support from the management. Social networking sites provide enough tools to connect with people from different geographical areas. Effective utilization of such tools can increase the efficiency and effectiveness of library services.*

**Keywords:** *Knowledge management, Knowledge sharing, Social networking tools, Community of Practice, Job shadowing, Job rotation, Mentoring.*

## Introduction

Knowledge management gained great significance in the 21st century. Information and knowledge became the key economic resource that controls the nation as a whole. The demand for information and knowledge also has increased as it became the major resource in the development of society. As a result of Research and Development activities, knowledge and knowledge resources are produced in huge quantities which makes it difficult for people to gather everything. Such knowledge is to be shared, to produce new knowledge and also for making the right decisions in organizations as well. Universities and Colleges encourage research and development activities. Libraries play a major role in collecting and disseminating it to the users.

Academic libraries support the parent institution by collecting, processing, storing and disseminating the required resources. Not all libraries are self-sufficient; constraints in the funding process prevent the libraries from collecting all the available resources related to the curriculum. In fact, libraries are collecting and disseminating knowledge in different formats for helping users. Knowledge management is essential for any organization for being productive and innovative. Knowledge sharing is essential in the era of 'information explosion'. The competence to identify and manage the required knowledge; and also the ability to utilize the knowledge of the staff members determine the success of library and information centres.

## Knowledge

Data, information and knowledge are interrelated terms and their value varies in terms of utility and application. Data, when processed, becomes information. Knowledge is neither data nor information. It is attained through processing and organizing information (Smitha,2018). The Random House Dictionary defines knowledge as, 'the organized body of information or the comprehension and understanding, consequent on having acquired an organized body of facts.' People gain knowledge through education'. It is the understanding of the subject which gains through learning. Interaction with people, inventions, innovating new concepts, the methods and techniques of doing things all lead to knowledge. Research and development activities also generate knowledge. This knowledge is again used to create new knowledge. Knowledge creation is an ongoing process. It is different from information as Foskett says "knowledge is what I know and information is what we know." In organizations, it often becomes embedded in documents, repositories as well as the routine tasks, processes, manuals, practices and norms(Davenport & Prusak,1998).

Knowledge is the prime resource that has helped mankind to progress. Knowledge is the insights, understandings, and practical know-how that people possess (Omotayo,2015). Sri. A P J Abdul Kalam was of the opinion that tomorrow's world will recognize knowledge in its most comprehensive form and that it will add further value to products through innovation which will, in turn, contribute to economic growth. Knowledge is gained through education, information, intelligence and experience. Dr Kalam was sure that proper Knowledge Management can lead India to a Knowledge Society (Smitha,2018). Knowledge can be categorized as '*explicit*' and '*tacit*' knowledge (Nonaka and Takeuchi, 1995). *Explicit* knowledge is the type of knowledge that is expressed in words, shared in the form of data, specifications, manuals etc. Formal transmission of knowledge between individuals is possible in this type of knowledge. It can be expressed in formal systematic language (Koochang & Britz,2008). It is the knowledge that can

be shared with others (Debowski,2006). It can be easily identified, stored and retrieved (Wellman, 2009). *Tacit* knowledge is highly personal (Nonaka and Takeuchi, 1995). It resides in the mind of the individual. It is gained through experience. It is hard to communicate or share such types of knowledge. Knowledge is the insights, understandings, and practical know-how that people possess.

## **Knowledge management**

Knowledge management means managing the right knowledge. According to Dyer, it is the management of organizational knowledge for creating business value and generating a competitive advantage. It is a key factor for future successful enterprises (Smitha, 2018). It includes the creation of knowledge, collection of knowledge, processing and disseminating it to the right person at the right time to make the right decisions. It also includes training the staff to develop skills for managing knowledge and sharing of knowledge. The strategies for managing knowledge will vary depending upon the type of knowledge which is valuable for the organization. Tackling tacit knowledge is essential for every organization. Successful knowledge management can be accomplished only through the coordination of the works of multiple functional areas of the organization. In libraries too, effective knowledge management can be carried out through this method.

## **Knowledge sharing**

'Knowledge sharing' is an activity through which knowledge (namely, information, skills, or expertise) is exchanged among people, within or between organizations. Knowledge sharing culture is to be developed among the employees for the effective use of acquired knowledge and also for increased productivity. Knowledge Sharing forms the key component of Knowledge Management. Several scholars (Davenport and Prusak,1998) have insisted on the necessity of practising knowledge sharing among employees, which values innovation, promotes continuous improvement and sharing of ideas for effective management processes. The advancements in technology, the introduction of the Internet, and communication technologies have greatly influenced the library services. Knowledge is a unique and intangible asset and it forms the potential source for advancement. The global networks and advancements in communication technologies have made it possible to interconnect geographically distributed human resources as well as information sources at our fingertips within seconds, allowing them to exchange documents and multimedia contents as well (Anand et.al, 1998); (Boland et.al,1994). Technology has eliminated the barriers of time and place. The tacit knowledge of the employees can be tracked and recorded for future use, which can save time and avoid redundancy. The value of knowledge only increases with sharing.

Like any other organization, libraries too must have employees who are willing to adapt themselves to the changes and also motivated enough to apply new market strategies and new ideas to their own work. The staff must be ready to acquire new knowledge and skills necessary for using new technologies in the library. Without such strategies, the organization may not be able to leverage its valuable assets (Cabrera,2002); (Wasko and Faraj,2000); (Nahapiet and Ghoshal,1998).

Even though Knowledge sharing has been identified as the prime focus area and the core element of Knowledge Management, it also has been considered as the principal barrier in Knowledge sharing. The unwillingness of the employees to share knowledge causes great loss to the organization as a whole. Lack of awareness of Knowledge Management, technical problems, slow speed of the Internet, Lack of skills to handle new technologies, lack of remuneration, lack of time to share, lack of understanding of the benefits of Knowledge management and knowledge sharing, forms the major barriers to sharing of knowledge among employees. Insufficient support from the top management in applying new ideas to their work also hinders the employees from sharing their tacit knowledge (Cabrera,2002). The organizational knowledge is the collective knowledge possessed by the people in an organization and it enhances the organization's decision making capability. Such knowledge is gained through the lessons of failure and success, knowledge of the procedures, knowledge about the customer needs and experiences in the field. In libraries also these types of knowledge sharing will boost the performance of the library staff and services.

Technology has introduced several new tools to enhance the exchange of knowledge. It has been commonly agreed that technology is a significant ingredient for knowledge management. Without the advancements in technology access to remote information resources may not have been feasible.

## **Advantages and Disadvantages of knowledge sharing**

The abundance of Knowledge resources are globally available and access to those resources are attained using the Information and Communication Technology tools. Explicit knowledge is acquired in the library and information centres in the form of books, CDs, Journals, magazines, databases and the like. But Tacit knowledge adds value to the



organization by helping the top management to make the right decisions by evaluating the merits and demerits of the existing system and thereby increase productivity, creativity and innovation. It remains with the individual knowledge workers and if not tackled properly will be lost forever. Through knowledge sharing the tacit knowledge can be converted to corporate knowledge.

### **Advantages**

Knowledge sharing enhances the connectivity between the knowledge workers and the organization. It increases efficiency, builds trust and confidence among the workers in the organization. Sharing of knowledge helps in better and faster decision making and better organizational adaptability. It also enhances creativity and innovation, helps to resolve complex problems, and sharing of expertise. It improves communication skills - both interpersonal and intrapersonal - among employees. It also helps to provide better services to the customers. Reduces the loss of know-how. Through knowledge sharing, both explicit and tacit knowledge can be tackled and reused in future. It helps to preserve the existing knowledge. Knowledge sharing also helps to easily identify the right people with the required knowledge.

### **Disadvantages**

The use of tools for sharing knowledge may not be easily comprehended by the workers. Incorrect use of tools may lead to waste of time and money. It raises the need for giving training to users.

### **Barriers for sharing of knowledge**

The disinclination, from the worker's part, to share knowledge is a major barrier. The concept of 'knowledge is power' actually prevents employees from sharing the knowledge they possess. Some strongly believe that by sharing their knowledge, the knowledge will become obsolete and they may no longer be needed by the organization. The workers will also think in terms of benefits they will get by sharing knowledge. Fear of technology also forms a barrier to sharing knowledge. In libraries, lack of awareness on knowledge management and knowledge sharing is a major barrier. Most of the libraries are managed with limited manpower and other resources and hence the staff may not get enough time to concentrate on knowledge sharing, as it involves finding the needed persons, creating the content for sharing and also finding the relevant materials for sharing. Then disturbing the existing routine also forms another barrier. In this knowledge era, the libraries must also welcome the change by introducing the new technologies to serve the users instead of sticking on to the tradition.

### **Knowledge sharing and academic libraries**

Libraries from the very beginning onwards play a major role in satisfying the demands of the information seekers by disseminating knowledge. The conventional functions of a library is to collect, process, store and disseminate information. Academic libraries are often confronted by constraints in budget and increased demand from the user community. Earlier, libraries provided Inter-Library Loan services to satisfy the demands of the users. Sharing of knowledge resources is a boon to such service institutions. With the advent of information and communication technologies, newer forms of resources were introduced and the libraries also adapted themselves to the changes in technology. It also started collecting resources in different formats. The library being the store-house of knowledge, managing these resources became a challenge to library professionals. Electronic resources like e-books, e-journals, databases etc were also added to the collection. Now we have digital libraries. In addition to technical skills, the need for special training also emerged in order to manage the library successfully.

The success of academic libraries depends on the ability of the staff to provide effective services to its clientele. The expectations of the users serve as the basis for library planning, and enrichment of the existing collection and also designing the service model. Knowledge sharing is crucial for library professionals in the era of the knowledge economy. It gives a competitive advantage to the institution. Academic libraries are usually attached to Universities or Colleges and it plays a major role in supporting the research activities by acquiring and sharing the relevant information resources to the research community, which in turn generate new knowledge.

Information is available in digital form and we can have global access also. Sharing of information helps people to plan well. Libraries too can share digital resources and databases to its users. So many novel technologies are available to share knowledge among people. Libraries have considerable potential for facilitating knowledge sharing and collective learning.

Academic libraries always try to maximise the use of resources through different means. Saving the time of the user and the library staff is equally important in a library. In addition to the print documents, the libraries also collect e-resources like e-books, e-journals, databases and the like to serve the users. Information and Communication

Technologies enhanced the dissemination process by saving time and money. It also helped to avoid duplication of effort and reduced mistakes. Use of these technologies needs experts. Sharing of knowledge also helped to learn lessons from the experience of others.

### **Tools for sharing knowledge in libraries**

Knowledge management and sharing can easily be done with the help of ICT tools. Internet, Intranet, Data mining, Data Warehousing, groupware etc helps to manage the available required knowledge. Internet and social networking tools provide easy delivery of information to remote users. Tacit knowledge can be shared through mentoring, coaching, creating communities and training; Internet, Intranet, E-mails, CD-ROMs, publications, multimedia content etc can be used to share explicit knowledge. Knowledge sharing can be done in libraries, using these tools.

### **The Community of Practice (CoP)**

The Community of Practice provides a theorized and proficient platform for collaborative learning in individual development, organizational development and social development. Professionals getting into contact with persons in the same field, can continue this contact and stay connected using CoP. The group, small or large, within the organisation or linked to people outside, can share expertise on an ongoing basis. It gives short-term and long-term value for members as well as organization (Kim,2015).

Involving in CoP can give professionals short-term values like confidence to work, access to expertise, and get help with challenges. For the organization, such practice will save time, get help in problem-solving, sharing of knowledge, help in interacting with other units, and enhance reuse of existing resources. The Long-term goals for the members include personal development, reputation, professional identity, collaborative advantage and marketability. For organizations, it will help to increase capabilities to apply new strategies, keep abreast of the current trends in the field, retention of talents and enable innovation.

CoPs formed online can help geographically dispersed people to connect and share their ideas, develop their skills and learn new things. CoPs formed by librarians working in different organizations can expand their knowledge and expertise by sharing tacit as well as codified knowledge. Experts can easily be identified and can be consulted effortlessly to solve the problems quickly. New library professionals and experienced library professionals can be found at one place and thus the freshers could get expert advice on various issues related to the functions of the library. Doubts regarding the use of modern software packages for library management, Technical processing of library resources, issues in the management of periodicals' subscription and the like can be easily resolved. Continuous updating of information and active participation in sharing knowledge is needed to make it a success.

### **Mentoring**

Mentoring is an earlier practice and the most effective way of sharing tacit knowledge from an expert to a novice, which is relevant even today. It is different from classroom learning. A fresher is getting practical training under the guidance of a mentor. A committed and expert professional with an ability to teach and motivate others can, with his skill in communication, bring out the best in the mentee. Libraries can make use of this method to train the staff on various sections of the library. It is a knowledge management tool and it can be used in libraries to make the professionals informed about the issues in knowledge sharing.

### **Storytelling**

It is a knowledge-sharing technique used by organizations to share the experience with colleagues or freshers. It can convey all the essential details of the job and helps to learn from the past environment and use that knowledge in future situations. The ability to use storytelling in mentoring can work wonders. Sharing the experiences and problems faced by experts can give valuable lessons to the freshers In libraries, this method can be used to share information among employees. Knowledge of how the senior employee handled the problems will give confidence to the colleagues.

### **Job shadowing**

Job shadowing is an effective way of sharing knowledge among employees. An inexperienced employee gets a comprehensive knowledge regarding the nature of the work that is expected from his job position. It is more effective than giving the job description or giving instructions at the time of the interview, as it gives the opportunity to observe the work personally. It is the best way to share tacit knowledge. The employee sees the actual performance of the person employed in a similar job position, which will help him to overcome the fear of the unknown(Tahleho,2016). It is very effective in the medical profession, administration, manufacturing industry, marketing etc. In libraries too, this can be implemented while giving training to the library staff. It will increase the efficiency of the newly appointed staff.

The person can observe how the senior staff is dealing with the daily problems and also get informed about the unexpected problems while doing the work. It gives a deeper understanding of the functions of the organization.

### **Job rotation**

Like any other organization, libraries also have different sections like acquisition, technical processing, which includes classification and cataloguing, circulation, serials management etc. Different sections demand different skills and competencies. Proper training is required to do the technical processing of books. In some libraries where there is less manpower, all these sections are handled by a single librarian. But in University libraries, where there are huge collections, there exist professionals to handle different sections. Job rotation can give them an opportunity to work in different positions and thereby develop their skills and competencies. Multi-tasking gives confidence to both the employee and the employer.

