Open Access Initiatives: The Inevitable Business Process Reengineering and Revolutions in Open Scholarly Communication

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ABSTRACT

Advances in science comprising the pure, applied, humanities and the social sciences historically vouch the collaborative and the communicative processes involved in the scholarly world. This has been the practice the world over for centuries and this (has to) will continue to be so in future too. Scholarly communication by means of scientific journals, research reports, short communications (letters), conference/symposia proceedings, monographs etc. have gone so deep into the world of scientific communication since long and it has grown into an institution by itself. The scholarly communication system has been, for the past several hundred years, largely monopolised by the publishers. An exemption here would be the learned society publishers, who mostly do not handle scholarly literature with a profit motive. Publishers also take away the copyright of the author while accepting their manuscripts for publication, freely, and the paradox is that the author or his university/institute will not have access to the article unless they have a subscription to the journal. On the other side, the spiraling costs of scholarly journals and the shrinking library budgets are of grave concerns to the academic and research fraternity the world over. Needless to say, the situations in developing world are in deep troubles, be it in scholarly information, IT and communication, or laboratory facilities. Of late the deprived stake holders in the scholarly communication ecosystem, by leveraging on the latest IT and digital technologies, are trying out Open Access alternatives for scientific publication and communication with a view to get rid of the clutches of the giant publishers. Disintermediation and the elimination of non-value adding operations (process chains) using digital and communication technologies in scholarly publication and communication has been offering excellent benefits to authors and the resultant shrinking of the supply chain of information. Open Access, as it is literally explanatory, intends seamless and free access to all scholarly works emanating from the scientific fraternity worldwide. Open Access Initiatives are indeed poised to revolutionise the scholarly communication process where the copyright of the article will rest with the author himself, which is a large departure from the conventional publication process. This paper attempts to highlight the importance of Open Access movement and gives an overview of the numerous OA initiatives and exemplary efforts that have taken place worldwide and those in India.

Introduction

The world of science and scientific communication are closely knit entities so much so that one cannot exist without the other. In other words one draws its oxygen, blood and strength from the other. Scholarly communication is a multifaceted and rigorous process involving many stakeholders. Scholarly communication refers to the explicit research findings, formal as well as informal, the academic and scientific community make known to the world for public consumption. These findings are meticulously brought out research reports, called popularly as 'articles' or with the common name 'papers', perhaps influenced by the predominant medium used to print them. Authors or contributors of these papers publish them for free unlike the books which form part of the trade. Publishing is the formal system whose key players include researchers, publishers (including scholarly societies), and libraries [CARL]. Researchers submit articles on their findings of years long efforts and publishers add value to these by processing them for peer reviews and necessary editorial corrections. At the other end libraries subscribe to these publications and facilitate access to primary as well as secondary sources of information for the scientific fraternity back. The supply chain of scholarly communication is illustrated in Fig1.
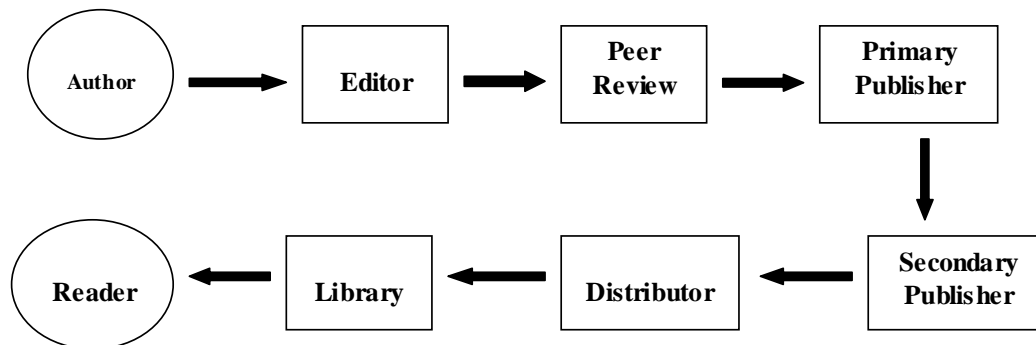

