

Is there a correlation between access to journals and their productive use?

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Ever since library consortia were established in India, academic and research libraries started gaining online access to more number of journals than what they were individually subscribing before. To find out how well Indian researchers make use of the additional resources, the use made of journals either for publishing or for citing by researchers in three Indian institutions - a unitary university, a CSIR laboratory and a DAE theoretical research institution was examined. It was found that in all three institutions, not more than 20% of journals for which they have access through consortium or through their own funds as part of their subscription have been used. Thus the large number of journals that publishers offer through their big deals seem to benefit the publishers rather than the researchers. It is suggested that academic and research librarians in India and library consortia use citation analysis as an "aid in pruning subscriptions to unused journals, eventually alleviating misapportioned moneys spending in the serials selection process".

Keywords: Collection development; Library consortia; Journal subscription; Consortia; Electronic resources; Electronic journals

Introduction

The job of a collection development librarian, especially one responsible for procuring scholarly journals, is indeed difficult. Researchers-scholars, professors and research scientists and their doctoral and Master's students carry out research and publish papers in an even larger number of journals. And they cite articles from a larger number of journals. To know in advance the journals that will be used by these researchers and subscribe to them is an unenviable task that librarians have to perform with a high level of efficiency. So, when the consortia came up in India, librarians were happy with the access they gained to a few thousands of journals.

In this paper, the journals actually used by researchers in three Indian institutions either to publish their papers or to cite in their own papers and match them with the journals made accessible to them by their libraries examined to specifically answer the following two questions.

1. What percent of journals subscribed by the library, either on their own or through a consortium, are used by the researchers in the institution for either publishing their papers or citing in their papers?
2. What percent of journals used for either publishing or citing are available in the library either in print or online?

The study was confined to cover research in science and engineering, including agriculture and medicine. Social sciences and humanities were not included, although one of the three institutions in the study carry out research in these areas as well. This restriction was owing to the limited access to *Web of Science*. Access was available only to *Science Citation Index-Expanded (SCI-E)* and not *Social Science Citation Index (SSCI)* and *Arts and Humanities Citation Index (AHCI)*.

The three institutions were chosen with care. One of them is a unitary university with a long tradition of research, Annamalai University (AU) established in 1929. This university has many science departments-mathematics, physics, chemistry, earth sciences, zoology, botany, marine sciences, etc. Indeed, the first marine biology department in India was set up here in 1957, long before the National Institute of Oceanography was established (1966).

The second is the National Institute for Interdisciplinary Science and Technology (NIIST), a constituent laboratory of the Council of Scientific & Industrial Research (CSIR). This laboratory was rated to be a 'rising star' by Kirsten Bound and Ian Thornton¹, authors of a 2012 report on science in India. According to them NIIST "publishes the highest proportion of world-class papers of any institute in India-world-class research accounts for 14 per cent of the total institutional output."

The third is the Institute of Mathematical Sciences (IMSc), Chennai, a small but a highly regarded research centre under the Department of Atomic Energy. Work here is essentially in three areas, viz. pure mathematics, theoretical physics (mainly condensed matter and high-energy physics) and theoretical computer science.

Review of literature

Such studies have been made by a number of others. For example, De Vries et al² examined the use made of the serials collection at the Eastern Michigan University (EMU), which is essentially focused on undergraduate programmes but has a reasonably strong graduate programmes in biology, chemistry, mathematics, etc. They found that in the three years 2005-2007, 144 EMU authors had published 244 articles in 209 journals of which 183 (>87%) were subscribed. "The 244 articles had a total of 8,639 cited references of which 6,171 (>71%) were owned by the library."

Salisbury and Smith³ analysed publications and cited references from the University of Arkansas over the three years 2004-2006 using the *Web of Science*. The university had subscribed to 97% of journals in which the local researchers had published at least 5 times, and 85% of journals cited by the university's researchers at least 10 times in the three years. They have used much more stringent criteria than the one done in the present study. They have also estimated the use made of journals received as part of packages from leading publishers: The researchers had published in 15% of the journals from the Science Direct package of Elsevier, and 5% of journals from the Wiley package. They have also cited at least once in the three years 29% of journals from Elsevier, 22% of journals from Wiley and 27% of journals from the IEEE package. Clearly a very large proportion of the packages from these three publishers were not used either for publishing or for citing.