### **Internet and intranet**

The *Internet*, the global network connecting millions of people, is the treasure house of knowledge. The Internet and the World Wide Web facilitates access to remote information. Individuals, firms, institutions, workplaces etc can be networked for easy exchanges of knowledge. Intranet and Internet facilities enhance knowledge sharing. Various departments in organizations can be connected internally using *intranet*; Libraries also make use of these facilities to connect with users and share information. These facilities help to share the relevant information to the right person without any delay. Internet and mobile technology have accelerated access to information and serve as an instrument to share knowledge through various mediums. *Email* service is the most widely used tool, in the libraries, for sharing information. It also helps to share tacit knowledge.

### **Social networking sites**

Social networking sites like *FaceBook and LinkedIn* provide a good platform for people to get connected with each other personally and professionally. Facebook is the most popular social networking site that allows individuals to share ideas and information; and also to create groups with common interests. LinkedIn is a social networking site where persons with professional aims can have connections with each other. *WhatsApp, Telegram, and online discussion groups* can be made use of for effective knowledge sharing among library professionals. Forming groups with a common interest on these sites provide an opportunity to discuss the common practical problems in handling the various problems inside the library and also implementing and managing Library management software packages. Library staff can also get connected with users through these social networking sites and exchange information. Details of the resources in the library, reference assistance and the status of the books etc can be passed on to the users through this facility. Sharing of e-books is also possible.

### **Other tools**

*Blogs* are the informational websites, where discussions can be written in diary-style and can be published on the Web. The Blogs written by experts in the field can be consulted for expanding the knowledge of professionals as well as sharing of knowledge. *YouTube* channels also can enhance knowledge sharing. Knowledge can be created and shared through videos which can further enrich the professionals. Other tools include *Twitter, Instagram, Discussion groups etc.*

### **Conclusion**

Knowledge sharing ameliorates the skills and competencies and strengthens the value of the organization. The advent of technology-facilitated the libraries with new gadgets to share knowledge. Many are unaware of using these technologies for knowledge dissemination. Sharing of knowledge will equip them with the necessary skills to compete in the world of 'information explosion'. Now we have digital libraries and many of the professionals are managing them efficiently. Knowledge sharing tools can help them to perform better. Library professionals must be aware of knowledge management tools in order to provide cost-effective services in the library. The motivation for continuous learning and skill development is needed to handle these tools. Librarians are actually doing knowledge management in their institutions. Many are not aware of it. Proper awareness must be given to the professionals regarding the benefits of KM and a knowledge-sharing culture should be created in the library to augment the process. Such types of knowledge retention methods can control the loss of organizational knowledge. It includes trust, communication, teamwork, leadership, management support, organizational strategies and reward system (Islam, Ahmed, Hasan and Ahmed2011). Reward in the form of appreciation and recognition can be more effective. Library and information centres have taken the matter seriously. In the present environment of global uncertainty due to the covid19 outbreak, nearly all educational institutions are closed and people are turning to distance learning and digital services. Many digital libraries and online education service providers have started sharing resources to people free of

cost. Digital libraries and online knowledge/information resources have helped people to stay informed during the crisis period.

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# INNOVATIVE TECHNOLOGIES AND TOOLS FOR TRANSFORMING LIBRARIES IN THE DIGITAL WORLD

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Dr T. Ajikumari

**Abstract:** *To extend the visibility and acceptance of library and information centres in the knowledge society it is imperative to adopt new tools and technologies. Libraries and information centres can't do today's job with yesterday's tools and concepts. Library and Information Centres have a window of opportunity and will not stay open forever. Hence alternatives will be brought in force when technologies are available. Also, Library and Information Science (LIS) professionals have to be in line with the past and online with the future. This paper discusses various innovative technologies and tools such as Content Management Systems, Reference Management Tools, E-learning Management Tools, Massive Open Online Courses (MOOCs), Research Information Management Systems, Altmetric tools, E-Resource Management and Web Discovery Tools that can be adopted in the libraries to reorient its services in the digital world. It also elaborates the application of different technologies such as Quick Response (QR) Codes, Near Field Communication, Radio Frequency Identification (RFID) and Mobile Augmented Reality Application for mobile-oriented library services. This paper also discourses different cloud computing tools viz. Dropbox, iCloud, Amazon Cloud Drive, Microsoft OneDrive and Google Drive.*

**Keywords:** *Innovative technologies, Content Management Systems, Reference Management Tools, E-learning Management Tools, Massive Open Online Courses (MOOCs), Research Information Management Systems, Mobile technologies, Cloud computing.*

## Introduction

Libraries and Information centres play a vital role in organising and providing access to information and knowledge for life-long education. Creativity and innovation are possible through information and knowledge and these are the major ingredients in the economic development of a nation. As we move from the information society to a knowledge society, the provision of library services and resources in any type of library has also been reoriented to reflect the changes of technologies, information usage, access and nature of the information. In the digital world, the mode of information acquired, processed, stored and disseminated in the libraries and information centres has been changing. The major advantage of this technology is the provision of top-quality library and information services, adequate resources, and communication infrastructure. In the knowledge-based society, the libraries and librarians are becoming effective in facilitating the dissemination of information and knowledge that is necessary to facilitate technological innovation. There are many technologies that can be adopted in the libraries to extend its visibility and acceptance in the knowledge society.

## Innovative technologies

Technology is systematic knowledge and action. Technology in libraries may be innovative or disruptive. Innovation is the introduction of a new product, service, technology, administrative practice or significant improvement to an existing product, service or technology. Disruptive technology changes existing business models or customer expectations. Such technologies are also disrupting libraries. For example, the abstracting and indexing services, current content page services, newspaper clipping services provided in the libraries in print format have disappeared due to the emergence of online journals and newspapers. Libraries cannot do today's job with yesterday's tools and yesterday's concepts. Libraries have a window of opportunity and will not stay open forever. Hence alternatives will be brought in force when technologies are available. Library and Information Science professionals have to inline with the past and online with the future. Hence this paper discusses various innovative technologies that can be adopted in the libraries to reorient its services in the digital world.

## Content Management Systems

Content Management System (CMS) is an application software or a set of related programmes that are used to create and manage digital content. It supports many users in a collaborative environment. The tremendous growth in electronic resources has forced library and information professionals (LIS) to use various information and communication technology tools to administer and deliver services to the users. LIS professionals are increasingly looking for new paradigms for delivering innovative library and information services. Library portals play a vital role by creating an online environment where users can easily access information. It not only delivers services but also enhances scholarly communication and research among the patrons of the library. Several Open Source content

management software is available free of cost to assist the librarians in the creation of websites without much knowledge in HTML code or without the help of a webmaster. The major advantages of these content management software are reduced cost, lower technical barriers, greater automation and ease of use. The updates of these websites can be done without the need for a system administrator. Based on market share statistics, the most popular content management system is WordPress, used by over 33% of all websites on the internet, and by 59% of all websites are using a known content management system, followed by Joomla (3%) and Drupal (2%) (W3 Techs, 2018).

### **Reference management tools**

Reference Management / Citation Management / Personal Bibliographic Management software is a software for scholars and authors to store bibliographic citations. Once a citation is stored, it can be used frequently for generating lists of references for books and articles in different styles. The major advantages of reference management software are: it easily stores bibliographic information and references for the institute publication or faculty members, discover new articles and resources, share references with your peers, find out who's reading, what you're reading, import, store and search your PDFs and it facilitates as an Altmetrics parameter.

There are a number of software packages that the LIS professionals, researchers and faculty members can use to manage the bibliographic details of information and the documents that are found during research. The main packages that provide free access are EndNote, Zotero, Mendeley, CiteULike and RefWorks, but now several software packages or bookmarking tools are available online at no cost. One may find these online tools on the internet but they do not have all the needed functions, so the selection of the tool is very important for the effective and efficient management of citations. Many eminent institutions such as MIT, Stanford University, Cambridge University, etc are using these free tools for reference management.

### **E-learning management tools**

E-learning or "electronic learning" is an umbrella term that describes education using electronic devices and digital media (The Tech Terms Computer Dictionary, 2019). It encompasses everything from traditional classrooms that incorporate basic technology to online universities. The present generation of students who grow up with advanced ICTs, love learning and interacting with professors through online platforms. Also, students look for the best content from the best universities for free. So it is iterative to personalise education to learner's talent and interest. This blended learning is possible through emerging e-Learning models.

Interactive Learning Platforms offer a wide range of free courseware online including a system of testing, grading, student-to-student help and awarding certificates. The e-Learning management system is used to deliver course content to the student community within an organisation or to the remote location. Librarians can play a pivotal role in designing and developing e-Learning systems for the organisation for effective course content delivery. More than 150 e-Content projects are at different stages of development under the National Mission in Education through ICT (NME-ICT), including National Programme on Technology Enhanced Learning (NPTEL) (Phase II), e-PG Pathshala, Consortium for Educational Communication (CEC) e-Content, e-acharya, etc. The major advantages of e-learning platforms are:

- ❖ 24/7 Accessibility
- ❖ Improved Pedagogy
- ❖ Enhanced Collaboration and Research
- ❖ Greener & Cost-Effective
- ❖ Suitable for millennial

Modern libraries can participate in the promotion of e-learning programmes by digitising their resources and providing access to their repositories. Content creation, development and management are the heart of e-learning. Libraries can play an effective and efficient role in the selection, creation and management of e-content and developing new services. There would be great opportunities for libraries to take new activities in creating an effective e-learning environment. This cannot be achieved without a radical rethinking of traditional service activities and without significant re-alignment of resources (Thakur, 2007).

### **Massive Open Online Courses (MOOCs)**

It is a type of online courses aimed at large scale participation and open access through the Internet. MOOC is an online course that is free and open to anyone who wants to register. MOOCs are a relatively recent online learning phenomenon; they are now generating considerable media attention and significant interest from higher education institutions. They can be seen as an extension of existing online learning approaches, in terms of open access to courses and scalability. More recently, a number of MOOC projects have emerged independently, such as EdX

(www.edx.org), Udacity (www.udacity.com), Udemy (www.udemy.com), Khan Academy (www.khanacademy.org), Coursera (www.coursera.org) etc.

The advent of MOOC raises serious legal questions that in turn pose important and fundamental policy challenges for academic libraries. As Universities rush to find ways to add courses to emerging MOOC platforms, the university libraries are being asked to take on new demands will surely be challenging. Rising to this challenge will better serve libraries than the alternative of being excluded from the MOOC conversation. Libraries are playing a vital role in conducting MOOCs as experts in information and its copyright issues. University and research libraries can play their role in this open revolution for gathering the learning materials and serve the academics in running courses. Following are some of the areas that libraries have to work on:

- ❖ Use of copyrighted works in instructional materials such as online lectures or modules, assignment of copyrighted works for outside reading;
- ❖ The copyright status of materials generated by faculty for use in MOOC courses (including video lectures and other instructional materials);
- ❖ Accessibility of MOOC courses for learners with disabilities.

### **Research Information Management Systems**

Research Information Management System (RIM) is the web-based tool to discover and use research and scholarly information about faculty, scientists and resources. These tools connect institution-level/enterprise systems, national research networks, publicly available research data (e.g., grants and publications), and restricted/proprietary data by harvesting information from disparate sources into compiled expertise profiles for faculty, investigators, scholars, clinicians, community partners, and facilities. The major features of RIM are:

- ❖ Profile information can be automatically imported from authoritative institutional data sources;
- ❖ Individuals can log in using institutional authentication procedures to modify their profiles;
- ❖ Information like research interests, publications, presentations, etc. can be easily customized on the site;
- ❖ Identify current work and find scientists with precision and veracity;
- ❖ Simplify reporting tasks and provide visualizations of personal networks;
- ❖ Route information based on interests.

Today libraries are playing an important role in Research Information Management and can offer considerable expertise to support publications harvesting, discoverability, training and support for researchers, and stewardship of the scholarly record. Some of the RIM tools that can be used by the libraries are VIVO (a web-based, open-source suite of computer software for managing data about researchers, scientists, and faculty members), Vidwan (Expert Database and National Researcher's Network is the premier database of profiles of scientists/researchers and other faculty members working in leading academic institutions and other R & D organisations involved in teaching and research in India) etc.

### **Altmetric tools**

Altmetric is defined as "social media-based metrics" (Priem, Piwowar & Hemminger, 2014) which is a new approach in determining the quality and popularity of research more quickly than ever before. It is the short form for "Alternative to metrics" or it is an alternative to conventional metric tools.

Altmetrics capture ways in which articles are disseminated throughout in the expanding scholarly ecosystem, and reach beyond the scope of traditional trackers and filters. By monitoring and capturing the imprint of research from the moment of publication as it circulates throughout the community, Altmetrics also measures the aggregate impact of the research enterprise itself.

The scope of Article-Level Metrics (ALM) in the Academic Institution or R&D organisation are:

- ❖ Incorporate ALM into institution's research assessment exercises;
- ❖ Ask researchers to report their article-level metrics in all professional evaluation activities (hiring, promotion, etc.);
- ❖ Encourage display of ALM across departmental researcher and laboratory pages;
- ❖ Feature relevant metrics when showcasing noteworthy researchers;
- ❖ Librarians to communicate the value of ALM in their work with researchers;
- ❖ Adopt ALM for articles in the institutional repository.

Altmetrics tries to measure the data sources such as (Brewer, 2020):

- ❖ Usage: Hits on web pages, downloads of the article, views, library holdings, or plays of a video.

- ❖ Readership: Number of views, saves, downloads, comments.
- ❖ Reference managers: Number of “saves” in online reference managers.
- ❖ Blogs: Number of times a publication has mentioned in blogs, comments, reviews.
- ❖ Social networking sites: Number of links or references to the resource.
- ❖ Citations: Citations on non-traditional sources like citation indexes, patent citations, clinical citations, and public policy documents.
- ❖ Wikipedia: Number of mentions of articles or other academic outputs in the English-language version.
- ❖ Facebook walls: Number of times a publication has mentioned on a wall on Facebook.

With the growing interest in the use of Altmetric, several new tools have been created and are available both free of cost and commercially. Some of the tools available are Research Gate, ImpactStory, ReaderMeter, PLoS Impact Explorer, PaperCritic, CrowdoMeter, ScienceCard, Citeulike, Plum Analytics etc.

