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Open access publishing in Indian premier research institutions

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Abstract

Introduction. Publishing research findings in open access journals is a means of enhancing visibility and consequently increasing the impact of publications. This study provides an overview of open access publishing in premier research institutes of India.
Method. The publication output of each institution from 2003 to 2007 was ascertained through Scopus and the name of source journals along with the number of publications recorded. All 4232 journal titles were searched in the Directory of Open Access Journals and then using the Google search engine to find out which journals are openly accessible.
Analysis. The data are tabulated and analysed in a systematic way to reveal findings in accordance with desired objectives.
Results. The 17,516 research articles are contributed by the five institutions and appear in 4232 journals. The Indian Institute of Science publishes 8.26% of its research output in open access journals, All India Institute of Medical Sciences 19.37%, Baba Atomic Research Centre 4.84%, Indian Institute of Technology, Delhi 3.04% and Indian Institute of Technology, Kharagpur 3.26%.
Conclusions. The study reveals that a small portion of research publications of Indian research institutes is published in open access journals, the majority in journals of Indian origin. The medical institutions are contributing more of their publications to open access journals compared to other institutions.

CHANGE FONT

Introduction

Traditional avenues of publishing are closed to many authors in developing countries. As a result, much of the research done in these countries is lost to researchers elsewhere (Fernandez 2006). In India there

are a number of internationally-reputed institutions which are producing a good number of research documents that are expanding the frontier of knowledge and scope for technological innovation (Das *et al.* 2005). As a country known internationally for its information technology industries, India is now also hosting the corporate R&D centres of some major multinational enterprises owing to its global reputation for academic and research excellence (Das *et al.* 2007). Poor access to international journals and the consequential low visibility of papers the papers they write are major problems facing Indian researchers. Open access is viewed as a solution to remedy this deficit (Fernandez 2006). Open access calls for the free availability of scholarly literature on the Internet. The open access movement has gained significant momentum over the past few years. It maintains that all scientific and scholarly literature should be available to all for free via the Internet (Bluh 2006; Mark & Shearer 2006). What makes open access so important is its potential effect on visibility, usage and impact of research. The careers of researchers and funding of research depend upon the up-take of their findings, as does the progress of research itself. Academic institutions, federal agencies, publishers, editors, authors and librarians increasingly rely on citation analysis for promotion, tenure funding, and reviewer and selection decisions (Meho & Yang 2007). It has now been established that research impact is increased by open access (Lawrence 2001; Antelman 2004; Harnad & Brody 2004; Harnad 2004; Hajjem *et al.* 2005; Hajjem, Harnad & Gingras 2005; Eysenbach 2006; Norris, Oppenheim, & Rowland 2008). There are two ways to achieve open access to scholarly articles: by publishing in an open access journal or by depositing in an open access repository, known as open access publishing and open access archiving respectively (Chan 2004). The present study attempts to ascertain the trends in open access publishing in premier research institutes of India.

Objectives

The following objectives were laid down for the study:

1. To assess the growth and trends of open access publications in select Indian research institutes.
2. To assess and compare the use of open access publishing across select Indian research institutions.

Scope

The scope of the present study is limited to research articles (excluding conference papers, reviews, letters, short surveys and editorials) published from 2003 to 2007 by the five premier research institutions of India.

Methods

Elsevier's Scopus database is used to identify the top research contributing institutions of India and their corresponding research output covering a time period of 2003 to 2007. Scopus claims to index 15,000 peer-reviewed journal titles including 1200 open access journals from 4000 publishers (www.info.scopus.com). The top five research institutions of India, by output, located by Scopus affiliation identifier are:

- Indian Institute of Science
- All India Institute of Medical Sciences
- Baba Atomic Research Centre
- Indian Institute of Technology, Delhi
- Indian Institute of Technology, Kharagpur

The research article output of each of these institutions from 2003 to 2007 was ascertained through Scopus and the name of source journals along with the number of articles recorded (as of August 2008). All the 4,232 journal titles were searched in the Directory of Open Access Journals and then using the Google search engine to find out which are openly accessible. The data were tabulated and analysed in a systematic way to reveal findings in accordance with the research objectives.

