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Digital Library - An Inevitable Resource for Modern Day Research in Developing Countries

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Abstract
Research in any area requires an extensive collection and study of relevant literature. The research literature may be found in different libraries dispersed at different geographical locations. The conventional library systems pose some potential difficulties in acquiring timely information and therefore impede the research activity. This paper presents use of digital libraries in carrying out cost-effective and quality research. With technology innovations, a commensurate progress is required in the development and maintenance of the knowledge base. Statistics have shown that the research activity has increased with the digitization of the information and its easy availability to the researchers especially in developing countries. The digital library has thus become an inevitable source of information for researchers around the globe especially in developing countries to maintain the pace of research in a highly competitive world.

Keywords: Digital Library, Open Access, Institutional Repository, Open Access Journals

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INTRODUCTION

The outstanding quality of human beings in contrast to the other forms of animal life is their intense sprit of enquiry and preservation of knowledge through ages. Recorded history has remained first and foremost requirement for advancement of the mankind. Whereas the knowledge, the personal experiences and the ideas of other animals die with their death, human beings form a repository of knowledge so that the coming generations start the pursuit of knowledge from where the previous generations have left. This pursuit of knowledge by the mankind has unveiled thousands of realities of life and demystified millions of mysteries of the Universe based upon previous findings.

Whereas the traditional library systems falsify the law of least effort in obtaining the information, the onset of electronic age and growth of Information and Communication Technology have accelerated speed of research. The developments of digital libraries have initiated a history in the pursuit of academic excellence and up to date knowledge. With the advent of Internet and its growth towards 1990, tens of thousands of researchers have already started romancing with the digital and readily available information (Chan - 2005).

In this paper we present a situation that has been created by various services on Internet and digital libraries which have greatly facilitated the conduct of research and improved the methodology involved in it. This paper mainly focuses on Internet and two broad aspects of digital libraries vis-à-vis Institutional Repositories and Open Access Archives.

CHALLENGES IN RESEARCH

Research is an original contribution to the existing stock of knowledge making for its advancement. It is the pursuit of truth with the help of study, observation, comparison and experience. An experienced researcher knows that research is often a tedious, painfully slow and rarely spectacular activity. The solutions to problems take a great deal of time, energy and intensive applications of analysis. The choice of suitable problem is always difficult unless the researcher has real and sufficient awareness of the problem. The study of literature available on a particular topic and related topics helps a researcher to identify the defects and faults that an existing research may have. For this purpose, the researcher undertakes extensive literature survey connected with the problem. The literature can be found in form of abstraction and indexed journals, published or unpublished bibliographies, academic journals, conference proceedings, survey reports, books and magazines etc. In carrying out research access to appropriate information and knowledge at right time plays a very important role towards its timely completion. A researcher in any part of the globe for the development of his research needs an access to the international knowledge base for up to date references and latest research results.

With the advent of Internet and digital libraries certain disadvantage of the conventional libraries have come to fore, that include: i) extensive storage space requirements, ii) high library maintenance costs involved, iii) tedious cataloging mechanism, iv) laborious searching of relevant research literature and v) geographical limitations. These difficulties posed by conventional libraries prove a great decelerating factor in carrying out quality and timely research.

RESEARCH FACILITATIONS THROUGH INTERNET

Internet connects people worldwide and makes available a great treasure of information for researchers. Various applications of Internet provide a variety of services that are exclusively helpful in the conduct of research work. Scholarly communication involves extensive use of Internet for information exchange in both informal disclosure and discussion among colleagues and formal publication of research results. Informal communication among researchers in a research group or collaboration takes place through use of e-mail, electronic conferences, seminars and discussion groups. Internet offers several other services that can greatly help researchers in timely completion of research. These services include Usenet, FTP, Gopher, Blog, Telnet, WWW, Web indexing, Internet Telephony, streaming audio and video, virtual labs, etc. World Wide Web is the largest source of digital information (Wendy – 2007) though it does not qualify to be called as digital library. The web is a gathering of thousands and thousands of documents pertaining to any topic that strikes the mind. With modest familiarity with computer and the Internet technology, a researcher with a request from his desktop can locate the correct information on the Internet in a very efficient way compared to the tedious ways of locating same in conventional libraries. The application software and fast search engines have made searching of relevant information even more easy and user friendly. The World Word Web provides ready references of different institutes involved in specific areas of research. It also provides information about the resource persons who have expertise in particular field of research and with whom new ideas can be shared and can be sought for guidance and help (Fullerton – 1999; Jebraj – 2003). The contact with the scholars round the globe belonging to common interest research groups can be established by maintaining mailing list of these scholars and necessary communication can be made using email services to know about present developments in the area of common interest. The information can be exchanged to expedite the research (Cetto – 2000; Tan - 2000). Some critics contend that setting up communication infrastructure, computing facility and Internet connection is not affordable for every individual and therefore it's all time accessibility is rather a theoretical idea. However, ICT infrastructure exists in developed countries and is rapidly being developed in research institutions of developing countries. Further, cost of setting up Internet connections is negotiated with keeping in view various advantages offered by it.