The rise of digital tools supporting altmetrics gives opportunities for libraries and librarians to maintain currency in research, scholarly production processes and illustrate their value to researchers in new ways. Altmetrics has been used to illustrate the value of electronic journals and books subscribed by the library and the use of institutional repositories. Altmetrics is a valuable offering that can enhance the services provided by a library publishing program and attract potential publishing partners.

### **E-Resource management tools**

Electronic resource management (ERM) is the practices and techniques used by the library and information professionals for the selection, acquisition, licensing, access, maintenance, usage, evaluation, retention, and de-selection of library's electronic information resources. These resources include, but are not limited to, electronic journals, electronic books, streaming media, databases, datasets, CD-ROMs, and computer software.

The advent of e-resources and their increased use have changed the library scenario from physical to virtual. Users' preferences are more for e-resources and virtual libraries with little attraction for physical libraries. With the proliferation of electronic resources ( e-resources) in terms of production, acquisition and usage the management of e-resources remains a cumbersome process. The process involved in the management of e-resources has often overwhelmed the library personnel. The relentless arrays of work in the management of electronic resources have made librarians to look for systems which can save their time and energy and provide efficient management of e-resources. (Khan and Tarannum, 2015). CORAL, ERMes and 360 Resource Manager are some of the major ERM tools used by the libraries.

### **Web discovery tools**

In the digital era another problem, faced by the libraries, is the different formats of information available in various knowledge platforms and databases. To integrate all the information and documents available in the library as well as outside the library, especially from subscribed online databases and Open Source documents, libraries have to depend on resource discovery tools or web-scale discovery tools. These tools are a one-stop-shop search interface which allows the users to search for all the information irrespective of open access resources or subscribed one. It provides Google-like search features which are easy for search and retrieval. A web discovery service provides centralised, pre-aggregated indexes which are searchable at the end-user. The discovery services are the next generation of library search interfaces that drag various resources together into one interface. Using this service one can find books, trade publications, articles, journals, dissertations, newspapers, e-books and more which integrate federated search features also. Some of the free /open source discovery tools are Fac-Back-OPAC (Kochief), LibraryFind, Blacklight, Rapi. Scriblio, SOPAC, VuFind etc. The major subscription-based discovery tools used by the libraries are EBSCO Discovery Service (EDS), WorldCat Local-OCLC, Summon, ExLibris Prime Central etc.

### **Mobile technologies**

Mobile devices can help to start bringing the physical and virtual worlds together. They can bring electronic resources into our physical spaces or bring physical items to life within the electronic world. Different technologies that can help the library to increase the visibility of its resources are Quick Response codes (QR codes), Near Field Communications (NFC) and Augmented Reality (AR).

### **Quick Response (QR) Codes**

QR codes are two-dimensional matrix codes. The traditional barcodes that encode information in only one dimension (the height of the lines contains no information). Matrix codes, such as QR codes encode information both



horizontally and vertically. Thus it encodes more information in a limited space than traditional barcodes. Mobile application and QR codes are currently being employed by many libraries in the UK and USA and utilize these codes as an additional marketing and promotional tool of library services. Librarians can tailor mobile applications and QR codes in web 2.0 technologies such as Facebook and Twitter for mobile use.

The most significant use of QR codes is in the library catalogue, with the expectation that students would scan the code and be able to save the bibliographic details of the book, as well as the shelf location on their phone rather than write it down. It may be URL based, linking to instructional videos, linking to their text service "ask a librarian," and storing the shelfmarks of items.

### **Near Field Communication and RFID**

Two technologies with similar functions to QR codes are currently being developed for smartphone use. These are Radio Frequency Identification (RFID) tags and Near Field Communications (NFC). RFID technology is currently common in the library service for holding the bibliographic details of items held in the library. This technology could be used in the future to provide access to a wider range of more complex information than the QR codes are able to do.

Near Field Communication (NFC) is a "short-range, wireless interactive tool that allows interaction with PCs, mobile devices and consumer electrical devices" and for a library, this would allow for payment of charged information products and services and overdue fines. RFID could be used for book recommendations, personalized help and social networking. In libraries, Near Field Communication could enhance outreach and existing services such as self-checkout. It also serves as a new way to link physical materials with digital information, potentially transforming the way users interact with the information environment. NFC can also be used for cashless payment for online downloads and access control.

### **Mobile Augmented Reality application**

Mobile augmented reality (AR) applications represent a profound opportunity for increased access to print and digital library collections. AR applications can deliver an engaging and interactive information experience. Applications that overlay graphical data are well suited for in-library engagement as well as off-site real-world interaction with library contents. The current state of mobile in libraries is such that many libraries now create and adapt their catalogues for mobile access. Mobile augmented reality applications offer much for the integration of library resources into users' information environment. Libraries can expand and extend the library services through augmented reality applications such as:

#### ***Physical book stacks browsing***

Use of augmented reality applications includes the integration of digital library content into the physical stacks browsing experience. Orienting a new user in the book stacks is both a challenge and also an incomplete introduction to the totality of available services of the library. The new members may consider the physical book stacks to be the only available library resource and they are not aware of the digital collections. With an augmented reality service in the library book stacks, the mobile app user can use the software to first identify the stacks that he/she is in (i.e. identify a subject area of "Dictionaries"), and then the software will overlay a range of digital content to this physical presence, once the meaning and subject area of the shelf are identified by the software.

The users can also learn about the circulation history of any book that the augmented reality program is able to identify. They could also then tap on their phones for more recommendations based on the identified book. A mobile augmented book stacks application is quickly accessed from a user's Smartphone and does not require users to enter a search query; it allows them to use their stacks location and Smartphone as a query point for additional library information.

#### ***Library navigation***

This applied mobile augmented reality research is particularly relevant to the problem of library wayfinding. These wayfinding problems include understanding call numbers or other library-specific numberings such as the shelf ranges or even the column number on the ranges that are typically utilized for inventory control.

### ***Optical Character Recognition (OCR) apps***

OCR apps allow users to scan the textual document using their mobile phone. It has options to scan a course-assignment page or syllabus; scan a citation or bibliography; scan the contents of a book page; scan a shelf of books in the library.

### ***Identify building services and collections***

An augmented reality application that can identify buildings by simply holding the phone's camera up to the building could be particularly useful for a large University campus or institutions with multiple library sites. The user of this augmented reality application can use this to identify the name of the library building, the hours of the library building, and can tell users when it will be closing and overlay information such as current computer availability, technology availability or even seating availability in the library.

The penetration of mobile phones enables us to run more AR applications, making this an area ripe for exploitation by libraries with a little imagination. The twenty-first-century library is a laboratory of experimentation and prototyping. Mobile augmented reality services are starting points for developing next-generation library computing services that are truly effective for meeting the information needs of users in a digital era (Hahn, 2012).

### **Cloud computing tools**

Cloud computing is the use of computing resources including both hardware and software that are delivered as a service over the Internet. Cloud computing entrusts remote services with a user's data, software and computation. Cloud computing tools enable users to access systems using a web browser regardless of their location or what device, personal computer or mobile phones they are using. The library and information science professionals can become more mobile than before. The librarians have information stored in many different places and on several different devices (work, home, laptop, fixed computers, and mobile phones) and struggle to access the right piece of information at the right time. There are tools and techniques that help to share information across fixed and mobile devices. The following tools use the Internet as a giant drive for documents and files.

#### **Dropbox**

It is a file hosting service that offers cloud storage, file synchronization, and client software. Dropbox allows users to create a special folder on each of their computers, which Dropbox then synchronizes so that it appears to be the same folder with the same contents regardless of the computer it is viewed on. Files placed in this folder are also accessible through a website and mobile phone applications. It offers 2GB of free storage space.

#### **iCloud**

iCloud is a cloud storage and cloud computing service from Apple Inc, allows users to store 5GB data, free of cost on remote computer servers for download to multiple devices.

#### **Amazon Cloud Drive**

It is a web storage application that provides users with 5 GB of storage space by default. The files and folders can be accessed and managed from multiple devices, including web browsers, desktop applications, and mobiles. Amazon Drive offers free unlimited photo storage with an Amazon Prime subscription or a Kindle Fire device.

#### **Microsoft OneDrive**

It was previously known as Windows Live SkyDrive and Windows Live Folders is a file hosting service that allows users to upload and synchronize files to cloud storage and then access them from a Web browser or their local device. The service offers 15 GB of free storage for new users.

#### **Google Drive**

Google Drive, file storage and synchronization service is now the home of Google Docs. It is the best known online collaborative system for working on documents. It works with a range of formats, so it is possible to upload documents originally created using other office software. Google Drive gives all users 15 GB of cloud storage to start with. Once a file is created or uploaded, it can be shared easily with everyone on the web or with nominated individuals, so that it can be worked on collaboratively over the Internet on anything from a fixed computer to a mobile phone.

These tools allow us to save a file on one device and continue to work on it from any other devices capable of connecting to the Internet. It is possible to save a document on a working computer, read through it on a mobile phone or tablet on the way to a meeting, display it on another device in the meeting, perhaps editing it. These devices completely replaced USB drives and gave increased flexibility in how and where to access the files making a user much more productive than before. Many social media tools work well over mobile devices such as Facebook, Twitter and Google Plus to build and participate in one's personal and professional learning networks. Library and information professionals can make use of these tools for roving support outside as well as inside the library. Equipped with a Smartphone, or preferably a tablet, a librarian can give support when and where it is asked for.

## Conclusion

In the digital era, we have many innovative technologies that can be applied in any type of library to transform its products and services to a more efficient, effective and user-oriented one. But it is quite sure that many of the library professionals are not aware of these technologies. The list of applications can give an idea too. But we cannot point out any library that implemented these technologies successfully. Hence the description of the above technologies and tools will give some insight to the LIS professionals to learn and implement some of them in their libraries without much financial commitment. Users' requirements are the most important factor to be considered while implementing these technologies and services. With certain technologies and applications, we no longer have to direct users to the library; we can bring the library to our users. The library and information professionals shall honour the past and create the future with innovative technologies.

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# BLOCKCHAIN TECHNOLOGY AND THE DIGITAL SOCIETY: DEVELOPMENTS, POSSIBILITIES AND CHALLENGES

Ramnath Reghunadhan

**Abstract:** *In what is considered as the 'Period of Digitisation', the human society is transforming, transitioning and creating new paradigms of technological innovations, governance and security. In a post-globalization world that is more conflict-ridden, fragmented, fractured and increasingly isolationist, the use and dissemination of the blockchain are considered to be revolutionary. This paper is the conceptualization of the emergence of blockchain technology into the present societies and provides a more thematic understanding of this technology, its developments, possibilities, implementation and challenges for the societies.*

**Keywords:** *Blockchain, India, Digital, Governance, Security.*

## Introduction

Human civilization is undergoing a digital transformation, particularly in the Spatio-temporal paradigm, creating interactional and normative changes to the existing societies. The largely variant spaces, particularly the spheres of interaction, provide for transitory nature and are being imbibed into the current ecosystem. This is creating multiple ripple effects in the perception, as well as (re)configuring the status quo among the various actors as well. The last century witnessed greater strides in the form of the internet revolution, transformation, dissemination and integration of related technologies into the digital world but more importantly have had a greater impact on the physical world. In particular, in relation to computers and computing, this period is generally perceived as the "Period of Digitisation," that is having a multiplier effect on the socio-economic, political as well as psychological nature of human beings themselves. Here every relation, information, thought process, decision-making and life as such has been either digitised or inherently linked to it. Increasing standardisation of interconnectedness and interlinkages through the digital networks as well as communication devices are happening, one which is developing the 'cyberspace', also known as 'digital world' or 'virtual world'. It is increasingly considered as a public good, pertinently as the right of an individual (citizen in particular). In the present scenario, human civilization is on the cusp of completely 'cybering' (if not already happened to at least some) the societal relations as well as interactions and conflicts. This century saw cyberspace being developed as a global arena for interaction among numerous activities shared as well as exchanged in relation to data, information, ideas and/ or knowledge by the population in and around the globe. The process of globalisation was accelerated through it, particularly enabling businesses to operate internationally, without any delay (at least virtually) and by providing previously unavailable opportunities to the population of many regions; in the likes of provision for health care, education, learning, access to knowledge and even greater interaction between people. This paper is the conceptualization of the emergence of blockchain technology into the present societies and provides a more thematic understanding of this technology, its developments, possibilities, implementation and challenges for the societies, both developed and developing countries.

## Blockchain technology

At the beginning of the twenty-first century, Satoshi Nakamoto(2008) published a paper that detailed the workings of a peer-to-peer electronic cash system for deinstitutionalization of financial transactions called Bitcoin (a digital currency or cryptocurrency), that is based on the platform provided by what is known as blockchain technology. Blockchain is a data structure or method of organizing information/ knowledge through a distributed ledger, which can be shared among a multitude of people and places. It enables transaction to be made that avoids the need to have a traditional concept of 'legitimate' central supervisory authority; and by reliance on "innovative combination of distributed consensus protocols, cryptography" and "in-built economic incentives based on game theory," (CIGI, 2017; Reghunadhan, 2020) thereby ensuring greater reliance, transparency as well as "integrity" to the transactions being conducted (ENISA, 2018). The first transaction that is added to a block is known as "generation transaction or coin-base transaction." The successful execution of the transaction leads to the formation of a "peer-to-peer bitcoin network," and becomes permanently imprinted once it undergoes verification through the process known as "mining". This is created by a miner or network of "miners," who run a "mining rig" (O'Reilly Media, 2013), specialised computers and related hardware used for mining bitcoins. The miner then competes with each other for validating the unconfirmed transactions (which are temporarily stored but not validated until confirmed) and later adds them as a "new block" (ENISA, 2018; Reghunadhan, 2020).