Fig.1. Scholarly Publication Value Chain

Upcoming Scholarly Communication Models

There are basically three models exist in scholarly communication the world over, viz., i.) the traditional paper based journal publishing process which has a track record of over 300 years, ii.) E-publishing and iii.) the Open Access mode of publishing. The developments in IT and Internet have contributed considerably to shrink the supply chain of information and it is indeed a welcome change. For the information industry, the

supply chain extends from the source of information to the point of usage. The traditional journals in paper format took 36-52 weeks for journals to publish. Surprisingly enough, in this total cycle time of 1 year, the value addition (generation, review, correction and printing) takes place in not more than 2-3 weeks, indicating a huge wastage of time and money contributed mostly by non-value adding links. In this context, the advent of the E-publishing has really been a boost to the scholarly publishing domain, bringing down the publishing time frame to a remarkable 3-4 weeks. A noticeable departure from the traditional systems here is that the printing is delinked from the publishing process, which is quite obvious. It is important to note here that the much appreciated and respected scholarly value systems are not compromised even a single degree in quality checks in the new process. In fact it improves and strengthens them with its inherent advantages of being online with respect to processes and procedures. The third category is the growing sets of Open Access Publishing and Scholarly Archive initiatives, which are the offshoots of the novel Open Access movement, catching up globally. Authors are now able to publish their findings at an astoundingly fast pace such as 10-15 minutes or even at a lesser time. The relative features and merits of the three systems are illustrated in the following figure (Fig. 2).
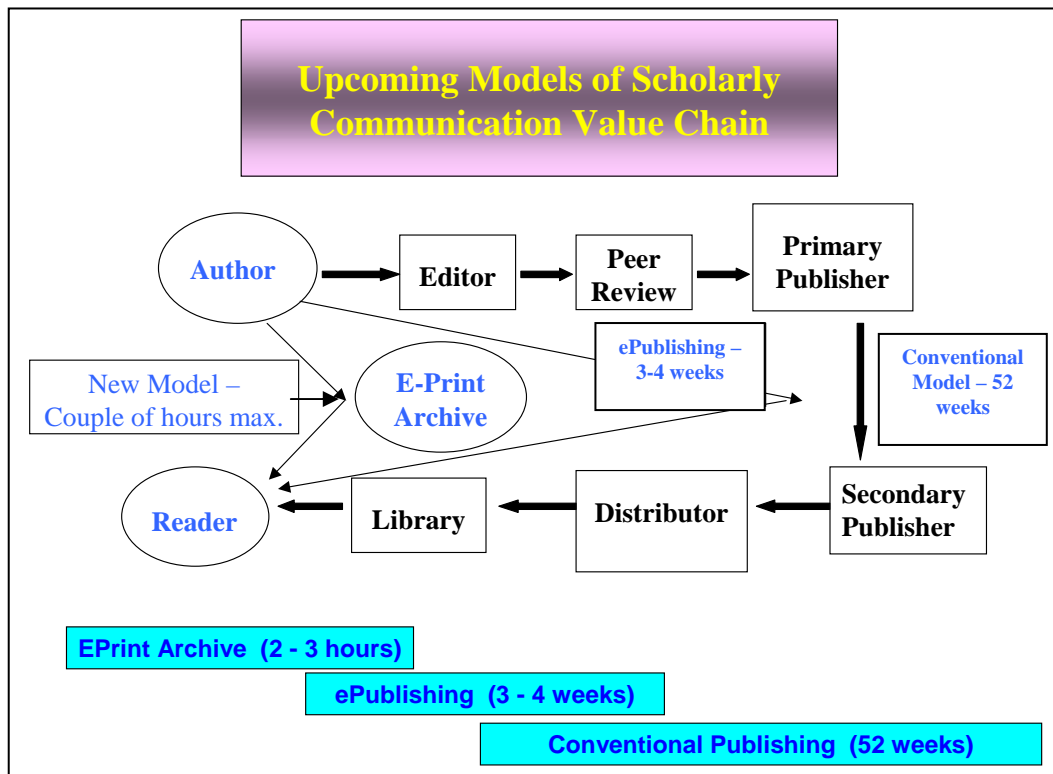

Fig.2 . Upcoming Models of Scholarly Communication Value Chain

Open Access

The dawn of the new millennium came with up the wonderful compliment 'Open Access'. Open Access or the popular abbreviation OA refers to the innovative and the most ambitious traitional concept of universal free access to scholarly information [Budapest Open Access Initiative (BOAI)]. The purpose of OA is to release the scholarly content, through various novel interventions and in phases, from the clutches of the monopolizing commercial publishers and make it available free to the scientific fraternity worldwide. The rationale is that the scientific community publishes their research findings without any expecation of payment. The tangible benefits they derive out of the publications are career prospects, recognition and visibility. The rest are simply to give away their treasure of findings for consumption of the world of science and eventualy the society. In other words, OA is a rephrasing of the historic dream concept the univrsal availability of publications the library and the academic fraternity have been pondering over the past several decades and centuries.