Related literature

Kingsley (2007) argues that the traditional scholarly journal system is outdated and in need of re-organization and that the new internet technologies provide opportunities for change. Ylotis (2005) looks open access archives and open access journals as steps towards the democratization of information and knowledge by removing access restrictions. McCulloch (2006) observes that open access initiative is dramatically transforming the process of scholarly communication, bringing great benefits to academic world. Chan and Costa (2005) argue that open access enriches the global knowledge base by incorporating the missing research from the less developed world and improves the south-north and south-south knowledge flow. Haider (2007) looks open access as a way to connect the developing world to the system of science, by providing access to scientific literature published in the developed world. Arunachalam (2008) stresses the need for an open access mandate by various research organizations in India for their own research output and for projects funded by them. Krishnamurthy (2008) sees open access, open source software and digital libraries as the natural result of the open models of exchange that help societies to grow and prosper. Falk (2004) observes that open access is gaining momentum with very broad support from library and professional groups, university faculties and even journal publishers.

Zhang (2007) believes that authors may take longer to fully realize the benefits of open access movement as presently they are confused by different open access platforms. However Herb and Muller (2008) discovered that the scientists use open access services to an increasing extent after becoming familiar with them. Ramachandran and Scaria (2004) argue that majority of academics in the developing world are not well informed on how they could improve the visibility of their publications by making them open access. According to an international survey by Rowlands and Nicholas (2005), the proportion of authors publishing in an open access journals has grown considerably from 11% in 2004 to 29% in 2005. Using the ISI database Bjork *et al.* (2008) found that 4.6% of articles published in 23,750 peer reviewed journals in 2006 were openly available on the Internet in primary open access journals, and that this percentage increased to 8.1% after an embargo period of one year. Bhat (2008) found that a substantial number of research publications are available through open access journals in the Indian state of Jammu and Kashmir. The study further reveals that open access publishing is much popular in medical institutions than in other institutions of the state.

Results and discussion

Table 1 shows that 17,516 research articles are contributed by the five institutions and that these articles appear in 4232 journals.Out of 17,516 articles, 1367 (7.8%) are published in 245 open access journals with 884 (64.66%) published in 77 Indian open access journals and 483 (35.33%) articles published in 168 foreign open access journals. The Chi-squared test was applied to determine whether the difference between open access publications of the All India Institute of Medical Sciences and the other institutions is statistically significant. Chi-squared = 667.52, which is significant at the 0.05 probability level, meaning that we can claim that the Institute publishes significantly more in open access journals than the rest.

Out of 2873 research articles published in 2003 by all the institutions 274 (9.53%) are in open access

journals. In 2004 the percentage of open access articles decreases to 7.02% and in 2005 it slightly increases to 7.46%. In 2006 and 2007 the percentage of open access articles is 7.36% and 7.87% respectively (Table 2). Most of these articles (884 or 64.66%) appear in Indian open access journals.

Name of the institution	No. of research articles	No. of non- open access research articles	open access research articles		
			Indian	Foreign	Total
Indian Institute of Science	4789 (1033)	4393 (979)	197 (11) 49.74%	199 (43) 50.25%	396 (54)
All India Institute of Medical Sciences	3185 (839)	2568 (743)	482 (36) 78.11%	135 (60) 21.88%	617 (96)
Baba Atomic Research Centre	3117 (623)	2966 (595)	101 (13) 66.88%	50 (15) 33.11%	151 (28)
Indian Institute of Technology, Delhi	3058 (863)	2965 (829)	40 (8) 43.01%	53 (26) 56.98%	93 (34)
Indian Institute of Technology, Kharagpur	3367 (874)	3257 (841)	64 (9) 58.18%	46 (24) 41.81%	110 (33)
Totals	17516 (4232)	16149 (3987)	884 (77) 64.66%	483 (168) 35.33%	1367 (245)

Table 1: Research output of Indian research institutions
(Figures in parenthesis indicate the number of journals)

Year	Total no. of research articles	No. of open access articles	No. of non-open access articles
2003	2,873	274 (9.53%)	2,599 (90.46%)
2004	3,119	219 (7.02%)	2,900 (92.97%)
2005	3,403	254 (7.46%)	3,149 (92.53%)
2006	4,020	297 (7.38%)	3,723 (92.61%)
2007	4,101	323 (7.87%)	3,778 (92.12%)
Totals	17,516	1,367 (7.8%)	16,149 (92.19%)

Table 2: Annual research output of Indian research institutions

Indian Institute of Science

This institution's total research output from 2003 to 2007 was 4,789 articles, out of which 396 (8.26%) were in open access journals. The yearly research output was in the range of 836-1,058 articles, with open access articles in the range of 67-88 articles (Table 3). The 396 open access articles were published in 54 open access journals out of which 11 were Indian and 43 were of foreign origin (Table 1). The distribution of open access articles was not balanced as 199 (50.25%) articles appear in 43 foreign journals while 197 (49.74%) publications appeared in just 11 Indian journals.