In a blockchain, each block comprises a unique hash-based proof-of-work, which is attached to each transaction and can be identified as a hash value. This hash is produced after each transaction and is reminiscent of a digital fingerprint. The key security feature of blockchain technology is that any modification of a parent block causes a change in all the subsequent blocks of the chain. This would automatically force a recalculation of all “subsequent blocks to be recalculated and for each subsequent block, new proof-of-work would have to be provided.” This would require computational power that would surpass the capability of an individual node(s) even though they (could) work together, (ENISA, 2018) thus preventing any ‘adjustment’ or malpractice to take place without informing all the stakeholders. Now each computer or electronic device connected to the blockchain’s network is called a node. Each node has a copy of the entire ledger and works with other nodes to maintain the ledger’s consistency. If any node disappears or goes down, all is not lost. A consensus mechanism (set of rules), based on which the network uses to verify each transaction and agree on the current state of the blockchain is ensured. Once a block of data is recorded on the blockchain ledger, it becomes extremely difficult to change or move, unless the majority of the nodes reach a consensus to examine and modify. Blockchain can be categorised into different types: public (complete transparency to all nodes), permissioned (selective transparency to nodes) and private (restrictive as in a closed-loop). Through the use of cryptography, each participant (stakeholder with verifiable access) is able to change the ledger, which is only temporary unless verified by a majority of different stakeholders, thus providing for the decentralization of authority in governing matters (Nakamoto, 2008; Deloitte, 2017).

## **Developments**

The Scandinavian countries like Finland have already enabled startups to bring up innovative solutions for providing identity by using the blockchain technology for data storage that could enable support starting from citizens to refugees, asylum seekers, provide prepaid debit card, and secure authentication procedures and links the identity of cardholders to the blockchain (Suberg, 2017). There are multiple startups and developers, like ConsenSys who intend to launch a biometrics-backed digital identity collaboration for Ubuntu phones and tablets, BlockApps intends to deliver e-wallet and identity systems. The uPort (digital wallet) allows third-party authorities as well as peers to validate the user’s information. For a refugee this might be the only way to receive cash, even from international agencies or kins far away, along with legitimising their identity before the authorities, particularly to access to goods and services. This ensures effective removal of middle-men, bridge loopholes in the distribution system as well as plugs the leakages in the ground-level. The service called ShoCard is currently developing solutions to overcome the issues of forged authentication, misrepresentation, human trafficking and offers access to a trusted identity distributor (Redman, 2015; Reghunadhan, 2020). The Blockchain Emergency ID (BE-ID) undertaken by Bitnation intends to facilitate as well as provide identification, emergency services, humanitarian aid to refugees and better governance (Bitnation, 2018). The UN’s World Food Programme (WFP) has deployed a pilot project known as ‘Building Blocks’ for 10,000 refugees in the Azraq camp (in Jordan) using blockchain technology to make cash-based transfers, payments, access to food and other means of entitlements in a much faster, cheaper but more secure manner (WFP, 2017).

In India, there is an enabling ecosystem for research and development (R&D) in the blockchain. With a huge middle-class, India is poised to become one of the largest markets for global cryptocurrency exchanges. The institutionalisation of blockchain can be used in healthcare, automobiles, industry, agriculture, finance, digitisation of records and in increasing transparency as well as accountability in day-to-day activities (Verberne, 2018). This year the nation’s online customer base is expected to rise above 500 million and have a huge potential to be tapped into (IAMAI, 2018). In the last three years with major startups like Primechain Technologies (2016), Elemental (2016), Sofocle Technologies (2016), Cateina Technologies (2017), EzyRemit (2015), Auxesis (2015), KrpC (2016), RecordsKeeper (2016), Signzy (2016), GetXS (2016) provided an upstart that could be accelerated using the existing innovation and startup hubs the government intend to invest in it Anupam, 2017). The concepts like a “refugee bank” (MEHR, 2015) supplemented by features like the Digilocker or the e-wallets is hailed as a game-changer as it could mainstream as well as enable institutionalization of a productive life for the refugees in India (Reghunadhan, 2020).

## **Possibilities**

The possibilities of integration of the blockchain technology into Digital India could enable the creation of a digital economy that is largely inclusive in nature, invariably secure, transparent as well as accountable to the users. It will enable the public with a robust mechanism that provides greater integration towards economic collaboration and cooperation at the trans-border level. This could play “a critical role in strengthening economic resilience,” and ensure relatively greater equity for the provision of accessibility and distribution of resources (CIGI, 2017). When complemented with other attributes like smart contracts, digital governance and Internet of Things (IoT), blockchain is considerably more transparent, accountable and highly secure against data manipulation or hacking. This can greatly

reduce the prospects of fraud or data mismanagement in the country. It also allows for transparency for a direct transaction(s) between different parties, and thus removes the requirement for intermediaries like banks, reduces payment costs, and greatly increases protection to beneficiary data (Reghunadhan, 2020).

Blockchain technology transcends the nature of the identity of citizens, by providing digital identity. This provides indestructible, untamperable access to goods, services and other provisions to the citizens of the nation, even outside their country. It could also provide identity solutions for refugees and/ or Internally Displaced Persons (IDP) so as to enable access to institutionalised mechanisms in any country, irrespective of the political boundaries, social hindrances and/or any other physical constraints. It ensures documentation, and voluntary identification, which can grant access to healthcare, social welfare services, livelihood opportunities and so forth. The benefits of blockchain include information consensus across the majority of stakeholders, time-stamping, encrypted information that provides greater security, digital signatures providing greater authenticity, enhanced ownership and tracking particularly in businesses, greater resilience, data loss protection, master data management, and sophisticated cryptographic authorisation that is enabled with programmable logic that ensues multi-party agreement. The recent ID2020 Summit that took place in New York saw technology companies, including that from India, vying to create a digital identification; by linking iris scans, fingerprints, birth date, medical records, education, travel, bank accounts and the like. This program of a universal digital ID could ease the issue of transit, travel by having just a smartphone app (ID2020, 2017; Deloitte, 2017).

## **Challenges**

There is an emerging issue of manipulating or editing blockchain, by the likes of major developers. This has manifold ramifications on the implementation of blockchain, particularly to the reliability and trust that blockchain has in the international arena. A lot of issues may arise when a 'trusted administrator' or 'limited key access' is given the power to record, rewrite and verify transactions, thus possibly disintegrating the decentralised nature of blockchain to the interest of few. This contradicts the basic principle followed by blockchain, that is, if half the computers on the network agreed to alter the transaction records, the records could be modified, which is unlikely to happen since the network is too decentralized. The currently proposed "chameleon" hash function could circumvent the transparency and accountability, that currently is the key feature of blockchain technology (Accenture, 2016). Though this, in turn, is argued as increasing the security features of cryptocurrencies like Ethereum, it would transform the genuine intention with which blockchain was originally devised. The emergence of issues of the volatility of these cryptocurrencies like Bitcoin, Litecoin, Ethereum, Dash, Ripple, Dogecoin has but become a greater threat, not only to the global financial system but also to the political system as well (Reghunadhan, 2020).

Though the use of blockchain technology promises a better, viable as well as more secure payment system that replaces the e-currency in the traditional bank accounts which most importantly are moving towards a cashless economy; many are sceptical about them. This includes suspicions of possible manipulation or abuse, even impacting the society at greater length. The means of exchange, that are provided for the basis of trust between the citizens as well as the governments, is an important symbol of legitimacy over the people, which when manipulated will disrupt not just the economic but socio-political fabric as well (James, 2018). There are traditional challenges like privacy, regulatory bottlenecks, lack of standardization and/ or internationally accepted 'benchmark-ism', differential scalability (size of ledger and speed of transactions), validation, (Bendor-Samuel, 2017) regulatory bottlenecks, expensive nature of maintaining and updating as well as the existence of unknown vulnerabilities. There are specific challenges like consensus hijack (51 per cent hijack), side chains (issue of proxy tokens), DDoS, wallet management (loss of access, compromise of a wallet and/ or irreversible fraudulent transactions), smart contract management issues (error) from people, processes and/ or technology and even the exploitation of permissioned blockchains (exploitation of regulator's capabilities) that will have greater ramifications for individuals and the nation as a whole (ENISA, 2017).

## **Conclusion**

Blockchain technology is an emerging technology with a lot of promises in various sectors of the society that is continuously connected in this period of 'digitalised globalisation' or 'Globalisation 2.0'. It has created various cost-effective solutions to address the various aspects of security and privacy but enabling decentralised access to the individual end-user as well. Thus it could enable greater accessibility, transparency, accountability as well as efficiency in the existing institutions of the society while providing for the creation of new institutions that often could transcend the traditional notions, perceptions as well as understandings. With the integration of blockchain, citizens could control their personal data accessibility, prevent (if not reduce) data loss, interoperability, ensure greater accountability from authorities and have low-cost verification, validation as well as authentication in various

circumstances, particularly for needs of accessibility to goods and services. But besides the pros of blockchain technology, it has its cons that could not only affect its implementation but ensure or lead further towards the exploitation as well as by the regulators. This overturns the real intention of the development of blockchain, i.e., decentralisation. The issues oligopoly (or monopoly) and the centralisation of blockchain technology by some could create greater disparities, exacerbate the societal divide in the population and the nation as a whole.

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# USE OF E-RESOURCES BY THE POSTGRADUATE BIOTECHNOLOGY AND MBA STUDENTS OF UNIVERSITIES IN KERALA

**Dr Joseph I Thomas  
Dr Humayoon Kabir S.**

**Abstract:** *This paper provides information regarding various information sources used by students of Biotechnology and MBA. The paper includes information regarding various sources used by postgraduate students of Biotechnology and MBA. It also focuses on providing an introduction to the various open and subscribed information sources related to scholarly literature in Biotechnology and MBA.*

**Keywords:** *Psychology, Journalism, Electronic Information Sources, Mass Communication.*

## **Introduction**

Information technology is now becoming part and parcel of our day-to-day activities. Electronic resources, the revolutionary output of human intellect, is drawing attention from persons belonging to various professions owing to its advanced features. Since its inception, e-resources are fast acquiring human vistas of knowledge so as to enable him to overcome his physical limitations. Thus helping mankind to rise above any other species on the planet.

Right from the beginning of human history, the urge for discovery existed in mankind. This primary tendency of mankind is to be lauded when it comes to each and every discovery. From Charles Babbage to Bill Gates, information technology has its story to be narrated on how mankind views information technology and electronic environment. From the analytical engine to microchips, techniques for information storage and retrieval have improved upon its efficiency and conservation of space.

On cultivating the basic human tendencies, electronic resources have a major share in enlarging the human knowledge map. The continuous and revolutionary metamorphosis observed in the development of e-resources is a welcome change for those expecting the age of e-resources where they acquire the capabilities of mankind. This development is indebted to technology masters who have spent their time and energy for building a better tomorrow for their successors.

## **Review of literature**

Pinfield (1998) reports results of an analysis of the usage of the BIDS ISI online service, by staff and students at Birmingham University, the UK between 1994 and 1997. The study found a consistent increase in total usage in line with national trends and with a pattern shaped by the academic year. ISI usage was considerably greater than other BIDS services. It was also revealed that the greatest use of ISI is made by the Faculty of Science.

The study by Janaki and Mohamed (2007) describe the steps taken by the University of Malaya Library to successfully implement the continual improvement project for the year 2005, entitled "Promoting the Use of Online Databases". The study reveals that the library has succeeded in reaching out to more and more postgraduates each year resulting in an increase in the use of online databases.

Ismail (2010) conducted a study to know the library use and needs of faculty and students at a satellite graduate social work program. The study found that half of the satellite students surveyed named the library's online databases as the most useful library resource. Almost half of the respondents reported using the library interlibrary loan service. A great majority indicated that they used the library web site to complete their assignments.

Aydeed and Beegam (2012) pointed out through their study that science postgraduates mainly use e-resources for getting subject information and about half of non-science students are using e-resources to gain current and general information. Lack of a required database is the main problem faced by the science students and difficulty in accessing full text is the main problem faced by non-science students.

Bansode and Pereira (2012) highlight how postgraduate students are highly influenced by digital resources, especially the Internet, to retrieve information for various purposes. The study found that many respondents are not aware of

what information can be searched and what cannot be searched using search engines on the Internet. It was also found that the respondents do not possess the necessary skills to locate the information.

Chauhan et al. (2012) assess and evaluates the use of e-resources by 240 students at Ratan Tata Library (RTL) of the Delhi School of Economics (DSE) and Faculty of Management Studies Library (FMSL), University of Delhi (DU), Delhi. The study found that the respondents are aware of various types of e-resources, e-databases, e-books and e-journals.

### **Objectives of the study**

The objective of the study is to find out the most used e-resources by the postgraduate students studying for Biotechnology and MBA as their mains for post-graduation in universities in Kerala.

### **Methodology**

Descriptive and statistical approaches were used to describe the data gathered. The study was carried out in four major Universities in Kerala viz. University of Kerala, Trivandrum; Mahatma Gandhi University, Kottayam; University of Calicut, Calicut; and Kannur University, Kannur. The data for the study was collected by using a questionnaire designed for the purpose.

### **Analysis of data**

The main purpose of the study was to obtain data on the various information resources used by postgraduate students. The findings have been prepared based on surveys taken with the help of a questionnaire.

#### **Frequently used E-resources by the postgraduate students studying Biotechnology as their main subject.**

In the sections below, responses received from the postgraduate students studying Biotechnology are tabulated, analysed and presented in the sections that follow.

#### **Analysis of frequently used e-resources of the first choice by the postgraduate students studying Biotechnology as their main subject.**

Postgraduate students of every branch will have a preferred electronic resource for enhancing academic activities. The table given below shows the most preferred electronic resource of postgraduates having Biotechnology as their main subject.

#### **Frequently Used Print Resources of First Choice by the postgraduate students studying Biotechnology as their main subject.**

The table given below shows the most preferred print resource of postgraduates having Biotechnology as their main subject.

**Table 1**

Analysis of Frequently Used Print Resources of First Choice by Biotechnology Main Postgraduate Students.

SI No.	Name of Resource	Frequency	Percentage (%)
1	BioChemistry by Stryer	1	7.14
2	Bio Instant Notes of Genetics	1	7.14
3	Cell Biology, Molecular Biology, genetics by Ananda Narayana Panikkar	1	7.14
4	Genetics by Benjamin	1	7.14
5	Immunology by Abbas	1	7.14
6	Immunology by Kuby	2	14.29
7	Microbiology by prescott	1	7.14
8	Resource book of BioChemistry by Satyanarayana	1	7.14
9	Resource book of BioChemistry by Vasudevan and Sreekumari	2	14.29
10	Resource book of Genetics, Microbiology	1	7.14
11	Textbook of BioTechnology	1	7.14
12	Textbook of Microbiology 9th Ed. by Ananthanarayanan and Paniker	1	7.14
	<b>Total</b>	<b>14</b>	<b>100</b>

From the above analysis it could be noted that out of the 14 respondents who have attempted the query, 2 (14.29%) each have chosen Immunology by Kuby and Resource book of BioChemistry by Vasudevan and Sreekumari as the most preferred print resource.