RESEARCH FACILITATIONS THROUGH DIGITAL LIBRARIES

Digital library which is an electronic collection of real and virtual resources help researchers to overcome disadvantages of conventional library system and introduce various other advantages that facilitate research activities further. The digital libraries use minimum storage space and cut down costs of library maintenance as every activity is computerized and automated (Arunachalam – 1992; Chan & Costa - 2005). With an effort of mouse click here and there huge mass of research related material becomes available at the desktop defying all geographical limitations and barriers (Antelman – 2004). Digital Libraries make publication of all types of research results possible including those that cannot be printed in traditional printed journals and still be meaningful e.g. research results that include 3D graphic, animation, moving simulation or dynamic visual representation. However, two main issues of digital libraries that impede the globalization of digital libraries are its completeness and copyright issues (Steven – 2008; Keith – 2007). Several studies have reflected that since the digitization of information and

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its easy accessibility to researchers, research activity has increased especially in developing countries (Pouris – 2003; Barbara – 2005). (Swan & Brown - 2005) indicates that the proportion of publications from non-Western countries indexed in the ISI Science Citation Index (SCI) has increased and that beyond the ISI SCI, scientific activity in developing countries has grown (SJR – 2009). In the following sub-sections we present research facilitations that have been granted by two important constituents of Digital Libraries vis-à-vis Institutional repositories and Open Access Archives.

Institutional Repositories

Institutional Repository (IR) is an online locus for collecting and preserving the intellectual output of an institution, particularly a research institution, in digital form, IRs are closely linked to scholarly communications, universities and research institutions and provide a set of services to members of its community for the management and dissemination of digital materials created by the institution and its community members. The concept of IRs can be interfaced with larger system of the IRs in the world to lend it a global character. In their global character they are indexed in a standardized way and made searchable using one interface, thus offer great promise for the development of new patterns of scholarly communication which is vital in carrying out quality research (Canadian – 2004; Lynch – 2003). The scope of the IRs can be taken beyond universities and research institutes, and can include any organization generating documents in digital format. These organizations may be governments, corporate organizations, and non-governmental organizations (NGOs). Each organization specific to the information that it deals with can built a repository of their own and also coordinate with other organizations to encompass and benefit researchers from interdisciplinary fields. Universities' institutional repositories would largely include materials such as research reports, data sets, examination papers, conference papers, newsletters and seminar papers, course notes, journals articles undergoing peer review, and digital versions of theses and dissertations. Government institutional repositories would include policy and strategy documents, speeches, documents pertaining to the legal aspects and administrative documents. The NGOs repositories would include technical papers, reports, consultancy and feasibility study reports, case study papers, on field project reports etc. The provision of access to institutional repositories has become fairly easy and affordable with the development of information and communication technology. Most universities have set up their own intranets, and obtain internet connectivity through microwave and satellite links promising them the adequate bandwidth to support a variety of file formats. Likewise Research institutions, corporate organizations and big NGOs have developed the necessary network infrastructure to provide access to the IRs hosted on local and non local servers (Drake – 2004).

Open Access Archives

To maintain the pace and the quality of the research worldwide the researchers need access to the global library of research information. However the main problem faced by most of the researchers especially in the developing and third world countries is the accessibility to the peer reviewed journals due to the high subscription fee. Many initiatives have been started to resolve the access problem and one of them is the open access. Open access means affordable availability of research articles, theses, manuals, teaching materials or other documents on the public Internet permitting any user to read, download, copy, search, distribute, print or link to the full texts of these study materials. With Open Access Archives (OAA) the main focus is on

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building a knowledge base preserving and making available the articles published in peer-reviewed journals, as they represent the main source of research results that largely remain kept behind subscription barriers. The primary goal of OAA is to maximize the accessibility of the research publications and their impact, as it is this that forms the basis for further advancement in the research (Rajashekar – 2004). The following strategies have been recommended (BOAI – 2002) to achieve the goals of OAA:

Self Archiving

In self archiving the authors deposit their referred journal articles in the open electronic archives. This will prove very helpful in disseminating the research articles without any subscription barriers. The researchers can access the papers on the internet and will be able to approach the depositor of the articles to obtain further information.