A pressing problem which had led to this coordinated and concerted movement worldwide, were the exorbitant cost of scholarly journals which have been sky rocketing, and the shrinking library budgets, which had rendered libraries and the academic community to resort to alternative models of access to their own content. The paradox was that the universities and research institutes who contribute the scholarly content through their researchers had apparently no access to the content when it went into the hands of the publishers. In the name of the 'copyright' which they take away from the authors at the time of submission of the manuscript, publishers have literally locked up the content for good.

The OA process is all about assuring the scholarly content made available online. This presupposes that the content, especially scholarly content, is to be born in digital and electronic format, which is the prevailing and upcoming standards of scholarly content authoring. In other words, Open Access is technology's answer to the scholarly journals crisis or popular as serial crisis, the world face today.

The Budapest Open Access Initiative (BOAI) launched by the Open Society Institute (OSI) gives a candid explanatory note on OA [OSI]. It says "Open Access is the ultimate convergence of an age old tradition and the new technology, to make possible an unprecedented public good. The old tradition is the willingness of scientists and scholars to publish the fruits of their research in scholarly journals without payment, for the sake of inquiry and knowledge. The new technology is the internet. The public good they make possible is the world-wide electronic distribution of the peer-reviewed journal literature and completely free and unrestricted access to it by all scientists, scholars, teachers, students, and other curious minds. Removing access barriers to this literature will accelerate research, enrich education, share the learning of the rich with the poor and the poor with the rich, make this literature as useful as it can be, and lay the foundation for uniting humanity in a common intellectual conversation and quest for knowledge".

BOAI, by 'open access' to literature, mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself.

The ultimate goal of the Open Access movement is open access to peer-reviewed scholarly journal literature. Presently BOAI suggests two ways to attain this goal:

1. Open Access Publishing (OAP), famous as 'golden' road to Open Access. In this model, as against the tradition, journal/s are published as open access publications and they provide instant online open access to articles upon publication.

2. Open Access Archiving (OAA) or open access self-archiving, also called the 'green' road to OA. In this model, as a new trend, authors submit their pre-peer reviewed versions of papers (pre-prints) or post peer-reviewed published article/s (post-prints) into the archive for open access.

Open-access (OA) literature is digital, online, free of charge, and free of most copyright and licensing restrictions [Suber]. It is all about democratizing the scientific intellectual capital, which often draws its energy from publicly or privately funded research. It is not against proprietary or peer reviewed scholarly journals.

Genesis and Growth

It is man's relentless quest for the universal free availability of scholarly literature coupled with the potential of latest technologies which enable and ensure online availability of digital informaiton, that gave birth to OA. From the very first mode of publicizing inventions, be it the early clay tablets to the medieval scripts days, to the mid-modern printing / publishing ages, this has been one of man's most haunted ambitions. The recent developments in computing, communications and the advent of the Internet and the World Wide Web started unleashing the amazing potential of the electronic medium and digital content. As early as in 1990, computer scientists were putting their scholarly works in FTP sites.

It was Paul Ginsparg, a physicist at Los Alamos National Laboratories in the US who in 1991, for the first time sowed the seeds, and brought up the ground breaking online accessible archive concept of putting the preprints of scholarly articles in physics [Ginsparg]. The service, named 'arXiv', allowed authors to self-archive their papers from anywhere in the world, grew from strength to strength and eventually it paved way for a new branch of service, namely the 'Open Access Archives' [arXiv]. arXiv provides Open access to 380,182 e-prints in Physics, Mathematics, Computer Science and Quantitative Biology and receives about 2,500 new author submissions monthly. Mirrored in 15

countries, it receives constant and heavy usage, supporting an average of 120,000 daily connections. The impact of this model in the scholarly communication value chain is illustrated in the Figure2.

The library fraternity's contribution to the OA movement is comendable with the Association of Research Libraries (ARL) forming the Scholarly Publishing and Academic Publishing Coalition (SPARC) in 1997 towards curbing the impending scholarly jurnal crisis and to look for alternatives such as the open access [ARL], [SPARC].

Leaders in the open access movement emerged from many different places: the U.S., the U.K., India, Latin America, Eastern Europe, and Canada, to name a few [Wikipedia]. Some of the leading proponents of the open repository concept, among many others who dedicate their lives for the cause of OA are Stevan Harnad [Harnad], Peter Suber [Suber] and Herbert Van de Sompel [Sompel]. India's contribution to OA initiatives are well recognized and the Indian champions in OA, among others, include Prof. Subbiah Arunachalam, Prof. A.R.D. Prasad and the late Dr. T.B. Rajasekhar.