Crissinger⁴ was one of the earliest to talk about the use of citation analysis; as early as 1980, speaking at a Geological Information Society conference, he said that citation analysis can be used as an "aid in alleviating misapportioned moneys in the serials selection process". Lascar and Mendelsohn⁵, Gao and Yu⁶, Wilson and Tenopir⁷ and Feyereisen and Spoiden⁸ were some among many others who have used citation analysis to evaluate collection development in different contexts.

One of the earliest in India to have attempted such a study was by Sridhar⁹ who in 1985 looked at the relevance of the journal collection at ISRO Satellite

Centre, Bangalore. He found that all journals often used either for publishing or citing by the centre's scientists were available in the library: about 97% of journal articles published and 91% of journal articles cited were from journals available in the library. Interestingly 42% of photocopies made were from 13% of journals used for publishing and citing papers, indicating the relevance of the collection. However, Sridhar did not give data on journals subscribed but not used either for publishing or for citing.

Later, Madras¹⁰ analysed the use of journals subscribed by Indian Institute of Science (IISc) by the institute's faculty and students and found that about 55% of journals subscribed were neither used for publishing papers nor for citing. He found that 600 journals were used by IISc researchers either for publishing or for citing over a five year period during which they had published about 5,000 papers. The number of journals subscribed during the period varied from about 1,300 to 1,378. However, if he had included the journals for which online access was provided by the INDEST consortium to IISc researchers (5,000 – 9,000) the percent of journals used would have been much less and it would have indeed been below 20 %.

More recently, writing about the problems faced by National Knowledge Resource Consortium (NKRC), Dasgupta¹¹ felt it was "necessary to analyse the research output of the respective institutions of NKRC, based on the utilization of NKRC e-resources."

For research institutions, journals used for publishing papers and references cited in them can form a valid indicator to see how effectively the subscribed journals are used by their researchers. And this technique has been used for long to assess the usage of journals subscribed by research institutions. As seen in the literature, while many libraries in the West use this technique, it is hardly used by Indian libraries. It is more than a decade since consortia formed in India and member libraries started getting access to thousands of journals. It is right time to see how seriously these journals are used by Indian researchers.

With this background, three different research institutes were chosen to analyze the correlation between the journals made available to their researchers and the actual use either for publishing or citing.

Objectives of the study

- To find out the correlation between access to journals and their productive use by the researchers in the selected institutes;

- To identify the journals used by the researchers either for citing or publishing, but not subscribed; and
- To find out open access journals used either for citing or publishing by the researchers.

Methodology

Science Citation Index Expanded (SCIE), a part of *Web of Science*, was searched using the organizations-enhanced feature to gather data on what these three institutions have published and in the case of NIIST also checked with the institution's website. The papers cited by each one of the institution's published papers were obtained through a search for 'full records with cited references.' These data were downloaded in tab delimited format.

Perl was used for analyzing the data and preparing lists of journals used by each institution's researchers to publish their papers over a period of time as well as lists of journals they have cited in their own papers. The two lists were combined and a consolidated list of journals used for either publishing or citing was prepared.

All three institutions obtain their journals mostly through participation in a consortium: IMSc is a member of the DAE consortium, AU is a member of the UGC-INFONET consortium, and NIIST is a member of the CSIR-DST National Knowledge Resource Consortium (NKRC). Besides, IMSc and NIIST also subscribe to a few journals on their own. Consolidated lists of journals made accessible to the institution's researchers either in print or online were prepared. The number of journals used by researchers in each institution and the number of journals subscribed were matched. Here is what we found.