Open Access Journals

Journals that do not charge readers or their institutions subscription fees to access the articles can be posted on the Internet for the open access. The authors can place the copies of their articles in the open access journals. Thus users will have free and unrestricted access to their works and the research that is currently inaccessible because of financial barriers becomes globally accessible. As more and more international institutes establish archives, a growing body of published research becomes available to anyone with Internet access.

Opening up access to primary literature published within scholarly journals will accelerate research, enrich education, share learning among rich and poor nations, and, ultimately, enhance return on investment in research. From being in a position where institutions cannot supply all of the information needs of researcher, researchers will be able to access all relevant information they need (Chan & Kishop – 2005). While the primary role of institutional archives is to make available published papers, many institutions also use their archive to provide access to other materials, including doctoral theses and dissertations, datasets, technical reports, instructional materials and other forms of electronic publications that can include multimedia objects. Many of these digital objects do not have regular publishing outlets, but are nonetheless important for teaching and research purposes. Making these intellectual products openly available through institutional archives is vastly increasing the depth and diversity of raw material for research and development (Chan – 2004). Scientists often need to refer to past papers when they are asked to review a new manuscript submitted for publication in a journal. If all the past papers referred to in the new paper are readily available in searchable archives, it will save a considerable amount of time spend searching for them in a library (Chan & Kishop – 2005; Bhide -2007).

Table 1 lists various initiatives taken in many countries for creation of Directory of Open Access Journals. Directory of Open Access Journals not only provide listing of open access journals and other research resources in a manageable and categorized form but also serves as information centre for transfer and access of information.

Directory Name	Web Address
Directory of Open Access Journals	http://www.doaj.org
Directory of Open Access Repositories	http://www.opendoar.org
Registry of Open Access Repositories	http://trac.eprints.org/projects/iar/wiki
Information and Library Network	http://www.inflibnet.ac.in

Directory Name	Web Address
Developing Library Network	http://delnet.nic.in
Traditional Knowledge Digital Library	http://www.niscair.res.in
Indian National Library in Engineering Science and Technology	http://paniit.iitd.ac.in/indest
Open J-Gate	http://www.openj-gate.com
Digital Library - Resource for Indian Cultural Heritage	http://www.ignca.nic.in/dlrich/welcome.html
Digital South Asian Library	http://dsal.uchicago.edu
Rhodes eResearch Repository	http://eprints.ru.ac.za/
Scientific Electronic Library Online	http://www.scielo.br
Japan Science and Technology Information Aggregator, Electronic	http://www.jstage.jst.go.jp

Table 1. Partial Directory List of Open Access Journals.

CONCLUSION

The greatest challenges to conduct a quality research is the availability of and accessibility to the relevant information in the area of interest. In this paper the authors have discussed research facilitations provided by the Internet and two important constituents of Digital Libraries vis-à-vis Institutional repositories and Open Access Archives that have been put to use by the researchers in timely completion of research assignments and immediate dissemination of research results. Various services on the Internet especially the World Wide Web is exclusively helpful in the conduct of research work as it makes the latest published research articles in highly reputed and referred journals both paid and open access, accessible to researches. The Institutional repository collects and maintains at one place the research papers, conference papers, doctoral theses, survey reports, project reports etc. pertaining to an institute in the digital form thus making it easily searchable and accessible to the members of the institution. The key concept in Open Access is access that is not expensive (i.e. there is a minimal fiscal barrier) and that research output is accessible (i.e. access to the material is not restricted in terms of physical infrastructure nor restricted by authentication systems). Open Access has granted increased access to research literature to researchers at poorly funded institutional libraries and thus access to research by and in the developing world has been greatly improved. To improve the scientific activity in a research institute especially in poorly funded institutions it is thus imperative to facilitate researchers by strengthening Internet connectivity, establishing institutional repository and subscribing to Open Access and other online Journals.

REFERENCES

Antelman, K. (2004). Do Open Access Articles have a Greater Research Impact? College and Research Libraries. Retrieved March 13, 2009 from http://www.lib.ncsu.edu/staff/kantelman/do_open_access_CRL.pdf.