Landmark Open Access Initiatives

The following are important initiatives to support the open access movement which have occurred since the launch of the BOAI in February 2002 [BOAI]:

- The International Federation of Library Associations and Institutions (IFLA) released the IFLA Statement on Open Access to Scholarly Literature and Research Documentation, February 24, 2004 [IFLA].

- Organisation for Economic Co-operation and Development (OECD) Declaration on Access to Research Data From Public Funding, January 30, 2004 [OECD].

- UN World Summit on the Information Society (WSIS) Declaration of Principles and Plan of Action, December 12, 2003 [WSIS].

- Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities, October 22, 2003 [Berlin].

- Bethesda Statement on Open Access Publishing, June 20, 2003 [Bethesda].

- Association of College & Research Libraries (ACRL) Principles and Strategies for the Reform of Scholarly Communication, August 28, 2003 [ALA].

Open Access Publishing (OAP)

In this model, as against the traditional practices, journals are published as open access publications and these journals provide instant and free online access to articles upon publication. There is confusion between free journals and open access journals. Free journals give only free access to the journals and the content is always under threat, as they have every reason to withdraw the facility even without notice or justification. OA journals are that way highly dependable and reliable as they assure unlimited and unrestricted access to the journal content for both current as well as retrospective data. Lots of learned societiy publishers are now coming up with OA models for their journals. Best examples of open access publishers are BioMed Central [BMC] and the Public Library of Science [PLoS]. Major expenses for publishing online journals include the costs towards article processing, peer review of articles, journal production charges, and the online hosting and archiving charges.

OA Publishing resorts to different business and revenue models, conceived on different strategic principles. Prominent among them are the 1. Author Paying model, 2. Institutional Membership model, 3. Sponsorships/Sponsored titles, 4. Publication fee model etc. The author charges or the publication fee could be ranging from US $ 1500 to 2500, depending on the title of the journal, subject/discipline, readership and the OA publisher. Authors, in turn, can budget the publication fee into their research proposals towards recovering this cost. Sponsors and funding agencies are also there for the rescue of the authors, especially to those hailing from developing countries.

OA Publishing Direcotries/Publishers' Policies: DOAJ (Directory of Open Access Journals) hosted by the Lund University Libraries is world's largest free, full text, quality controlled scientific and scholarly journals directory. The service covers almost all major subject disciplines and languages. An amazing 2340 journals are listed in this directory of which 674 journals are searchable at article level. During the preparation of this manuscript, as many as 105552 articles are included in the DOAJ service [DOAJ]. SHERPA project of the University of Nottingham runs the appreciated RoMEO service which gives publishers' copyright policies on self archiving [RoMEO]. RoMEO lists as many as 169 publishers worldwide and categorizes publishers into 'green', 'blue', 'yellow' and 'white' publishers based on their policies on author archiving rights. Those allow archiving of pre-prints as well as post-prints are called green publishers. 79% of the publishers in SHERPA allow some form of author archiving and a significant 45% among these are green publishers.

Open Access Archives (OAA)

An archive is a generally accepted synonym for a repository. A repository is a network accessible server that holds scholarly digital content or eprints. Scholarly Archives or

Institutional Repositories are established medium to communicate peer reviewed (post-prints) and non-peer reviewed scholarly literature (pre-prints). There are basically three types of scholarly archives in vogue, viz., author archives, institutional archives and subject archives. Subject archives are also called as central archives. According to Stevan Harnad, open archiving is just self-archiving the articles the author has published in (peer-reviewed) non-OA journals. Hence it neither bypasses nor replaces peer-review. It has nothing to do with changing peer review. Self-archiving is a way of supplementing non-OA journal access with an OA version for those would-be users whose institutions cannot afford the non-OA journal.

There are numerous advantages that OA boasts while they campaign worldwide. Authors as well as Institutions can derive a number of benefits out of Archives. For authors, instant dissemination of the fruits of their long years of rigorous research to a global audience is the first and foremost. OA papers get increased visibility through novel models of harvesting done by search engines such as the Google, Citeseer etc. and the interoperability among similar archives achieved through the Open Archives Initiative (OAI) Protocol for Metadata Harvesting (PMH) are unparallel value additions to OA Archives. While more visibility leads to more citations, one's research impact naturally gets scaled up. Authors are therefore attracted to come to OA Archives. Additional benefits to self archiving include the assurance of the long term preservation of their articles and the facility to have a proper control as well as meticulous monitoring of one's own Publications.