Analysis

Annamalai University

In the three years 2008-2010, Annamalai University researchers published 1,209 papers in all branches of science, engineering and medicine in 422 journals, as seen from *SCIE*. [This university publishes a large number of papers in the social sciences as well, but were not taken into account here]. There were 29,551 references to journal articles appearing in these 1,209 papers and these references were taken from 2,782 journals. In all, AU researchers have used in the three years 2,871 journals either for publishing or for citing. Of these, 209 are open access journals. In the remaining 2,662 journals only 656 are subscribed by the AU, although the total number of

STM journals subscribed is 4.8 times this number, viz. 3,169. Close to 80% of journals subscribed have not been used by the institution's researchers either for publishing or for citing. At the article level, a little over 40% of papers of AU scientists are published in journals which are either subscribed or open access. More than 59% of papers are published in non-subscribed journals. About 25% of journal articles cited by AU researchers are from subscribed journals and 7% are from open access journals, but more than two-thirds of articles cited are from non-subscribed journals.

National Institute of Interdisciplinary Science and Technology

In the five years 2006-2010 NIIST researchers published 1,044 papers (in agroprocessing, chemical sciences, materials science and technology, biotechnology, process engineering and environmental technology) in 278 journals, as seen from *SCIE*. [NIIST researchers published 73 papers in non-*SCI* journals as seen from NIIST website, but these were not included in the analysis, as *SCIE* will not provide the references cited in these papers. Most of these papers are in non-indexed Indian journals]. There were 35,543 references to journal articles appearing in these 1,044 papers and these references were taken from 1,721 journals. In all, NIIST researchers have used in the five years, 1,744 journals either for publishing or for citing. Of these, 70 are open access journals. In the remaining 1,674 journals, only 737 are subscribed by NIIST either through CSIR-NKRC consortium or using their own funds, although the total number of STM journals subscribed is 6.2 times this number, viz. 4,605. About 84% of journals subscribed have not found serious use. A little over 79% of papers by NIIST scientists are published in journals which are either subscribed or open access. Twenty one percent of the papers are published in non-subscribed journals. About 75% of journal articles cited by NIIST researchers are from subscribed journals and 1.38% are from open access journals. The rest, about 23.5% of articles cited are from non-subscribed journals.

Institute of Mathematical Sciences

In the five years 2006-2010, IMSc researchers published 465 papers in mathematical and physical sciences, and theoretical computer science, in 153 journals, as seen from *SCIE*. [IMSc researchers have also published in conference proceedings, which are not taken into account here]. There were 11,573

references to journal articles appearing in these 465 papers and these references were taken from 711 journals. In all, IMSc researchers have used in the five years 735 journals either for publishing or for citing. Of these, 30 are open access journals. In the remaining 705 journals, only 413 are subscribed by IMSc either through DAE consortium or using their own funds, although the total number of journals subscribed is 8.4 times this number, viz. 3,483. A little over 92% of papers by IMSc scientists are published in journals which are either subscribed or open access. Eight percent of papers are published in non-subscribed journals. About 90% of journal articles cited by IMSc researchers are from subscribed journals and 1.7% are from open access journals, but about 7.52% of articles cited are from non-subscribed journals. The institution's researchers have not used close to 88% of journals subscribed either for publishing their papers or for citing in their papers.

The reason behind IMSc scientists using less than 12% of journals their library subscribes for publishing/citing seem to be because of the DAE consortium's policy. The consortium subscribes to only Elsevier journals, a bundle of 2,041 journals consisting of journals in the areas of mathematics, physics and astronomy, and computer science. And

these are made accessible to all members of the consortium irrespective of the size of the institution. The IMSc scientists use only about 70-80 of these and the library was regularly subscribing to them even before the consortium was formed. The nearly 1,960 journals that accompany these 70 or 80 when the consortium opted for the bundle increased the number of unused journals. They also subscribe to JSTOR which includes a package of 804 journals (at the time gathering data) of which only 23 are used over five years for publishing or citing. Although most JSTOR journals are not in the area of science, there are some mathematics and statistics journals, some in biology, some in economics, etc.