Year	Total no. of research articles	No. of open access articles	No. of non-open access articles
2003	836	88 (10.52%)	748 (89.48%)
2004	874	67 (7.66%)	807 (92.33%)
2005	966	76 (7.86%)	890 (92.13%)
2006	1,058	89 (8.41%)	969 (91.58%)
2007	1,055	76 (7.20%)	979 (92.79%)
Totals	4,789	396 (8.26%)	4393 (91.73%)

Table 3: Research output of the Indian Institute of Science

All India Institute of Medical Sciences

The institution has published 19.37% of its publications in open access journals. The total research output of the institution was 3,185 research articles from 2003 to 2007. The research output of the institution increased each year from 555 articles in 2003 to 743 articles in 2007. The highest percentage of articles published in open access journals was 21.21% during 2006 and the lowest was 16.37% during 2004 (Table 4). The 617 open access articles appeared in 96 journals, out of which 60 were foreign and 36 were of Indian origin. Indian open access journals published 482 (78.11%) articles and foreign journals published 135 (21.88%) articles. The average number of articles in Indian journals was 13.38 whereas it was just 2.25 in foreign journals (Table 1).

Year	Total no. of research articles	No. of open access articles	No. of non-open access articles
2003	555	115 (20.72%)	440 (79.27%)
2004	574	94 (16.37%)	480 (83.62%)
2005	653	112 (17.15%)	541 (82.84%)
2006	660	140 (21.21%)	520 (78.78%)
2007	743	156 (20.99%)	587 (79.00%)
Totals	3,185	617 (19.37%)	2568 (80.62%)

Table 4: Research output of the All India Institute of Medical Sciences

Baba Atomic Research Centre

The research output of the Baba Atomic Research Centre increased from 556 articles in 2003 to 757 in 2006 and then decreased to 652 in 2007. The total research output of the institution from 2003 to 2007 stands at 3,117 research articles, out of which 151 (4.84%) were published in open access journals. The highest numbers of open access articles were published in 2003 and 2007 (36 in each year). During 2004-2006 the range of open access articles was 23-32 (Table 5). Of these, 66.88% appeared in Indian open access journals whereas 33.11% appearede in foreign open access journals. The 151 open access articles appeared in 13 Indian and 15 foreign journals. The average number of open access articles in Indian and foreign journals was 7.76 and 3.33 respectively (Table 1).

Year	Total no. of research articles	No. of open access articles	No. of non-open access articles
2003	556	36 (6.47%)	520 (93.52%)
2004	571	24 (4.20%)	547 (95.79%)
2005	581	32 (5.50%)	549 (94.49%)
2006	757	23 (3.03%)	734 (96.96%)
2007	652	36 (5.52%)	616 (94.47%)
Totals	3,117	151 (4.84%)	2966 (95.15%)

Table 5: Research output of the Baba Atomic Research Centre

Indian Institute of Technology, Delhi

The total research output of this institute from 2003 to 2007 was 3,058 research articles, out of which only 93 (3.04%) are open access. The research output of the institution increased from 463 articles in 2003 to 775 articles in 2007. The contribution to open access journals also increased gradually from 2.8% in 2003 to 3.35% in 2007 (Table 6). The 93 open access publications appeared in 34 journals, of which 8 were Indian and 26 were of foreign origin. There were 56.98% publications in foreign open access journals and 43.01% in Indian open access journals. The average number of open access articles in Indian journals was 5.0 whereas for foreign journals it was 2.03 (Table 1).