For institutions too, a long list of advantages and benefits invite them to OA. Firstly, the institute's archive, popularly known as Institutional Repository helps in pooling the organization's Intellectual Capital into once central place which is otherwise scattered, distributed and unnoticed. The archive therefore serves as a one-stop-source or a single access point for the research output of an institution. It provides ample scope for introspection as to whether the institute is going in the right direction on its research activities. Necessary strategies and meticulously designed action plans could be charted out based on the feedback. Institutional repositories facilitates instant generation of research reports and thereby saves a valuable amount of time otherwise spent unwanted. Most importantly the archives ensures long term preservation of its scholarly materials with the help of Open Source softwares and Open Standards of data models and data structures.

Open Archive Directories and Search Engines: There are many value added services which index OA archives spread globally, as well as harvest metadata records for search and retrieval. OpenDOAR, the Directory of Open Access Repositories lists 502 OA archives situated worldwide [OpenDOAR]. OpenDOAR is a joint effort led by the Open Society Institute (OSI), along with the Joint Information Systems Committee (JISC), the Consortium of Research Libraries (CURL) and SPARCEurope [JISC],[CURL]. DMOZ,

the largest open directory of the Web, lists 59 free access online archives [DMOZ]. The Registry of Open Access Repositories (ROAR) hosted by Eprints.Org lists 607 plus open access archives [ROAR]. OAIster, one of world's outstanding OA repository registry services offered by the University of Michigan, indexes over 663 OAI-compliant open repositories worldwide with an overwhelming 8,593,164 records [OAIster]. Arc, developed by the Old Dominion University, is among the early federated search services based on OAI-PMH protocol [Arc].

Noteworthy OA Efforts Worldwide

Internationally, a number of initiatives are fast progressing spreading the novel open access concept and the open publishing philosophy of scholarly communication amongst the academic fraternity. There are three major categories upcoming predominantly, viz., i.) Author driven initiatives, ii.) Commercially driven initiatives and iii.). Collaborative projects. Examples of author driven initiatives include the e-print services such as the physics e-print archives arXiv and the PubMedCentral [PMC]. The earnest efforts of e-prints.org software development team and the Free Online Scholarship Movement (FOS) aiming the open access to journal literature by freeing authors from publishers' monopoly etc. are laudable initiatives.

The 'BioMed Central' (BMC) and the 'Public Library of Science' (PLoS) who provides open publishing facility for the biomedical researchers, 'CrossRef', a publisher-linking service promoted by over 170 publishers the world over, are examples of commercially driven initiatives [Crossref].

Examples of collaborative endeavours include the ICAAP (International Consortium for the Advancement of Academic Publications), SPARC, High-Wire Press and many more such efforts [ICAAP]. The ICAAP does wonderful job and publishes a number of journals for the developing countries. SPARC (Scholarly Publishing and Academic Resources Coalition) an alliance of universities, research libraries, and organizations built as a constructive response to market dysfunctions in the scholarly communication system. HighWire Press hosts the largest repository of free full-text life science articles in the world, with more than 600,000 free, full-text articles online. Since 1995, with the launch of the Journal of Biological Chemistry (JBC), to the continuous online production of hundreds of prestigious journals, such as Science Magazine, the New England Journal of Medicine, PNAS and JAMA, HighWire has established an outstanding reputation for helping to disseminate primary scientific information on the Web. In the year 1997, the U.S. National Library of Medicine of the National Institute of Health (NIH) made Medline, the most comprehensive index to medical literature on the planet, freely available. Usage of Medline increased a hundred fold when Medline became free, strongly suggesting that prior limits on usage were indeed impacted by lack of access [Medline].

ELSSS the Electronic Society for Social Scientists, INASP (International Network for the Availability of Scientific Publications), and the Electronic Publishing Trust for Development (EPT) are other international initiative promoting open publishing and open access systems [ELSSS],[INASP],[EPT].

A new genre of open access material started appearing recently, namely, open cousewares (OCW). OCW are now gaining popularity and momentum amongst the academic community quite actively and prominently. The MIT courseware project is the first in the lot and followed by MIT, many a univerties and educational institutions are now putting their courses online for open access.

Open Archives Initiative (OAI)