Arunachalam, S. & Singh, U.N. (1992). Access to information and the scientific output of India. Journal of Scientific & Industrial Research, 51, 99-119.

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Barbara Kirsop & Leslie Chan. (2005). Transforming Access to Research Literature for Developing Countries. Serials Review. 31(4), 246-255.

Bhide, Aditya M. Heung, Yoo Jae Kee & Choi Mun. (2007). Research Library: A New Look of Academic Digital Libraries. In proc of IEEE ICIW '07, (57-57).

BOAI (2002). Budapest Open Access Initiative. Retrieved March 25, 2009 from http://www.soros.org/openaccess/read.shtml.

Canadian Association of Research Libraries (2004). Canadian Association of Research Libraries: Institutional Repositories project. Retrieved March 18, 2009 from http://opcit.eprints.org/feb19oa/mark-carl-ir.doc.

Cetto, A. M. (2000). Sharing scientific knowledge through publications: what do developing countries have to offer? World Conference on Science: Science for the Twenty-first Century, a New Commitment, Paris UNESCO (148-150).

Chan, L. & Costa, S. (2005). Participation in the Global Knowledge Commons: Challenges and Opportunities for Research Dissemination in Developing Countries. New Library World 106 (1210/1211), (141-163).

Chan, L. (2004). Supporting and Enhancing Scholarship in the Digital Age: The Role of Open Access Institutional Repositories. Canadian Journal of Communications 29(3-4), 277-300.

Chan, L., Kirsop & B., Arunachalam, S. (2005). Open Access Archiving: the fast track to building research capacity in developing countries. Science and Development Network, Retrieved March 31, 2009 from http://www.scidev.net/ms/openaccess.

Chan, L., Kirsop, B., Costa, S. & Arunachalam, S. (2005). Improving access to research literature in developing countries: challenges and opportunities provided by Open Access. World Library and Information Congress Oslo, 14-18 August 2005. http://www.ifla.org/IV/ifla71/papers/150e-Chan.pdf.

Drake, M. A. (2004). Institutional repositories: hidden treasures. Searcher. 12(5). Retrieved March 25, 2009 from http://www.infotoday.com/searcher/may04/drake.shtml.

Fullerton, K. et al. (1999). A digital library for education: the PEN-DOR project. The Electronic Library, 17(2), 75-82.

Jebaraj, F. (2003). The Electronic Library: An Indian Scenario. Library Philosophy and Practice, 5(2). Retrieved March 14, 2009 from http://www.webpages.uidaho.edu/~mbolin/jebaraj.pdf.

Keith G. Jeffery (2007). Technical Infrastructure and Policy Framework for Maximising the Benefits from Research Output. Proceedings ELPUB2007 Conference on Electronic Publishing – Vienna, Austria.

Lynch, C., (2003). Institutional repositories: Essential infrastructure for scholarship in the digital age. ARL Bimonthly Report, 226.

Pouris, A. (2003). South Africa's research publication record: the last ten years. South African Journal of Science, 99, 425-428.

Rajashekar, T. B. (2004). Open-access initiatives in India, Open Access and the Public Domain in Digital Data and Information for Science. In: Esanu J.M. and Uhlir P. F., eds. Proceedings of an International Symposium, The National Academies Press, Washington, DC 154-157.

SJR (2009), SCImago Journal and Country Rank 1997 – 2007. Retrieved March 18, 2009 from http://www.scimagojr.com/countryrank.php.

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Stevan Harnad, Tim Brody, François Vallières, Les Carr, Steve Hitchcock, Yves Gingras, Charles Oppenheim, Chawki Hajjem & Eberhard R. Hilf. (2008) The Access/Impact Problem and the Green and Gold Roads to Open Access: An Update. Serials Review, 34(1) 36-40.

Swan, A. & Brown, S. N. (2004). JISC/OSI Journal Authors Survey Report. Retrieved March 18, 2009 from http://www.jisc.ac.uk/uploaded_documents/JISCOAreport1.pdf.

Tan-Torres Edejer, T. (2000). Disseminating Health Information to Developing Countries: The Role of the Internet. British Medical Journal 321, 797-800.

Wendy Aitken (2007). Use of Web in Tertiary Research and Education. Webology, 4(2), Article 42. Retrieved March 1, 2009 from http://www.webology.ir/2007/v4n2/a42.html.

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