Year	Total no. of research articles	No. of open access articles	No. of non-open access articles
2003	463	13 (2.80%)	450 (97.19%)
2004	522	13 (2.49%)	509 (97.50%)
2005	575	17 (2.95%)	558 (97.04%)
2006	723	24 (3.31%)	699 (96.68%)
2007	775	26 (3.35%)	749 (96.64%)
Totals	3,058	93 (3.04%)	2965 (96.95%)

Table 6: Research output of Indian Institute of Technology, Delhi

Indian Institute of Technology, Kharagpur

The research output of the Indian Institute of Technology at Kharagpur in 2003 was 463 articles, increasing to 876 articles in 2007. The total number of articles published between 2003 and 2007 was 3,367, out of which 110 (3.26%) were open access. The highest proportion of open access articles was for the year 2003 (4.75%) and the lowest for 2006 (2.55%) (Table 7). The 110 open access articles appeared in 64 Indian and 46 foreign journals. Indian journals accounted for 58.18% of total open access articles while foreign journals accounted for 41.81%. The average number of open access articles in Indian journals was 7.11 and in foreign journals it was 1.91 (Table 1).

Year	Total no. of research articles	No. of open access articles	No. of non-open access articles

2003	463	22 (4.75%)	441 (95.24%)
2004	578	21 (3.63%)	557 (96.36%)
2005	628	17 (2.70%)	611 (97.29%)
2006	822	21 (2.55%)	801 (97.44%)
2007	876	29 (3.31%)	847 (96.68%)
Totals	3367	110 (3.26%)	3257 (96.73%)

Table 7: Research output of Indian Institute of Technology, Kharagpur

Collectively the 1,367 open access articles appeared in 184 journals with the average of 7.42 articles per journal. The Indian Institute of Science and Indian Institute of Technology, Delhi contribute most of their articles to foreign open access journals whereas the other three institutes contribute most of their articles to Indian open access journals. *Current Science* is the most popular open access journal amongst all the institutions with 189 (13.82%) open access articles in it. Second comes *Acta Crystallographica Section E Structure Reports Online* with 125 (19.14%) open access articles. *Neurology India*, and *Pramana Journal of Physics* are also popular open access journals in the Indian scientific community (Table 8).

Journal title	Country	Starting year	No. of articles
Current Science	India	1932	189
Acta Crystallographica; Section E Structure Reports Online	UK	2001	125
Bulletin of Materials Science	India	1979	68
Indian Pediatrics	India	1997	65
Neurology India	India	1999	55
Pramana Journal of Physics	India	1973	49
Indian Journal of Pathology and Microbiology	India	2006	47
Indian Journal of Medical Research	India	2003	45
Indian Journal of Ophthalmology	India	2005	41
Journal of Chemical Sciences	India	1977	31
Nucleic Acids Research	UK	1996	31
Journal of Anaesthesiology Clinical Pharmacology	India	2002	25
Indian Journal of Cancer	India	2002	22
Indian Journal of Gastroenterology	India	2004	22
Proceedings of the Indian Academy of Sciences; Chemical Sciences	India	1977	21
Electronic Journal of Geotechnical Engineering	USA	1996	19
Indian Journal of Dermatology Venereology and Leprology	India	1995	19
Indian Journal of Medical Sciences	India	2002	19

Journal of Radiation Research	Japan	1999	18
Indian Journal of Chest Diseases Allied Sciences	India	2000	17
Journal of Biosciences	India	1998	17

Table 8: Top open access source journals with number of articles

Conclusion

The present study reveals that only a small portion of research articles of Indian research institutes is published in open access journals with no substantial increase over the period of time. The medical institutions are contributing more of their publications in open access journals and the Engineering institutions the least. This confirms a trend identified in earlier research (Bhat 2008). The higher number of open access articles appear in Indian journals, although there are more source journals of foreign origin. The study also reveals that only standard, peer reviewed open access journals (such as *Current Science*, *Acta Crystallographica Section E Structure Reports Online*, *Bulletin of Materials Science*, *Indian Pediatrics*, *Neurology India*, and *Pramana Journal of Physics*) are used by the Indian scientific community for dissemination of their research findings.

Limitations and Future Research

Publications in journals not covered by Scopus are not included in the study (as the Scopus database is used for identifying the research publications). Further studies need to be undertaken to ascertain the actual proportion of authors publishing in open access journals along with the underlying motivating factors.

About the author

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