In October 1999, in a meeting held in Santa Fe, USA to discuss mechanisms to encourage the development of open repository solutions and the integration and interoperability among the existing distributed and scattered e-print archives, the Open Archives Initiative (OAI) was formed [OAI]. The consensus was to work on a framework facilitating the federation of content providers on the Web. Since that first meeting, the OAI has undergone a period of intensive development both organizationally and technically. The Open Archives Initiative is therefore to support the development of open access e-print archives and to provide seamless interoperability between them. The mission statement of OAI says 'The Open Archives Initiative develops and promotes interoperability standards that aim to facilitate the efficient dissemination of content. The Open Archives Initiative has its roots in an effort to enhance access to e-print archives as a means of increasing the availability of scholarly communication. Continued support of this work remains a cornerstone of the Open Archives program. The fundamental technological framework and standards that are developing to support this work are, however, independent of the both the type of content offered and the economic mechanisms surrounding that content, and promise to have much broader relevance in opening up access to a range of digital materials. As a result, the Open Archives Initiative is currently an organization and an effort explicitly in transition, and is committed to exploring and enabling this new and broader range of applications. As we gain greater knowledge of the scope of applicability of the underlying technology and standards being developed, and begin to understand the structure and culture of the various adopter communities, we expect that we will have to make continued evolutionary changes to both the mission and organization of the Open Archives Initiative'.

Two major applications came out of the OAI movement are the Protocol for Metadata Harvesting (OAI-PMH) and the OAI Repository Explorer which is useful for interactive exploration and validation of OAI repositories [OAI-PMH],[OAI Explorer]. The OAI-PMH protocol harvests metadata between hundreds of OA archives at the low barrier metadata level and passes them on to OA service providers. The service, by focusing

mainly on metadata, relieves the digital objects as well as the data provider OA servers from the burden of searching and the resultant retrieval. The OAI community complimented the movement with over two dozens of interesting OAI based value added tools and services and they are available in the OAI site [OAI Tools].

OA Application Tools

Open Journal Systems (OJS): The Public Knowledge Project developed the open source publishing software Open Journal Systems (OJS), which is the most used open source application for developing and launching open access journals around the world [OJS].

Institutional Repository (IR) Softwares: There are many world renowned free open source Institutional Repository (IR) softwares available such as EPrints, DSpace, FEDORA, ARNO, i-TOR, CDSware etc. They are issued either under GNU public license or the BSD license and can be downloaded from their own sites or open source software directories such as SourceForge [sourceforge]. Each of the software has a host of features, unique facilities and excellent capabilities, which the users could explore and experiment.

Open Archives Harvester: The **OA** harvester service PKP harvester software developed by the Public Knowledge Project is an excellent application software which can be easily downloaded, configured and customized [PKP].

The Indian Scenario

In particular reference to India, the research fraternity in the country face a number of problems with regard to infrastructure, be it in IT and communication, scholarly information or laboratory facilities. Weakly endowed most of our campuses are, barring exceptions like the IISc, IITs, IIMs, few other MHRD Institutions and the laboratories which are part of the central research councils and central research bodies such as the CSIR, ICAR, ICMR, DBT, DAE, DRDO etc. Few of the Indian Universities, especially the central universities, are also fortunate enough. Rest of the whole big lot are suffering from acute information poverty, which is to be addressed proactively at the earliest. Access to world class scholarly literature, nascent as well as retrospective, is a prerequisite for state-of-art research and development, whereas the ground reality in most of our research centers and academic institutions is really lamentable and panicking. Whereas India's scientific potential and innovations in science have been accredited worldwide, our performance in terms of contributions to the world of science during the past couple of years have been a lamentable all time low, a shaming <1%, as against the earlier 8-10%. The intensity of the matter was best described in a recent letter of warning issued by the country's noted scientist Prof. C.N.R. Rao to the Prime Minister, who is

also the chairman of the Scientific Advisory Council to the Prime Minister [Rao,CNR]. Unless there is a level playing ground provided to our scientists and the academic community, India will never be able to compete with their first world counterparts, and the OA movement at this juncture is a real blessing for developing countries.

OA Initiatives in India

The academic and the scientific fraternity in India, since the beginning of OA movement worldwide, have been striving its best in promoting and scouting for the cause of open and unrestricted access to scholarly literature. India also has been able to convince the international community, with an array of local, national, regional as well as international initiatives, taken up in different parts of the country. These include publishing of open access journals, setting up of open access archives (institutional repositories), configuring and commissioning of open archive harvester services, providing open coursewares to the academic world, imparting of training programmes on e-publishing of journals as well as on institutional repositories etc. Some of the commendable activities such as the OA journals of the Indian Academy of Sciences (IAS), eprints@iisc, ldl@drtc, sdl@drtc, OpenMED and the indMed services of NIC New Delhi, efforts of MedKnow publications, the e-journal initiatives and archives at INSA, IIT Delhi, Raman Research Institute, NIT Rourkela, Vidyanidhi etc. deserve special mention [OpenMED]. From the corporate world, the OPEN J-Gate open access journal portal service, is a laudable service accessible worldwide [OPEN J-Gate]. The initiatives of late Dr. T.B. Rajasekhar of NCSI and Prof. A.R.D Prasad of DRTC are really praiseworthy. Prof. Prasad is now a member of the Governing Board of DSpace, speaks volumes about his contributions.