#### **Frequently used electronic resources of the second choice by Biotechnology main postgraduate students**

The table given below shows the second most preferred print resource of postgraduates having Biotechnology as their main subject.

**Table 2**

Analysis of Frequently Used Print Resources of Second Choice by  
Biotechnology Main Postgraduate Students

SI No.	Name of Resource	Frequency	Percentage (%)
1	BioChemistry by Lehninger	2	16.67
2	BioChemistry by Stryer	1	8.33
3	Cell Biology by Gerald Komo	1	8.33
4	Genetic Analysis	1	8.33
5	Microbiology by Stryer	1	8.33
6	Molecular biology	1	8.33
7	Practical Biotechnology	1	8.33
8	Resource book of BioChemistry by Vasudevan and Sreekumari	1	8.33
9	Resource book of BioTechnology	2	16.67
10	Resource book of Genetics	1	8.33
	<b>Total</b>	<b>12</b>	<b>100</b>

From the analysis shown above it could be noted that out of the 12 respondents who have attempted the query, 2 (16.67%) each have chosen BioChemistry by Lehninger and Resource book of BioTechnology respectively as the most preferred print resource of the second choice by them.

#### **Frequently used electronic resources of the third choice by Biotechnology main postgraduate students**

The table given below shows the third-most preferred electronic resource of postgraduates having biotechnology as their main subject.

**Table 3**

Analysis of frequently used e-resources of third choice by Biotechnology main postgraduate students.

SI. No.	Name of Resource	Frequency	Percentage
1	Microbiology: An Introduction	1	8.33
2	i-genetics: A molecular approach by Peter J Russel	1	8.33
3	Resource book of BioChemistry by Vasudevan and Sreekumari	1	8.33
4	Cell and Molecular Biology	1	8.33
5	BioChemistry: instant notes	1	8.33
6	Essentials of Molecular Biology	1	8.33
7	Resource book of Microbiology by chakraborty	1	8.33
8	Genetics by Benjamin	1	8.33
9	Gene by Lewis	1	8.33
10	BioChemistry by Stryer	1	8.33
11	Microbiology by Prescott	1	8.33
12	Microbiology by Tortora, Funke	1	8.33
	<b>Total</b>	<b>12</b>	<b>100</b>

From the analysis, as shown above, it could be noted that out of the 12 respondents who have attempted the query, one each (8.33%) of the above resources have been chosen as their third most frequently used print resource for academic purposes.

#### **Frequently used E-resources by the postgraduate students studying Management as their main subject.**

In the sections below, responses from the postgraduate students studying Psychology are tabulated, analysed and presented in the sections that follow.

**Frequently used electronic resources of first choice by postgraduate students studying for MBA.**

The table given below shows the most preferred electronic resource of postgraduates having management as their main subject.

**Table 4**  
Analysis of frequently used e-resources of first choice by MBA main postgraduate students.

SI No.	Name of Resource	Frequency	Percentage
1	Azheekodan Vayanasala and Grandhalayam, Morazha	1	4.17
2	Business Communication	1	4.17
3	Business Line	2	8.33
4	Business Times	1	4.17
5	DC Books English Malayalam Dictionary	1	4.17
6	Education Press	1	4.17
7	Financial Management by I.M. Pandey	1	4.17
8	Internet, Finance Management	1	4.17
9	Managerial Economics	1	4.17
10	Marketing Management by Philip Kotler	6	25.00
11	Modern Banking	1	4.17
12	Operations Management	1	4.17
13	Principles of Management by LM Prasad	1	4.17
14	Principles of Management Studies, HR Management	1	4.17
15	Principles of Marketing by Philip Kotler	1	4.17
16	Research Methodology by Kothari	2	8.33
17	The Hindu newspaper	1	4.17
	<b>Total</b>	<b>24</b>	<b>100</b>

From the analysis it could be noticed that out of the 24 respondents who have attempted the question, 6 (25%) of the respondents chose Marketing Management by Philip Kotler as the most frequently used print resource.

**Frequently used electronic resources of the second choice by the postgraduate students studying for MBA.**

The table given below shows the second most preferred electronic resource of postgraduates studying for MBA.

**Table 5**

Analysis of frequently used e-resources of the second choice by the postgraduate students studying for MBA.

SI No.	Name of Resource	Frequency	Percentage
1	Artificial Networks	1	6.67
2	Business Law	2	13.33
3	Financial Management by I.M. Pandey	2	13.33
4	Human Resource Management	1	6.67
5	India Today	1	6.67
6	Marketing Management by Philip Kotler	1	6.67
7	Quantitative techniques	1	6.67
8	Research Methodology by Kothari	2	13.33
9	Security Analysis and Portfolio Management by S. Kevin	1	6.67
10	Supply Chain Management by Upendra Kachu	2	13.33
11	The Hindu	1	6.67
	<b>Total</b>	<b>15</b>	<b>100</b>

From the analysis it could be noticed that out of the 15 respondents who have attempted the question Business Law (13.33%), Financial Management by I.M. Pandey (13.33%), Research Methodology by Kothari (13.33%), Supply Chain Management by Upendra Kachu (13.33%) were the most frequently used print resource of second choice by MBA students.

#### **Frequently used electronic resources of the third choice by MBA students**

The table given below shows the third-most preferred electronic resource of postgraduates studying for MBA.

**Table 6**

Analysis of frequently used e-resources of the third choice by MBA students.

SI No.	Name of Resource	Frequency	Percentage
1	Principles of Management	1	9.09
2	Tax by Vinod Singhania	1	9.09
3	Security Analysis and Portfolio Management by S. Kevin	1	9.09
4	Project Management by Prasanna Chandra	1	9.09
5	Supply Chain and Logistics Management	1	9.09
6	Income Tax	1	9.09
7	Entrepreneurial Development	1	9.09
8	Operational Research	1	9.09
9	<i>Economic and Political Weekly</i>	1	9.09
10	<i>Business line</i>	1	9.09
11	Fundamentals of Accounting	1	9.09
	<b>Total</b>	<b>11</b>	<b>100</b>

From the analysis, it could be noted that each of the above resources is chosen by only one (9.09% each) respondent.

#### **Findings**

The following are the major findings of the study.

- ❖ Immunology by Kuby and Resource book of BioChemistry by Vasudevan and Sreekumari is the most preferred print resource by Biotechnology students

- ❖ BioChemistry by Lehninger and Resource book of BioTechnology respectively are the 2<sup>nd</sup> most preferred print resource by Biotechnology students
- ❖ Marketing Management by Philip Kotler is the most frequently used print resource by MBA Students
- ❖ Business Law (13.33%), Financial Management by I.M. Pandey (13.33%), Research Methodology by Kothari (13.33%), Supply Chain Management by Upendra Kachu (13.33%) were the most frequently used print resource of the second choice by MBA students.

## Discussion

It's evident from the results that the Internet is not often used by the postgraduate students of Journalism and Psychology departments. Valuable e-resources like OpenDOAR ([www.opendoar.org](http://www.opendoar.org)), ROAR (<http://roar.eprints.org>), DOAJ (<http://www.doaj.org>), DOAB (<http://www.doabook.org>), Digital Library of India (<http://www.dli.ernet.in>), Sodhgangothri (<http://sodhgangothri.inflibnet.ac.in>), E-Shodhsindhu (<http://www.inflibnet.ac.in/ess/>) are few among the innumerable information sources which contain subject-specific information useful for both psychology and journalism students. Thus it could be concluded that more awareness programs regarding information resources must be given to postgraduate students.

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# OPEN JOURNAL SYSTEM AND OPEN ACCESS PUBLISHING IN INDIA

**Mahesh Palamuttath**

**Abstract:** *India, One of the populous and fast-growing country, emphasizes on Higher education system with revolutionary educational polices, hundreds of universities and thousands of colleges etc. Every year thousands of PhD's are being awarded. Scholarly journals are considered to be the carrier of quality scholarly knowledge. These research projects are mostly gone using Public money. Every research scholar produces an article containing his/her research result and which are sent to publish in scholarly journals. Providing open access to the research work will assist other researchers, especially in a developing country to have access to research literature across the world. This article deals with the Open Journal System (OJS) one of the most popular Open-source software for publishing journals and its features. As far as a developing country like India, more and more number of Open Access journals will enhance the productivity and visibility of Indian research.*

**Keywords:** *OJS, Open Access, Scholarly Journals.*

## Introduction

The importance of knowledge preservation and distribution have been recognized by society since the development of human civilization. Academic and research communities in modern society preserve and distribute their scholarly output in both physical and digital formats.

Scholarly journals are one of those communication channels, that is being considered as a very well recognized communication channel in the recent past. A scholarly journal is a periodical that contains articles written by experts in a particular field of study. The articles are intended to be read by other experts or students of the field and are usually much more sophisticated and advanced than the articles found in popular magazines. Many instructors assign research papers or projects that require students to use articles in scholarly journals.

Scholarly journals are generally academic publications that encourage academic and scientific research. These journals generally prefer to publish original research works, conducted by following a systematic research methodology. The articles published in scholarly journals are critically evaluated following an in-depth analysis of the research data. Scholarly Journal articles strictly adhere to a standard format of writing, expressing the details pertaining to any comprehensible and communicable scientific understanding by the fellow researchers. Once the author completes the whole task of writing with standard citation format, the work is submitted for publication in the journal. The Journal then verifies whether it is written as per the academic norms or not and checks for plagiarism.

## Open Access publishing

Open Access publishing is the publication of material in such a way that it is available to all potential users without financial or other barriers. An Open Access publisher is a publisher producing such material. Many types of material can be published in scholarly journals, known specifically as Open Access journals. Open Access journals are scholarly journals that are available to the reader "without financial or other barriers other than access to the Internet itself." Some are subsidized, and some require payment on behalf of the author. Subsidized journals are financed by an academic institution or a government information centre; those requiring payments are typically financed by funds made available to researchers for the purpose of research by a public or private funding agency, as part of a research grant. (Nagaraj et al., 2009)

In 2002, the Budapest Open Access Initiative (BOAI) was launched to encourage science to be freely available on the Internet (Budapest Open Access Initiative, n.d.) to support this. Nowadays a scientific community can use different open-source electronic publishing systems for the e-journals. Some popular ones are the Digital Publishing System (DPubs), ePublishing Toolkit (ePubTk), Open Journal System (OJS). With its features, functionalities such as easy to use, modest system requirements, extensive documentation, user manuals, support, customization and biggest user community Open Journal System (OJS) has become a popular journal management system. (Nagaraj et al., 2009)

## Open Journal Systems (OJS)

Open Journal Systems (OJS) was originally developed as part of the research program of the Public Knowledge Project (PKP) at the University of British Columbia in 2001. It is an Open-Source software that is specially developed to manage and publish journals online. Every phase of journal publishing, from submitting to publishing a paper, is



automated in OJS. Open Source software can also keep publishing costs down by taking advantage of technical infrastructure. The Open Journal System is licensed under GNU General Public Licence.

## **OJS features**

Important features of OJS are as follows.

- ❖ OJS provides a web interface and it is built for Linux operating system
- ❖ Helps Online submission and management of all content.
- ❖ Editors can configure requirements, sections, review process, etc.
- ❖ Subscription module with delayed Open Access options.
- ❖ Comprehensive indexing of content part of the global system.
- ❖ Useful tools for content reading, based on field and editors' choice.
- ❖ Email notification and commenting ability for readers.
- ❖ Complete context-sensitive online Help support.
- ❖ Payments module for accepting journal fees, donations, etc.

OJS assists with every stage of the refereed publishing process, from submissions to online publication and indexing. Through its management systems, it's finely grained indexing of research, and the context it provides for research, OJS seeks to improve both the scholarly and public quality of refereed research (Open Journal Systems, 2019)

OJS has been designed to reduce the time and energy devoted to the clerical and managerial tasks associated with editing a journal while improving the record-keeping and efficiency of editorial processes. It seeks to improve the scholarly and public quality of journal publishing through a number of innovations, from making journal policies more transparent to improving indexing. (Nagaraj et al., 2009)

OJS was designed to facilitate the development of Open Access, peer-reviewed publishing, providing the technical infrastructure not only for the online presentation of journal articles, but also an entire editorial management workflow, including article submission, multiple rounds of peer-review, and indexing. OJS relies upon individuals fulfilling different roles, such as the Journal manager, editor, reviewer, author, reader, etc. ('Wikipedia', 2019)

## **OJS workflow**

OJS management systems are structured around the traditional journal workflow (Diagram-1) required to move a submission through reviewing, and if accepted, editing and publishing, with records maintained, about who is doing what and when. It uses roles to organize activities and spaces within the journal's management and publishing website. (OMICS International, n.d.)

Roles in the Publishing Workflow Are:

- ❖ Journal manager: who sets up the journal by filling in templates and checking options; manages users, assigns roles; manages reading tools, indexing, and prepares email templates.
- ❖ Editors: can assign one or more editors or section editors to submissions; oversee editorial process and decisions; assemble and publisher issues.
- ❖ Section editor: he manages the peer review process and makes the editorial decisions for submissions, in consultation with the Editor.
- ❖ Subscription Manager: who sets up different types of subscriptions and manages subscription processes.