The IMSc scientists use of journals from several other publishers were checked. Here are the numbers of journals subscribed and numbers effectively used: Springer 276 and 71; IoP 53 and 20; ACM 50 and 5; Annual Reviews 29 and 11; World Scientific 19 and 15; SIAM 14 and 7. By and large, they subscribe to journals they use or likely to use. If IMSc had subscribed to journals on their own, then the percent of journals used by their researchers to publish or cite would have been substantially higher.

Figs. 1 and 2 show that a small percent of journals account for a large proportion of use made for

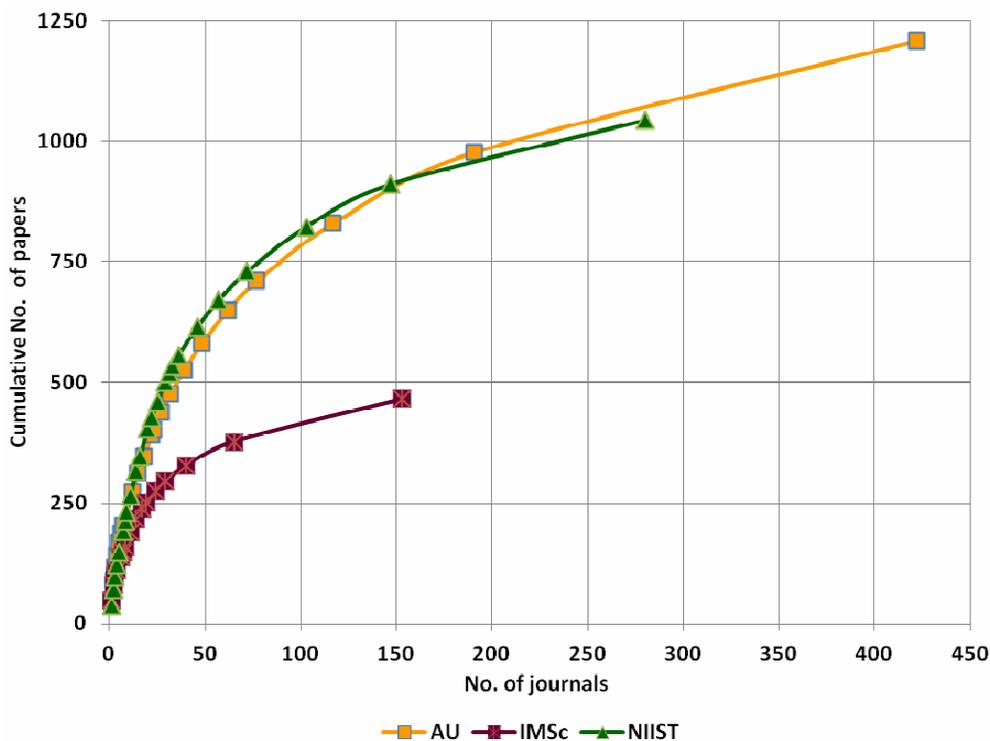


Fig. 1—Distribution of papers published by the three institutions over journals

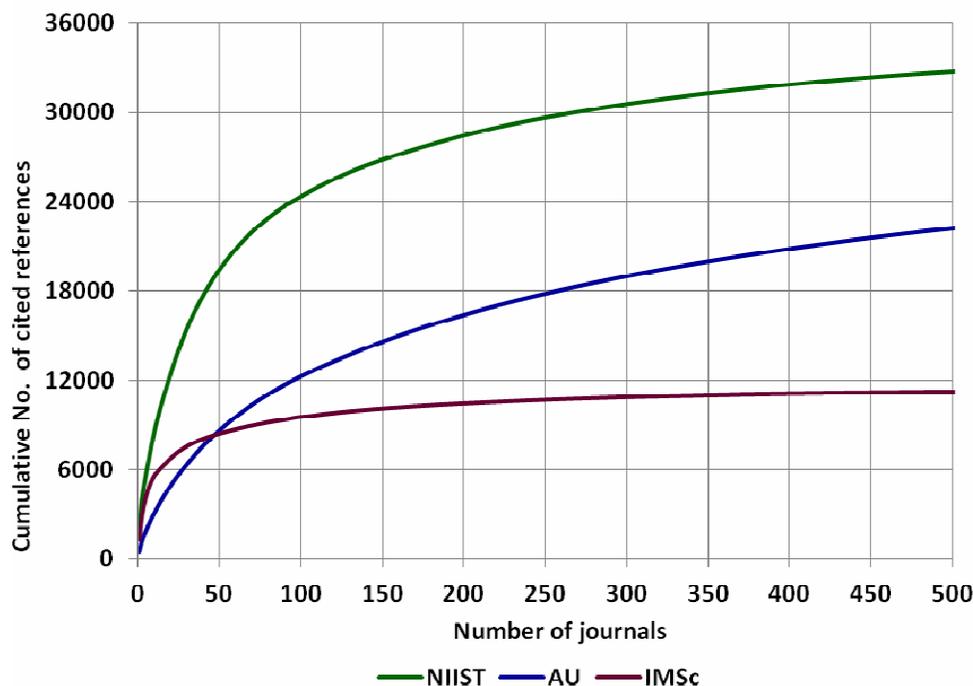


Fig. 2—Distribution of cited references over journals

publishing or citing. For example, more than 25% of IMSc papers are published in the top 5 journals (3.27%). More than 10% references cited by NIIST scientists have appeared in the top 2 journals, more than 25% in the top 12 journals, and more than 50% in the top 41 journals while all of NIIST's 35,543 cited references have appeared in 1,721 journals. As was observed by Bradford in different fields, no matter whatever institution, relatively small core of journals will account for as much as 90% of the significant literature, while attempts to gather 100% of it will add journal to the core at an exponential rate.

Fig. 3 gives the comparison of the use of accessible journals by the three institutions. Several studies from India which looked at the research output have erroneously attributed the recent increase in research output to the enhanced access to journals made possible by the consortia¹²⁻¹⁴. These studies have mainly used download statistics provided by the publishers. Access to literature can help in improving the quality of papers but the increase in the number of papers itself may be due to several other factors such as increase in the number of researchers and availability of funds.

Some recent perspectives

The use of download statistics as a proxy for use made of journals is problematic. As pointed out by

Aspesi and Luong¹⁵, only a handful of titles drive the bulk of readership, while the rest are hardly, if ever, accessed. Citation analysis, as used in this paper and recommended long ago by Crissinger, is a more appropriate technique.

One of the reasons for the low percent of use of subscribed journals by all three institutions in this study is the large number of journals that come as a bundle along with the ones they actually need and use when they become a part of a consortium. It is in this context, one should examine the possibility of organizing a collective approach by institutions to ensure that institutions do not buy too many unused journals and that unreasonable subscription rates are not paid to commercial publishers¹⁶. It may be a better option for librarians to purchase leading journals individually. Unfortunately, the centrally supported consortia in India are "ill prepared to address the issue of overpricing," says Balaram¹⁶. As pointed out by Bergstrom et al.¹⁷, negotiating skills can make a difference in the price one pays publishers. They cited the example of the California Digital Library. Acting for the nine campuses of the University of California System, they paid Elsevier 9% less in 2004 than in 2003 and agreed for less than 1.5% annual price increases well below the usual 5%. Several other universities in the US could not negotiate such favourable terms.