OA Archives

Over two dozens open access institutional repositories have been successfully set up in India and they are operational. Most of them are still under filling-up process or populating stages. Many among them are OAI-PMH compliant and are listed in OAIster and OpenDOAR directories. Many institutions, universities, and organizations are in the process of installing their IRs. EPrints and DSpace are the IR softwares popular in India. One of the major bottlenecks found in setting up the IRs are that both these are software intensive applications and in many cases it is beyond the reach and capabilities of librarians. It is therefore anticipated that simple and more friendly forms of IR software applications may emerge for the help of librarians and information professionals.

OA Journals

Unlike the US, UK and other major developed economies, journal publishing in India have been, for long, primarily a public funded activity and done mostly by Government agencies such as the CSIR, ICAR, DRDO, ICMR, Indian Academy of Sciences (IAS), Indian National Science Academy (INSA) etc., and by a few learned societies. Compared

to the number of articles published by Indian authors from India, the number of journals published in India are relatively poor. This may be due to the fact that authors wish to have more impact, visibility and readership for their articles which they doubt if published in Indian titles. However, the coverage of Indian journals in international indexing, abstracting and full-text database services are very poor. There are many challenges Indian journals face, such as quality of articles, stringency in peer-review process, timeliness of production, infrastructure and funding, subscriptions and readership, distribution channels and market demand etc. In spite of all these, many organizations and scientific bodies are striving their best to make our journals open access. Some of the laudable efforts include:

1. The Indian Medlars Centre of NIC provides free full-text access to 38 Biomedical Journals [IMC]
2. The Indian Academy of Sciences has put all its 11 journals in the public domain [IAS-journals].
3. The Indian National Science Academy's all 4 journals are available in the public domain [INSA].
4. MedKnow publications has, within the past three years, brought 28 Indian Biomedical Journals into the Open Access domain [MedKnow].
5. Kamala-Raj Enterprises has brought 5 social science and humanities journals to open access [Krepublishers].
6. IndianJournals.com provides open access to 7 scholarly journals [IJCom]

Added to these, several other single title open access efforts are also progressing in the country, such as 'Sankhya' of the Indian Statistical Institute Calcutta, the Economic and Political Weekly (EPW).

OA Harvester Services

Two of the major value adding features of OA archives, among many others, are their Internet presence (omnipresence) and interoperability. The interoperability feature keeps all OA archives virtually a single digital library system wherein they share their metadata through some common services called metadata harvesters or service providers using the OAI-PMH protocol. A number of tools are now available for starting such services and the PKP archive harvester is the appreciated and simple one used by many [PKP]. CASSIR (Cross Archive Search Service for Indian Repositories) is a DSIR sponsored cross-repository indexing and search service recently launched by NCSI (National Centre for Science Information), IISc. [CASSIR]. CASSIR, a PKP archive server based service, harvests metadata from country's OAI-PMH compliant institutional repositories, and provides search and browse functionality over the Web. Institutional Repositories can add their IR in the service by clicking and passing the necessary details of the IR. CASSIR has currently indexed 13974 records from 17 repositories in the country. SJPI journal harvester service of NCSI has over 1000 papers harvested and indexed from 13 journals

[SJPI]. Open J-Gate, perhaps the second largest open access archive after Medline, has indexed over 1 million articles from more than 3000 open access journals of which more than 1500 are peer-reviewed scholarly journals. DRTC's SDL (Search Digital Libraries) harvester service has indexed about 7000 records from 13 archives spread globally [SDL]. Knowledge Harvester@INSA has indexed over 2000 articles from different archives [KHI]. The harvesting service SEED at IIT Delhi has over 5000 records indexed in it [SEED]. The OAI harvester at IIMK has over 19000 records indexed for search and retrieval [IIMKH].

Open CourseWare (OCW)

The Open CourseWare (OCW) is a new genre of academic content category, going in line with and supporting the OA objectives, focused at the academia as well as those with a curious mind for learning, at a global scale. It was UNESCO in 2002 which first mooted and adopted the idea of opening up educational resources for all, especially targeting the developing countries. Access to state-of-art and quality educational material has always been at acute dearth among the rural communities worldwide and the whole of developing countries in particular. The movement soon received wholehearted support from the MIT, with its mission to advance knowledge and education, with the kind gesture of serving the globe with the premium content of one of world's leading universities which has the distinction of values of excellence, innovation and leadership. The Open CourseWare services of MIT is an outstanding Web based e-publishing initiative, with a massive coverage of over 1400 courses spread across in as may as 35 plus disciplines [OCW]. India also has slowly endorsed this movement with IGNOU and NCERT putting their educational resources and course materials online [IGNOU], [NCERT].