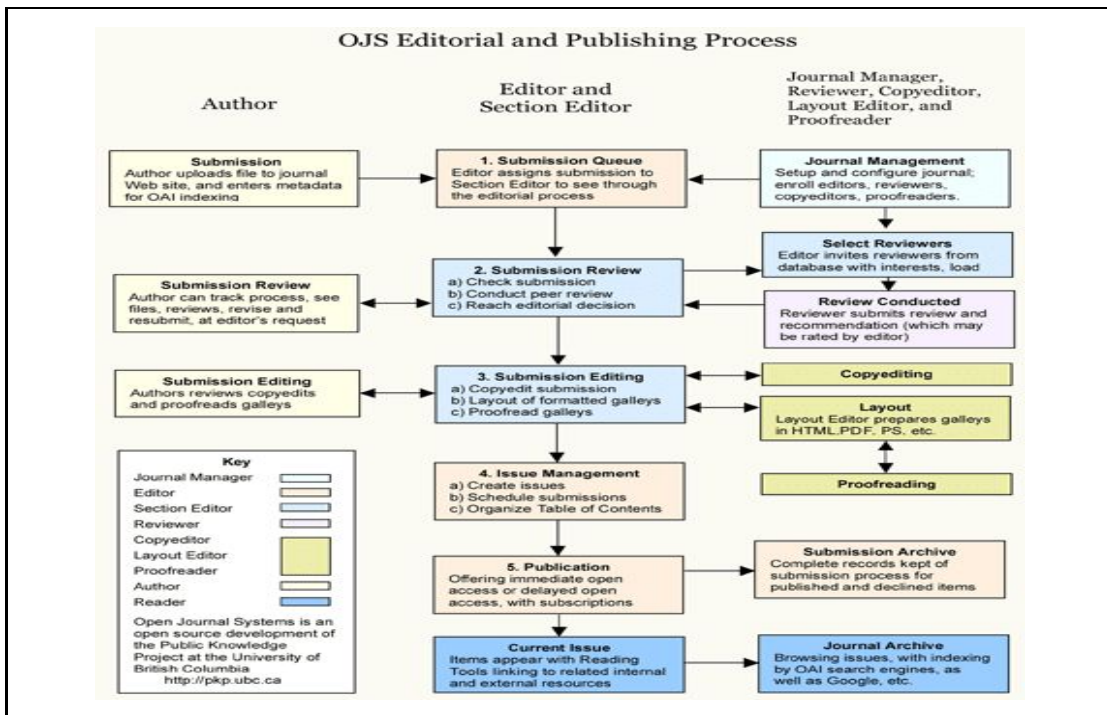


Figure 1. OJS workflow  
 Image courtesy: wiki.osgeo.org

OJS has a 'plugin' architecture, similar to other community-based projects such as WordPress, allowing new features to be easily integrated into the system without the need to change the entire core codebase. Some plugins contributed to OJS include tools to facilitate indexing in Google Scholar and PubMed Central, a feed plugin providing RSS/Atom web syndication feeds, a COUNTER plugin, allowing COUNTER-compliant statistics and reporting, and more. OJS is also LOCKSS-compliant, helping to ensure permanent archiving for ongoing access to the content of the journal. OJS has been translated into eight languages (English, French, German, Italian, Portuguese, Russian, Spanish, Turkish), with additional languages (Arabic, Catalan, Chinese, Croatian, Persian, Hindi, Japanese, Norwegian, Thai, Vietnamese) in development. All translations are created and maintained by the OJS user community. (Nagaraj et al., 2009)

### OJS and Indian journals

As per the OJS Map, 139 journals hosted using Open Journal System from India (Public Knowledge Project, n.d.). NISCAIR alone publishes 19 journals on Science and Technology using the Open Journal System (CSIR-NISCAIR, n.d.). Here are some Indian journals which use OJS for their journal publishing.

**Table 1**  
**Indian scholarly journals on Open Journal System**

Sl. No.	Journal Name	Publisher	Subject
1	Journal of the Indian Institute of Science	Indian Institute of Science	Science
2	KLA Journal of Information Science and Technology	Kerala Library Association	Library and Information Science
3	Rajagiri Management Journal	Rajagiri College of Social Sciences	Management
4	GIAP Journals	GIAP Publications	Humanities & social science
5	Indian Journal of Psychiatric Social Work	Sundar Publication	Mental Health/clinical practice
6	Socialsci Journal	Khalsa Publications	Social Sciences
7	Eastern Journal of Psychiatry	Indian Psychiatric society Eastern Zonal Branch	Psychiatry
8	Indian Journal of Child Health (IJCH)	Atharva Scientific Publications	Child Health

## **OJS Software requirements**

OJS is web-based and supports any operating system (including Linux, BSD, Solaris, macOS, Windows) and needs a webserver to run on. OJS is written in the PHP programming language. It uses a database management system like MySQL/MariaDB. The software can also be installed in the cloud as well. The Public Knowledge Project itself provides a hosting service for OJS. The software can be customised for the requirements of the user. The look and feel of the journal can be changed to a great extent.

## **Conclusion**

Open Journal System is a comprehensive Open Source journal publishing platform affordable for developing countries like India. OJS is multilingual and supports over 30 languages. It also supports content in various languages and helps to make available Indian scholarly literature in regional languages. Availability of scholarly literature in Open Access mode will increase the readership, and it leads to more appreciation to authors. Higher education and research institutions need to give more promotion to both the Open Access movement and encourage publishing platforms using the Open Journal System.

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# SELF-PUBLISHING FOR THE ACADEMIC COMMUNITY

Dr Vimal Kumar V.

**Abstract:** *Writing and publishing a book is a dream of all. Book publishing is essential for those working in the fields of literature, education, research and the arts. Self-publishing the book has become an effortless task with the assistance of digital technologies and the Internet. The academic community can opt self-publishing mode to publish books within a short period of time and maximise the availability to all kinds of readers.*

**Keywords:** *Self-publishing, Open Access publishing, Amazon KDP, Book Publishing, Scholarly Publishing.*

## Introduction

Knowledge sharing is an integral part of scholarly communication. Books belonging to tertiary sources of information play an essential role in knowledge sharing. Earlier it was difficult to print and sell books without the help of traditional publishing houses. Major publishing houses are more selective in accepting the works for publication. It shrinks the opportunities for authors who would like to publish through famous publishing houses. Advancements in printing and computer technology have made the publishing industry more accessible to ordinary people. Now anyone can publish a book and make it available worldwide if the author owns a computer with an Internet connection. The self-publishing sector offers more possibilities for writers to publish books using cutting edge technologies.

## Drawbacks of traditional publishing

Publishing the book with a popular publishing house is the dream of authors. Slow processing time is one of the main drawbacks of traditional book publishing. Traditional publishers are very selective and only accept works based on their priorities. Once the manuscript is submitted to the publishing house, the author loses control over the book. The publishing house decides everything regarding the book. Famous publishing houses send the manuscript for a rigorous review process (Clark & Phillips, 2014). As it is a business, publishing houses cannot ensure the successful selling of books. Majority of publishing houses charge the publishing expenses from the author to cover the loss. Advance payment makes the book publishing expensive to authors. The royalty rate in India is very nominal, and the authors cannot expect a decent income from book publishing. Very few well-known authors receive a higher rate of royalty (Subramanian, 2014). Often authors need to transfer the copyright of the book to the publishing house. Popularity and respect received from society motivate the authors to publish the book.

## What is self-publishing

Self-publishing is the publication of an author's work without the help of any publishing house. The author takes full responsibility for the publishing process, print and sell it on their own or with the help of self-publishing service providers. The author himself can decide the selection of reviewers, proofreaders, layout and design professionals. The author has complete control over the manuscript selection, processing, printing, marketing and distribution of the book (Hartgers, 2019). Self-publishing depends on the Internet and cutting edge technologies. Self-publishing platforms help the authors to publish the book in various formats like ebook and paperback. Readers from anywhere in the world can access the book as both ebook and paperback editions. Amazon Kindle Direct Publishing platform allows authors to publish the books in both ebook and paperback format and make them available to readers in more than 175 countries.

## Various approaches in self-publishing

Book publishing involves several processes. A book undergoes various phases like manuscript preparation, expert review, proofreading, layout, design, printing, pricing, marketing, and sales before it reaches the reader's hand. The author can choose and apply custom methods at each stage of publishing, for convenience. Let us get acquainted with the various approaches to self-publishing.

## Online publishing

An author can make available the e-book on the Internet and it can be made convenient for the readers to access the same. PDF and EPUB are the popular formats used for publishing e-books. PDF and E-Pub formats are compatible with a computer, mobile phone and e-book reading device. E-books are ideal for publishing with or without price. Authors need not bear the printing expenses. It is common in the Academic and research circles to publish with

copyright for wider access (Dilevko & Dali, 2006). If the author expects monetary benefits, he can place the book for online selling services like Amazon. Online booksellers offer higher rewards to authors (up to 70%) than traditional publishing houses.

### **Paperback**

With the support of modern printing technology, it is possible to print paperback editions instantly. Print-on-demand service is one of the most popular distribution methods in self-publishing. Here, the copy of the book will be printed only when the order is placed by the customers instead of printing books in anticipation of sales. If the order for one copy of a book is received, then only one copy will be printed. Unlike the regular offset printing machine, specific machines are used for print-on-demand service. The advantage of the print-on-demand method is that the author need not have to spend money in advance to print the copies of the book (Print on Demand, n.d.).

### **Merits and demerits**

The main advantage of self-publishing is that there is no need, for the author, to depend on a publisher for the whole publishing process. For authors, self-publishing is a practical way to publish a book, within a short period of time, that too done under the full control of the author. The author himself can select the best professionals in the field, for the expert review. The self-publishing industry makes use of innovative technologies for the publishing processes. Automated book submission, online author tools, online sales, ebooks, paperbacks and print on demand service are the highlights of self-publishing (Maguire, 2020). Works in local languages can be published effortlessly without delay. E-book and print editions can be made available simultaneously. It is convenient to add accessible features in e-books for the differently-abled people, such as having visual and print disabilities (Polanka, 2013). Self-publishing allows you to publish books globally, and readers can access copies from anywhere in the world.

Let us check the inconveniences with the self-publishing method. The author must bear the cost of publishing if he cannot manage the processes alone. The pricing of print-on-demand copies is a little higher than the conventional print copies. Only computer-savvy authors can manage various stages of self-publishing. Otherwise, the author has to depend on others to finish data entry, layout and design. The marketing and promotion of the book can be difficult if the author is not well-known among the specific reader's community (Kieffer, 2017). There is a general perception that books are self-published without expert examination.

### **Methods of self-publishing**

In the academic environment, authors can approach two methods to publish books - Open Access method and selling of books.

#### **Open Access method**

The Open Access method ensures free availability, and it expands the reach of the book to more number of readers. The author can choose a license suitable for free distribution. Open licenses ensure copyright and the free distribution of works. Creative Commons is an ideal license for the public availability of literary, artistic, and scientific works. Creative Commons assists the authors in creating licenses based on four conditions: Share-Alike, Attribution, Non-Commercial, No-Derivatives. License builder available at the <https://creativecommons.org/choose> website. Usage increases when the book is available free. More readers get the opportunity to use the document (Busch, 2020).

Authors can upload Open Access books to an online public place for free distribution; upload the document into the author's personal website/blog and institutional repository/digital library. The author can make use of tools to know usage analytics (e.g. downloads). It's possible to collect feedback and comments on the book from readers through websites/blogs. Based on the comments and suggestions, the author can improve the book and prepare the next edition soon.

#### **Bookselling**

Self-publishing services assist authors in publishing and selling of books. They offer author services, guidance and publishing platforms. Authors can hire editing, layout and designing services from self-publishing agencies. If the author can manage the manuscript ready for publishing, then he can make use of the publishing platform to release the book. He needs only to upload the document and cover design in the prescribed format to the self-publishing platform website. Within a few hours, the book will be released and made available in the online shop. Amazon Kindle Direct Publishing is a major global player of self-publishing. Authors can find local self-publishing agencies to publish the book. Pothi, Notionpress and Partridge are popular self-publishing agencies in India.

## Conclusion

Self-publishing is suitable for both academic and non-academic sectors. The author experiences complete freedom and control at all stages of self-publishing. Every stage of self-publishing is augmented with the help of technology. Books get global reach. Self-publishing can help to overcome many of the drawbacks in traditional publishing. If the author can manage the tasks of self-publishing alone, he will be able to deliver the book to the reader in a cost-effective manner.

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# **DSPACE BASED INSTITUTIONAL REPOSITORY: A CASE STUDY OF DHEMAJI COLLEGE**

**Hirak Jyoti Hazarika  
Dr Labanya Hazarika  
Dr S. Ravikumar**

**Abstract:** *This paper discusses the implementation of Dspace digital library software at Dhemaji College Library with the reading annotation tool for knowledge archiving and sharing services. The library made customisations on Dspace to enhance the user experience. The paper illustrates the experiences and challenges faced during the digitisation of information resources.*

**Keywords:** *Open Source Software, Institutional repository, DSpace, Digital Library, Dhemaji College.*

## **Introduction**

The Internet has become an essential medium for information exchange. Various web services host various services for scholarly communications and offer ways of sharing scholarly output. Changes in technology-enabled platforms give opportunities to showcase their academic and research output to the entire world. The scholarly communication process is getting restructured for the digital environment. Open Access publishing, self-archiving, and institutional repositories became popular among the academic and research community. Researchers and academicians increasingly publish their research results, mainly preprints in subject-specific and web-based archives for broader and faster dissemination. Technological advancement, shrinking budgets, and sky rocking journal subscription costs have stimulated the rapid growth of self-archiving services. Often an Institutional Repository acts as a digital archive to preserve the scholarly literature and learning object of Institutions in digital format. It makes the quality and breadth of scholarship produced at that institution accessible to others over the Internet. "It is a set of facilities that a University/Organization offers to the members of its community for the management and dissemination of digital material created by the institution and its community members" (Devi, Hosamani, & Murthy, 2004). It is essentially an organizational promise to the stewardship of the digital materials, including long term preservation.

## **About the college**

Dhemaji College is the oldest and premier institution of higher learning in the district of Dhemaji, Assam state, India. The college is affiliated to Dibrugarh University. At present, it imparts education from Higher-secondary to Bachelor Degree level in Arts and Science streams along with different parallel oriented courses.

The collections in the library include 14,580 books, 390 bound periodicals, 18 journals, 15 magazines, 7 newspapers, and 50 CD/DVDs. The Library has a reference section and both short and long-range reference services are rendered to the readers. The central library has several specialized collections for the reader, such as Gandhi Corner, Human Rights Corner, Ambedkar Study Corner, Travel and Tourism. Women Study Corner, WildLife and Fishery Corner, Medicinal Plants Corner, Ethnic Corner, Late Keshab Gogoi Corner, Book Bank for Poor Students etc. The library follows the Open Access System. It follows the Dewey Decimal Classification Scheme (DDC) and AACR-II cataloguing scheme. Practical orientation is provided to the students at the commencement of each academic session on the ways to avail different library facilities. The circulation system has been fully computerized by using 'SOUL 2.0' software.

## **About DSpace**

DSpace was developed in November 2002 by Massachusetts Institute of Technology (MIT) and Hewlett-Packard (HP), as an Open Source software. DSpace is developed for the long-term preservation of digital materials. It supports all digital formats like articles, preprint, working paper, technical reports, and conference papers. DSpace is designed to operate as a centralised institutional repository service. The metadata, including access and structure of information, is stored in a database. Users can choose either PostgreSQL or Oracle for the database. Communities and collections in Dspace facilitate the organisation of digital objects. Members of the communities can deposit content directly via a web interface. The DSpace system then indexes the metadata submitted with the digital item and makes it available according to the access privileges.