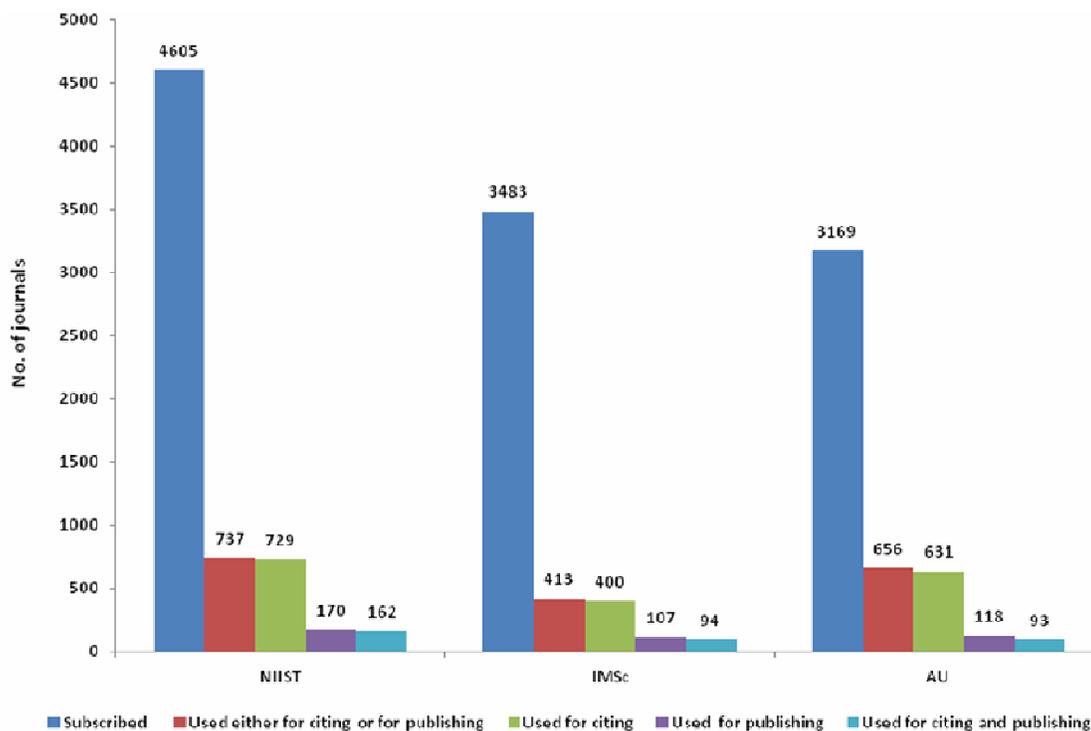


Fig. 3—Use made of accessible journals by the three institutions

In a recent talk on the past, present and the future of scholarly communication, Nobel Laureate and PLoS cofounder Michael Eisen commented, “Is it any wonder that such a large fraction of the population rejects basic scientific findings when the scientific community thumbs its collective noses at them by making it impossible for them to read about what we’re doing with all of their money?”¹⁸ Agreeing with Eisen, Mike Taylor made this powerful statement which is a scathing attack on current publisher attitudes and the practice of authors giving away copyright to journal publishers, “Really, we should all be thoroughly ashamed of ourselves for ever having propped up this corrupt and venal system. It kills.”¹⁸

Conclusion

The study found that 80% or more of the journals made available to the researchers either through consortia or through their institutional subscriptions had not found use either for publishing or citing. Further, the distribution of cited references is highly skewed with over 30% of the articles are cited only once in all the three institutions, about 75 % of cited references accounted for top 100 cited journals and 98 % of the journals used for citing also used for publishing by the researchers. Also, it is observed that the most often used journals for publishing are not the most often cited and

vice-versa. From this study, it is found that a considerable number of non-subscribed journals are being used for publishing and citing by the three institutions. It is suggested that during the journal selection process, the respective institutions or the consortia may fix a threshold based on the usage of those journals and they may be considered for subscription.

The consortia model of journal subscription through “bundles” or “big deals” bring in super normal profits to the publishers whereas, the corresponding benefits accrued to the researchers are really intriguing. In India, the negotiation on subscribing journals and renewals are made based on usage statistics provided by the publishers. Such statistics have no sense in terms of real usage. As followed by the major research libraries in the USA and UK^{19,20}, it may be better for libraries India to purchase leading journals ‘title-by-title’ rather than subscribing in bundles. It is suggested that academic and research libraries and library consortia may use citation analysis for making collection development decisions. This will also help libraries and consortia to subscribe journals in a cost-effective manner.