OA Training Programmes

India may perhaps be the leading country among developing nations in offering quality training programmes on OA applications. Two international workshops were organized by the Indian Academy of Sciences, Bangalore during March 2002 on Open Access Journals in which over 40 professionals were trained in e-Publishing [IAS]. During May 2004, for the first time in India, under the stewardship of Prof. Subbiah Arunachalam, with the support of a few funding agencies such as IDRC, CSIR, British Council and OSI, two full-fledged workshops on open access and institutional archiving were organized by the M.S. Swaminathan Research Foundation at Chennai with a view to developing a cadre of open access experts in Indian higher educational and research institutions. The primary purpose of the workshops was to provide Indian scientists and librarians with (i) a thorough understanding of the global scientific and scholarly communication issues that open access addresses; (ii) the technical knowledge of how to set up and maintain an open access institutional archive, and (iii) an awareness of the local institutional policy and organizational requirements for a successful, sustainable

open access institutional archive. In all, 48 participants representing general and agricultural universities and government laboratories under the various councils and departments, were trained in the two workshops. Some of them were scientists and others librarians, drawn from different parts of India and from different disciplines [MSSRF].

During July 2004 the NCSI of IISc, under the captaincy of Dr. T.B. Rajashekar in association with the Old Dominion University, USA and sponsored by the INDEST Consortium of MHRD, conducted a 3-day workshop on Institutional Repositories, for the benefit of the INDEST Member Institutions. The workshop was a successful one in which 21 participants comprising librarians and computer/system professionals were trained [NCSI].

The first International Workshop on DSpace was held at Bangalore on March 7-11, 2005. The workshop was organized by the Documentation Research and Training Center (DRTC), Bangalore. The Indian Institute of Management Kozhikode (IIMK) conducted three national level workshops on Institutional Repositories during 2004, 2005 and in 2006 [IIMK]. A number of training programmes have come from DRTC Bangalore, INSA New Delhi, NIC New Delhi, INFLIBNET Ahmedabad, DELNET New Delhi, MALA Chennai, University of Mysore and by several universities and institutions in the country.

Conclusion

As it is rightly captioned in BOAI, 'open access' is an unprecedented 'public good' made possible with the convergence of the good old academic and scientific tradition of sharing scholarly knowledge and the great potential of latest technologies. Ensuring free and unrestricted peer-reviewed scholarly literature accessible worldwide shall definitely accelerate research and enrich education and thereby bridge the widening digital divide between the developed and the underdeveloped nations. After all science can compete with one another only if there is a level playing ground provided for a free and fair performance. This new form of electronic publishing could potentially and drastically alter the dynamism among authors, publishers and consumers of scholarly works. And this can definitely pave way for excellence in science and academics in a developing country perspective. It is heartening to note the enormous amount of initiatives that have taken place already and further taking place world over, towards this innovative and novel goal. The selfless contributions pumped in by the open source software (OSS) front, the compliments from the Free Software Foundation (FSF) and the generous funding received for the cause of science are absolutely praiseworthy [OSS],[FSF].

Both Open Access Publishing (OAP) and Open Access Archiving (OAA) are central and crucial to India as far as its academic and scientific agenda for the coming years are concerned. Thanks to the selfless efforts of a few, the laudable OA efforts and the initiatives on training and workshops are good models for creating open access resources

as well as OA experts. However, given the magnitude of India's wealth of scholarly knowledge base, appreciated IT expertise and the strength of the academic/scientific community, it is strongly felt that they are not just good enough unless the policy makers' whole hearted support is ensured for the successful implementation of repositories in the respective institutes from where the professionals were rigorously trained. Similarly the country's major journal publishing organizations should come up with open access models of publishing. CSIR, ICAR, ICMR, ICSSR, DRDO are just few examples. What is more important is the involvement of the University system in the Open Access movement, which is unfortunately not making any headways as yet in this direction. UGC should take the lead and involve Institutions like the INFLIBNET in capturing the invaluable intellectual capital being unattended and untapped in our universities and put them together into Open Access Archives. Similarly the national level research councils, viz., CSIR, ICAR, ICMR, DRDO, ICSSR etc. could consider collecting and archiving their research papers into a central archive which could be accessed by all, while individual institutional repositories which are interoperable, could be attempted simultaneously. Ultimately, it is not the adequate progress of technology, but lack of long range vision and proactive policies which pull us back from success in most cases.

Acknowledgement

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