## Configuration of DSpace for digital library

Dhemaji College chose DSpace Digital Repository software in the College library to build a Digital Repository. Dhemaji College implemented the latest version of DSpace (version 6.0) Open-Source software in a local server machine. An entry-level server (HP ML 10 with 8 GB RAM, 1 TB Hard Disk and Xeon Processor) with Ubuntu 16.04 LTS Linux operating system is used for the Dspace installation. There are two web-based interfaces in DSpace Digital Repository Software, i.e. XMLUI Interface and JSPUI Interface. Dhemaji College selected JSPUI web interface (Figure 1). JSPUI theme gives a user-friendly interface compared to the XMLUI interface. JSPUI theme provides a lot of space and options for customization.

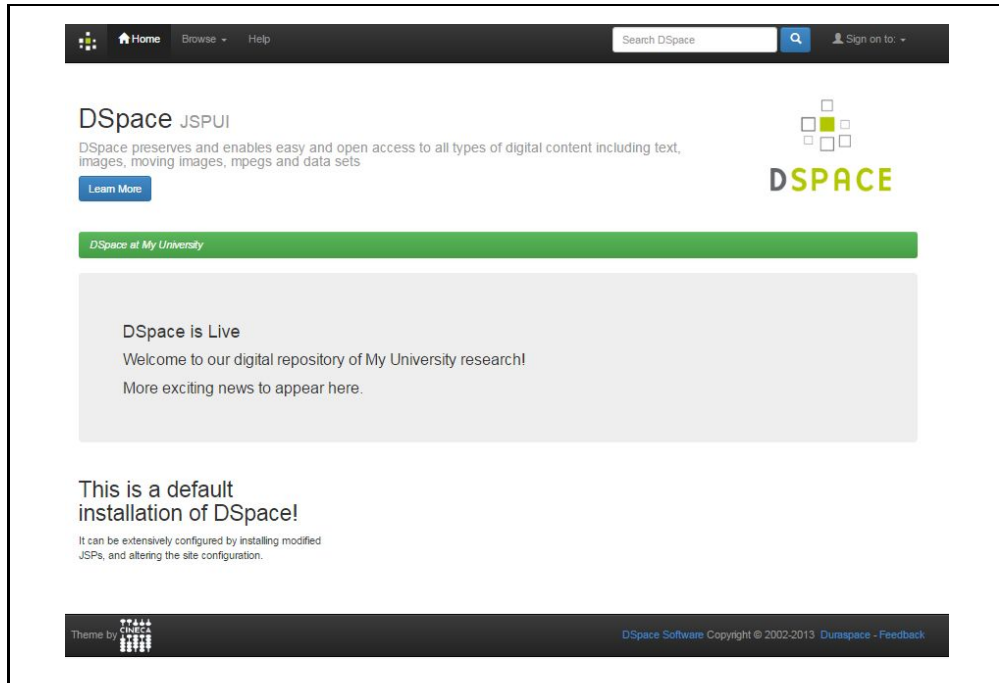


Figure 1. DSpace JSPUI Home Page

DSpace is developed on the Java platform and uses tools like XML, HTML, XHTML. It does not allow construction of very different objects with independent metadata sets due to its database-oriented architecture. DSpace supports faceted search and browses through communities and collections. DSpace allows customization to accommodate the requirements of an Institution that handles various departments. DSpace provides a flexible data object model. Modifications are made in the JSPUI interface to enhance the visual appearance. Successfully customized and restructured the entire workflow pattern as per users needs (Figure 2). Information about the College and the library is added on the JSPUI home page. Useful links for the academic community are added to the home page. For example, links to National Digital Library of India, DOAJ (Directory of Open Access Journals) and OATD (Open Access Theses and Dissertations) displayed on the Dspace home page.



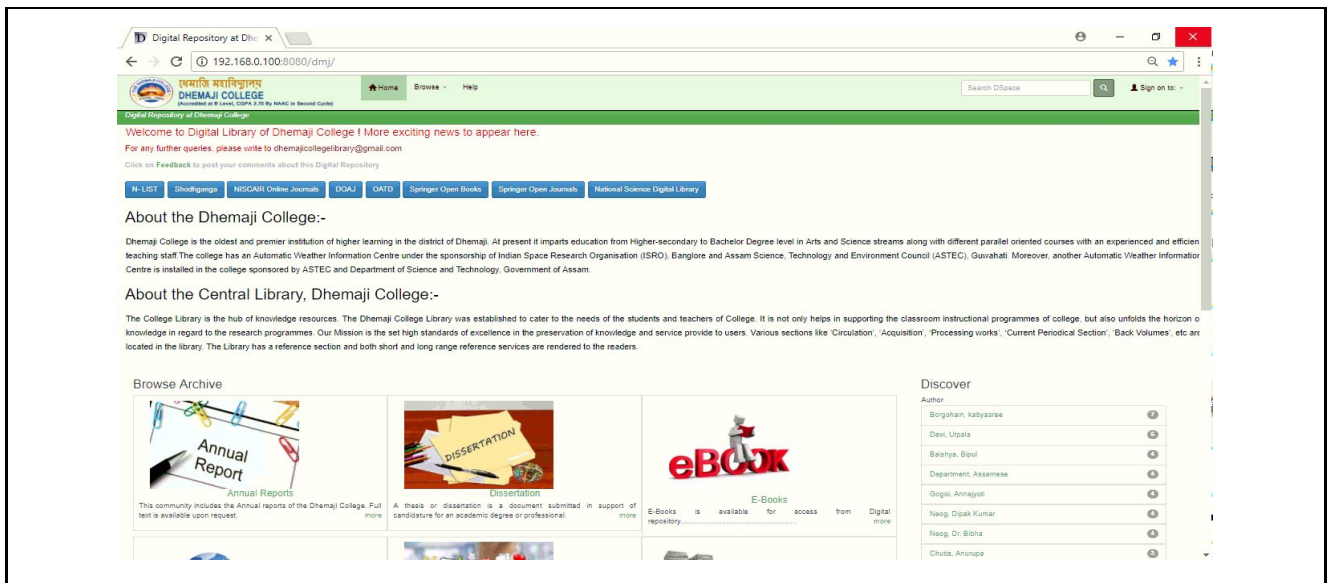


Figure 2. DSpace Home Page Customization

After the DSpace JSPUI interface customization, we created a different community in DSpace for uploading electronic files. Figure 3 shows the diverse community in Dhemaji College Digital Library, i.e. Annual Reports, Dissertation, E-Books, Publication, Question Papers and student scholar. Sub-communities and collections have been created to organize the resources.

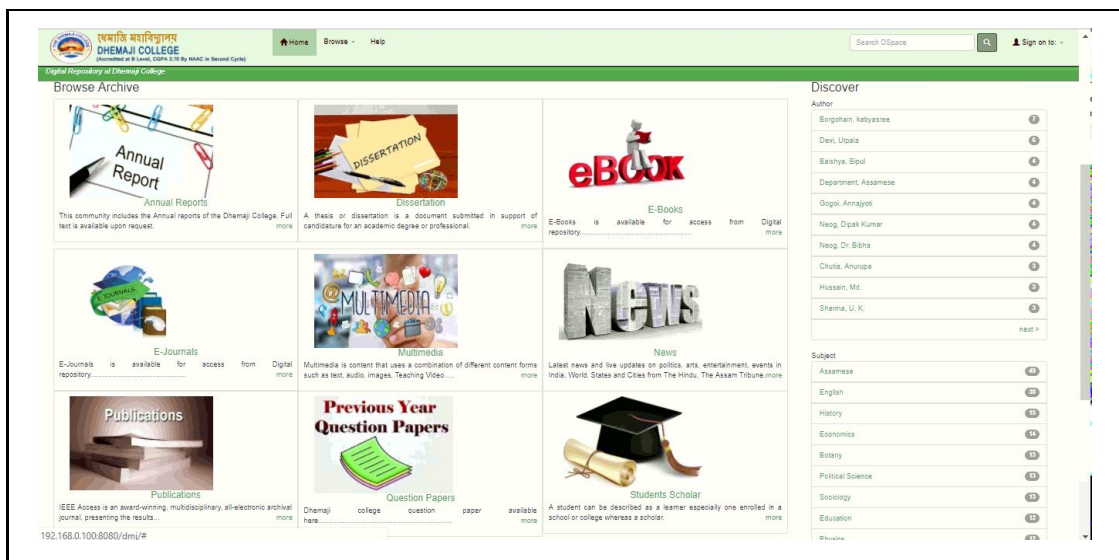


Figure 3. Community in Digital Library at Dhemaji College

### Metadata customization

DSpace makes use of the Dublin Core metadata standard to describe digital objects. Only three fields are mandatory in DSpace i.e. title, language, and submission date, all other fields are optional. There are supplementary fields for document abstracts, keywords, and technical metadata and rights metadata, among others. This metadata is displayed in the item record, and is indexed for browsing and searching. Figure 4 shows the different metadata fields customized in DSpace to build a good database system. In DSpace, there is no Assamese language, Hindi Language and Bengali language options to identify the language of the resources. So we have done the modifications in DSpace to add a new language in the system.

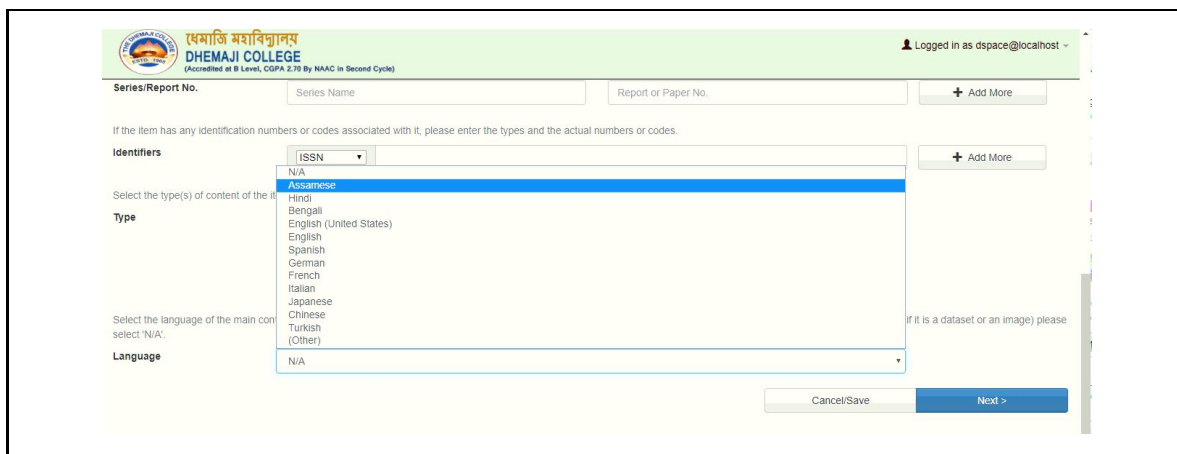


Figure 4. Metadata Customization in DSpace

## Backup policy

DSpace software facilitates the backup and restores all of its contents as a set of AIP Files. It includes all Communities, Collections, Items, Groups and People in the system. Cron job is very helpful to automate the routine tasks in a Linux based operating system. By using the Cron job scheduled to take DSpace backup and deposit in an assigned folder. We have created a Cron job on the server to take a backup every evening at 3:45 PM and deposit the backup in a particular folder in compressed format.

## The outcome of the DSpace implementation

An institutional repository is one of the best methods to promote the intellectual outputs of Academic and Research Institutions. The outcome has led to users obtaining remote access to varieties of digitized information that is earlier locally resident before digitization in hardcopy form, in the various information centres and libraries without users' restrictions. This initiative has helped to enhance Open Access inventiveness. Consequent upon this development, the college embarked on the digitization of its local contents such as question papers, Government publications; and staff publications and theses and dissertations, and making these local resources available online. Users can access the repository through a campus network.

## Conclusion

DSpace is one of the best Open Source institutional repository software which is modified day by day with the latest features. It is clear that the institutional repository is a very powerful idea that can serve as an engine of change for our Higher Education Institutions, and more broadly for the scholarly enterprises that they support. If properly developed, it advances a surprising number of goals and addresses an impressive range of needs. The major advantage of the software is that it allows the submission of digital documents by its members. However, many institutions have implemented digital libraries in Assam as well as India, but not all are online but are accessible in the library or College campus only. Even Dhemaji College Digital Library also can be accessed through College Wifi or College LAN but is not available online. In the future, the College authorities are planning to move on cloud technology for better use or access to the software at the global level.

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# MANAGING REFERENCES USING THE OPEN REFERENCE MANAGEMENT SOFTWARE ZOTERO

Sajan C.S.

**Abstract:** *Reference management software packages are established as research software packages to help scholars to organize their data, improve workflows and ultimately save time. Open Source software does not need the initial cost of commercial software and enables researchers to have greater control over their working environment. Library professionals should be aware of the advantages of open source software and should be involved in their development. In this context, Open Source software can solve the problem of the researcher without giving financial burden. Hence the purpose of this study is to identify and analyze the prominent features of the Zotero reference management software.*

**Keywords:** *Open Source Software, Reference Management Software, Citation, Zotero.*

## Introduction

Borrowing ideas, from other works, is essential to provide evidence to support the argument while preparing scholarly literature. Giving credit to the authors of the literature consulted for the writing process is a practice and also a formality during academic and scholarly writing. The author of the manuscript respects the creator of the original idea by giving references to the literature. Authors were manually adding references to documents before the advent of computers. The arrival of computers in word processing made changes in the scholarly writing process. Reference management software mechanised the process of reference management.

During the last few years, research work and publication of research articles has been growing significantly. With the advent of Information Communication Technology (ICT), writing a research paper has become more comfortable. Reference management by the manual method was difficult, with different reference management styles like APA, MLA, Chicago and the like. The management of literature and citations was comfortable with the assistance of reference management software. There are several software packages available for compiling citations like Mendeley, Endnote, and RefWorks. Reference management software is available under Open Source and proprietary license.