References

- 1 Bound K, and Thornton I, Our frugal future: Lessons from India’s innovation system. Nesta, London, United Kingdom (2012). Available at: <http://www.nesta.org.uk/library/>

- documents/OurFrugFuture.pdf (Accessed on 16 October 2014).
- 2 deVries S Kelly R and Storm P M, Moving beyond citation analysis: how surveys and interviews enhance, enrich, and expand your research findings, *College & Research Libraries*, 71(5) (2010) 456-466.
 - 3 Salisbury L and Smith J S, The use of Web of Knowledge to study publishing and citation use for local researchers at the campus level, *Collection Management*, 35 (2) (2010) 69-82.
 - 4 Crissinger J D, The Use of Journal Citations in Theses as a Collection Development Methodology, p. 113-24 (1980), In *Keeping Current with Geoscience Information: Proceedings of the Fifteenth Meeting of the Geoscience Information Society* (Washington, DC.: Geoscience Information Society) seen from Edwards S, Citation analysis as a collection development tool: A bibliometric study of polymer science theses and dissertations. *Serials Review*, 25(1) (1999) 11-20.
 - 5 Lascar C and Mendelsohn, L, D, An analysis of journal use by structural biologists with applications for journal collection development decisions, *College & Research Libraries*, 62 (2001) 422-433.
 - 6 Gao S J and Yu W Z, A local citation analysis in China: from Wuhan University faculty in Surveying and Mapping, *Journal of Academic Librarianship*, 31(5) (2005) 449-455.
 - 7 Wilson C S and Tenopir, C, Local citation analysis, publishing and reading patterns: Using multiple methods to evaluate faculty use of an academic library's research collection, *Journal of the American Society for Information Science and Technology*, 59 (9) (2008) 1393-1408.
 - 8 Feyerisen P and Spoiden A, Can local citation analysis of master's and doctoral theses help decision-making about the management of the collection of periodicals? A case study in psychology and education sciences, *Journal of Academic Librarianship*, 35 (6) (2009) 514-522.
 - 9 Sridhar M, S, Citing patterns of Indian space technologists, *International Library Review*, 17 (3) (1985) 259-274.
 - 10 Madras G, Scientific publishing: Rising cost of monopolies, *Current Science*, 95 (2) (2008) 163-164.
 - 11 National gateway of S&T on-line resources for CSIR and DST Laboratories, *Current Science*, 105 (2) (2013) 1353-1357.
 - 12 Arora J Trivedi, K J and Kembhavi A, Impact of access to e-resources through the UGC-INFONET Digital Library Consortium on research output of member universities. *Current Science*, 104 (3) (2013) 307-315.
 - 13 Pratap G, E-resources usage and research productivity, *Annals of Library and Information Studies*, 60 (2013) 64-65
 - 14 Sahoo B B and Agarwal G P, INDEST-AICTE Consortium: A decade of service for engineering, science and technology community of the country, *Annals of Library and Information Studies* 59 (3) (2012) 170-180.
 - 15 Aspesi C and Luong H, Reed Elsevier: Goodbye to Berlin - The Fading Threat of Open Access (2014) (Upgrade to Market Perform), In: Bernstein Research. Available at: <http://www.richardpoynder.co.uk/Aspesi.pdf> (Accessed on 6 October 2014).
 - 16 Balam P, Libraries, journals and publishers, *Current Science*, 98 (2010) 879-80.
 - 17 Bergstrom T C, Courant P N and McAfee R P and Williams M A, Evaluating big deal journal bundles, *Proceedings of the National Academy of Sciences*, 11 (2014) 9425-30.
 - 18 Eisen M, The past, present and future of scholarly publishing, Available at: <http://www.michaeleisen.org/blog/?p=1346> (Accessed on 4 April 2015).
 - 19 Howard J J, British research libraries say no to 'Big Deal' serials packages, July 22, 2011, Available at: <http://chronicle.com/blogs/wiredcampus/british-research-libraries-say-no-to-big-deal-serials-packages/32371> (Accessed 31 August, 2015).
 - 20 Mayor S, US universities review subscriptions to journal "package deals" as costs rise, *British Medical Journal*, 328 (7431) (2004) 68. Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1150298/> (Accessed on 31 August, 2015)