## Zotero reference management software

Reference management software can save references from any websites and favourite databases. The researchers can organise and build bibliographies and insert citations into the manuscript at the time of writing. Reference management software also saves time of the research scholars in collecting, organising and formatting their references for publication. Reference management software is generally categorised into four models according to distribution, such as web-based, desktop-based, browser-based and hybrid. Reference management software is available with proprietary and Open Source licenses. Popular reference management software is developed by publishing companies and made available as freeware. For example, Mendeley is a proprietary reference management software maintained by Elsevier and distributed freely. Zotero is a Free software licensed under AGPL (Affero General Public License). The advantages of Free/Open Source software for the academic community are cost-effectiveness, availability of source code, the facility for modification, customisation and redistribution. There are a good number of reference management software available to perform these tasks on computers, but the popular tools currently used in Academic libraries are Zotero, RefWorks, Mendeley and EndNote.

In 2006 Zotero was launched as a project of the Roy Rosenzweig Center for History and New Media, a non-profit organisation at the George Mason University of United States. Zotero came in a standalone version which is compatible with Safari and Google Chrome in 2011. The name of Zotero originates from the Albanian language "to master or acquire" (Dingemanse, 2008). Zotero is a pure Free/Open Source reference management software to manage bibliographic data and related materials. The Notable features include web browser integration, cloud storage, online synchronizing, generation of in-text citations, footnotes, and bibliographies. Zotero works well with the popular word processors like Microsoft Word, LibreOffice Writer, and Google Docs.

## Features

Zotero assists in organising research documents in a systematic order. Users sort items into collections and tag them with keywords. Zotero provides online and offline information storage and retrieval. Zotero instantly creates references and bibliographies for any text editor, and directly inside Word, LibreOffice, and Google Docs. By default, Zotero makes available popular citation styles such as Chicago Manual Style, APA, and MLA. Besides, users can select from over 9000 citation styles. Zotero can optionally synchronise user's data across devices, keeping notes, files, and bibliographic records seamlessly up to date. Zotero makes available 300 MB free cloud storage for users to store their references and documents. Also, Zotero allows users to connect to other cloud storage services to store the references and documents. The User can build communities of users and share materials with others and create a collaborative bibliography. Zotero users can share a Zotero library with many people.

## Strength of Zotero

Following are the highlights of Zotero which strengthen the software as a fully functional reference management software:

- ❖ Zotero is an Open Source software licensed under Affero General Public License (AGPL).
- ❖ Zotero creates snapshots of online resources and can open the page offline.
- ❖ Users can manage references in English and regional languages in India.
- ❖ References can be shared with others.
- ❖ Zotero can capture citations from websites such as Google Scholar, PubMed, Amazon.com and webpages of journals, where DOI, PMID and ISBN are displayed.
- ❖ Capability to extract metadata from PDF files.
- ❖ Annotation to web pages.
- ❖ Users can generate a bibliography from collections into text files.
- ❖ Zotero is compatible with popular office suites Microsoft Word and LibreOffice.
- ❖ Zotero supports Google Docs and users can import and export references using Bibtext, RDF, RIS and MODS data formats.
- ❖ A web translator facility is available with Zotero which helps to scan a website to determine the desired resource type.
- ❖ Users can store the references into either Zotero own cloud storage or use any other cloud storage service.

## Weakness of Zotero

- ❖ Zotero provides only a limited 300 MB as free storage.
- ❖ Zotero cannot prevent and remove duplicate items automatically, but one can do it manually.
- ❖ Editing and creating styles is difficult for regular users.

## Installation of Zotero

Zotero can work on Windows, Linux and Mac operating systems. Zotero reference management tool has no Debian/Redhat package for installation. Linux users had to install from source. Installation from source is not easy for Linux newbies. Now the Zotero snap package is available. Snap is a software package management system developed by Canonical (Mother organisation of Ubuntu Linux). It's easy to deploy applications using the snap tool. Zotero web interface also available and the users can work and manage references online.

**Zotero online account:** The user has to create an account to get in the web-based version of Zotero. Creating an account is essential to start with Zotero. Adding references and creating collections is possible from the web interface. From Zotero websites, users can communicate with other users, participate in the forums, and also in group discussions.

**Zotero client:** Zotero client is the software suitable to work on computers. Windows, Linux, and macOS versions available. It facilitates working offline and online. Users can manage accounts, plugins, styles, references, collections, and notes.

**Zotero Connector:** Zotero Connector is a browser plugin compatible to work with Firefox, Chrome, and Safari. The Connector helps the user to save the reference from the web to the Zotero account.

## **Usage of Zotero**

Zotero helps to save and manage references. Usage of reference management software saves the time of the research and academic community. Here is the workflow of Zotero reference management software.

### **Adding items to Zotero**

The Zotero Connector's save button is the most convenient way to add bibliographic metadata to the Zotero library. The Zotero Connector detects the bibliographic information on web pages you visit and is saved to Zotero.

### **Adding PDFs and retrieving PDF metadata**

Many researchers already have an extensive collection of PDFs that they've previously organized manually or used by another program. Users can import these PDFs and retrieve full bibliographic metadata.

### **Saving webpages**

The users can create a snapshot of a web page and save to Zotero. Snapshots of the web page useful to read the webpage offline.

### **Data migration in Zotero**

Zotero users can import references from similar software or backup files in supported standards. The users of Mendeley and EndNote can export the references and import them into Zotero.

### **Add collection into Zotero**

Zotero has the facility to quickly add items to the library by using ISBN, Digital Object Identifier (DOI), or PubMed ID.

### **Importing from databases**

It is possible to import a large number of items from scholarly databases such as Google Scholar, ProQuest, and the Web of Science.

### **Managing reference library**

Items in Zotero can be organised into collections. Managing collections can be possible with the Zotero web site and software client. Collections allow hierarchical organization of items into groups and subgroups. The same references can belong to multiple collections and subcollections. Collections are useful for filing items in meaningful groups (e.g., items for a particular project, from a specific source, in a particular topic, or for a specific course). You can import items directly to a specific collection or add them to collections after they are already in your library.

Tags (often called "keywords" in other contexts) allow for detailed characterization of an item. You can tag items based on their topics, methods, status, ratings, or even based on your workflow (e.g., "to-read").

Tags are portable, but collections are not. Copying items between Zotero libraries (My Library and group libraries) will transfer their tags, but not their collection placements.

### **Citation styles with Zotero**

Zotero ships with popular citation styles and users can add from over 8,100 additional styles from Style Repository. The reference styles are built using the Citation Style Language (CSL), a popular open XML-based language to describe the formatting of citations and bibliographies. Users can develop their citation styles.

### **Generating bibliography**

There are different ways to automatically generate bibliographies, either using the Zotero client or from word processors. Zotero plugins are available to connect with popular word processors. Zotero plugins are available for Microsoft Word, LibreOffice, and Google Docs.

## **Conclusion**

The citation management software is one of the essential tools for academic and scientific writings. Zotero is a popular Free and Open Source reference management software. Zotero allows users to collect and organize a variety of web sources such as citations, full texts, web pages, images, and audio files directly in the browser. The ability to integrate with various platforms is the strength of Zotero. Zotero can be used online and offline. Zotero possesses all

the features and functions as a citation management tool. Overall, Zotero is an excellent citation management software which is quite easy to use.

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# TeX FOR TYPESETTING BOOKS

Dr V. Sasi Kumar

**Abstract:** TeX is a document preparation system that can help in all aspects of typesetting a document, especially structured ones and those that have technical content, including mathematics. It incorporates all the conventions that printers have evolved over centuries, which makes it rather complex. There exist sets of macros for TeX, such as  $\LaTeX$  and ConTeXt, which make it somewhat easier. Of these,  $\LaTeX$  has become more popular and is used by many publishers, especially of scientific and technical journals to adopt it, so that many researchers also use LaTeX for their documents.

TeX can handle only ASCII text, which limits it to languages that primarily use Latin script. In modern times, people have created other similar pieces of software that can handle Unicode, and hence all languages in the world. Examples are Xe $\LaTeX$  and Lua $\LaTeX$ .

TeX is too complex to be fully discussed in a short article, and hence this is just an introduction to its intricacies.

**Keywords:** Writing, Document preparation, Publishing, Book publishing,  $\LaTeX$ .

## Introduction

TeX is a system for creating documents of all kinds. It was developed in 1978 by the well-known mathematician and computer scientist, Donald Knuth (born January 10, 1938), as a system for typesetting technical documents (see Knuth, 1984), but it has evolved to make the creation of all kinds of documents possible. TeX is essentially a kind of markup language, a very sophisticated one that can do almost anything related to typesetting and incorporates all the conventions developed by printers over centuries. Hence, it is very complex and has a rather steep learning curve.

"The name TeX is intended by its developer to be  $\tau\epsilon\chi$ , with the final consonant of loch or Bach. The letters of the name are meant to represent the capital Greek letters tau, epsilon, and chi, as TeX is an abbreviation of <https://en.wikipedia.org/wiki/Technē> (TEXNH – technē), Greek for both "art" and "craft", which is also the root word of technical." says Wikipedia.

Considering the great quality of typesetting that TeX can provide, on the one hand, and the difficulty in learning it, on the other, Leslie Lamport (born February 7, 1941) created a set of macros that can do most of the things that most people would want to in their documents, making it somewhat easier to learn, compared to TeX (see Lamport, 1994). This was the first such set of macros to be created, and was followed by others, including ConTeXt, XeLaTeX and Lua $\LaTeX$ .

There are some differences between them, though largely superficial. Thus, for instance, ConTeXt is similar to  $\LaTeX$ , but has a different syntax and is slightly different in structure. But, Xe $\LaTeX$  and Lua $\LaTeX$  are different in the sense that they have different features, though similar to plain  $\LaTeX$ , as they are macros for the XeTeX and LuaTeX engines, which are capable of handling Unicode text, unlike plain TeX, which can handle only ASCII text. LuaLaTeX also has built-in facility to use the Lua programming language.

## LaTeX

As mentioned earlier, TeX is a markup language, like HTML, for formatting documents. But, unlike HTML, where the formatting is done by the browser that displays the document, here, the document along with the markup is compiled like a program to obtain a formatted document in .pdf or some other format. Just as HTML has a set of tags that can be used within documents,  $\LaTeX$  also has a set of tags, usually called *commands*, and a set of basic commands that are essential in all  $\LaTeX$  documents, just as there are in HTML.

Thus, the procedure to typeset a document using LaTeX is to write the desired text using a text editor, such as Gedit, Kate or Kwrite in GNU/Linux, Notepad in MS Windows and TextEdit in Mac. The document should have the required tags (commands) added. It is saved with the extension .tex in a folder and then compiled using the command pdflatex in the case of plain LaTeX document, xelatex in the case of XeTeX document and lualatex in the case of LuaTeX document. If it has only English text, all these should give similar results. Remember that using a word processor like LibreOffice or MS Word is also possible, provided



the file is saved as a plain text, or ASCII file. The default formats of the files saved by these applications are xml or binary, which cannot be handled by T<sub>E</sub>X.

Most documents would need many components other than just text, such as figures, tables, lists, etc. There are commands to include these and also commands to set document properties like page size, margins, line spacing, etc. and commands for building table of contents, list of figures, index and so on. And also commands to do things that word-processors normally don't allow one to do. Thus, it is clear that even LaTeX is rather complex. The learning curve is admittedly steep. The advantage is that TeX can create good-looking documents by default without much effort from the typesetter, but can do almost anything that one wants, unlike applications with graphical interface that permit one to do only those things that the creator has allowed one to do.

One of the greatest features of TeX is that it can typeset mathematics beautifully, which virtually no word processor can do, and only a few expensive DTP applications can. Another feature of T<sub>E</sub>X is that it can create references in the text and reference lists at the end in any of the formats that are commonly used without too much trouble for the author, by using the bibtex package. This is a huge help for researchers who often have to spend hours ensuring that the citations are done according to the specification of the publication.

TeX also makes it easy for the publishers of research journals, as they can just put together the .tex files to typeset their journal, which results in many journals, especially in mathematics, to ask contributors to write their papers in LaTeX. Another major advantage, particularly for today's digital world, is that it is easy to create html, xml and epub files from TeX.

## Unicode

Now, a limitation of TeX is that it can handle only ASCII text, which limits its use to a small number of languages in the world, though most European languages can be included with Extended ASCII. That excludes all Asian and African languages. A new method of encoding, called Unicode, was created in the 1980s that could encode all languages in the world. In TeX, this problem was addressed first by Yannis Haralambous and John Plaice, when they developed Omega as an extension of TeX, the development of which had been frozen (Wikipedia). However, Omega itself was abandoned when John Plaice left the project to work on something else and XeTeX was developed with Unicode support, which became virtually a substitute (with Unicode support) for pdflatex, which was the popular standard utility for compiling documents in Latin script to get pdf files.

With X<sub>3</sub>T<sub>E</sub>X, one could not only use Unicode text, but could use fonts in the system other than those meant specifically for TeX which made it so much more convenient. The set of macros for X<sub>3</sub>T<sub>E</sub>X, like L<sup>A</sup>T<sub>E</sub>X for T<sub>E</sub>X, is called simply X<sub>3</sub>L<sup>A</sup>T<sub>E</sub>X and the syntax also is similar, making it easy for people to shift from pdflatex to xelatex as the compiler. Thus, while pdflatex or xelatex can be used for languages using Latin script, xelatex or lualatex has to be used for others including Indian and other Asian languages.

## Ithal

Normally, on a stand alone computer, one has to install a rather large set of packages in order to use any flavour of TeX, such as MikTeX in MS Windows, MacTeX in Mac OS and TeXLive in GNU/Linux. But nowadays, many pieces of software can be used online, such as Google Docs. Similarly, there are sites where one can request an account and create TeX documents. One such is Ithal (<https://ithal.io/>), which is hosted in Thiruvananthapuram, and is available for free use for individuals and paid use for commercial purposes.

## Conclusion

The T<sub>E</sub>X document preparation system is a professional system that has all the capabilities of any typesetting system and gives greatly higher quality output compared to word processors but has a steep learning curve. In its modern forms, it can handle all languages in the world as it uses Unicode fonts and all formats of images, such as pdf, jpeg, png, and so on. Although the system can be installed on personal computers, today there are web sites that provide the facilities to create and edit .tex files. Although it has a rather steep learning curve, almost anyone familiar with computers and the command line can learn it with some effort. The advantage is that by default it gives a good output, but with some effort one can do almost anything one wants, unlike word processors. Being Free Software, it is freely available for any platform and there are many web sites that provide help and active communities that are always willing to help.

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