

Assessing the use of electronic information resources in DRDO institutes: An analytical study of DRDO e-journals consortium

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Resource sharing amongst libraries is a good old practice that is aimed at overcoming budgetary constraints. The new millennium saw quite a few number of Library Consortia established in the country, NKRC of CSIR and INDEST being the most successful of them. After taking in to consideration the experiences of these and other Library Consortia that are successfully serving their users, DRDO E-Journals Consortium was established by DESIDOC in the year 2009 with 7 core publishers. This paper briefly discusses the genesis of the DRDO Consortium, its services, budgetary provisions, services offered, and efforts made by DESIDOC to enhance the use of e-resources across the Organisation. An analytical study of the usage of e-resources by the DRDO scientific community was also made and the inferences were listed. Overall the Consortium has been perceived as a major facilitator in providing required information within least possible time.

Keywords: E-journals consortium, DRDO, usage, resource sharing

Introduction

Defence Research and Development Organisation (DRDO), Ministry of Defence, Government of India, established in 1958, is a premier R&D organization in India working towards self reliance in cutting edge technologies to safeguard the security of the country. DRDO, one of the largest R&D organizations in India, has a chain of over 53 laboratories and establishments spread across the country. About 7000 scientists, supported by technical and other staff, are engaged in designing and developing products, components, systems and technologies in diverse areas like aeronautics, armaments, bio-medical sciences, combat vehicles, computer science, electronics, explosives, high altitude agriculture, materials, missiles, naval systems, and so on. The scientists engaged in the R&D activities require timely access to the latest research conducted in the frontier areas of science, engineering and technology fields across the world.

At present about 25,000 peer-reviewed journals published by nearly 2000 publishers are available in the field of Science, Technology and Medicine (STM). In a survey conducted by the Association of Learned and Professional Society Publishers has revealed that 96 per cent of STM journals are now

available online¹. The escalating costs of journals, especially those pertaining to S&T, have always been a bane for information centres attached to these labs. Subscription cost of these journals takes away a large chunk of their limited resources. The advent of Internet and advances in information and communication technologies (ICTs), have changed the publication scenario as well as the distribution mode in the electronic environment. The availability of e-journals and online resources helped the libraries to access them much earlier to print material with easy to search interfaces and resource sharing over the networks. To cater to the information needs of the research community, for optimal utilization of the resources coupled with the inherent advantages of e-resources besides developments of Internet and intranets, libraries of same organization or having a common focus started collaborating to form Library Consortia. Collaboration facilitates better negotiations with publishers and at the same time helps in providing better services to their users. Libraries all over the world are adopting the consortia approach to meet the users' needs and provide access to e-resources. At present there are above 200 members in the International Coalition of Library Consortia (ICOLC), which is an informal group from all over the world². During the past decade, in India various academic, scientific and technical organisations have formed their own consortia to provide access to online content and value added services to their users.

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DRDO E-Journal Consortium

Defence Scientific Information and Documentation Centre (DESIDOC), a constituent establishment of DRDO, aims at providing information and documentation services to the S&T community of DRDO. It is providing strategic information support to high priority projects across the Organisation. Duplication of print journals and scarcity of resources are key concerns to be addressed. Expenditure on subscription/renewal of print journals in DRDO laboratories crossed Rs 30 crore annually. This and some of the issues were discussed in the Heads of DRDO Libraries Conference in 2007 and it was agreed to establish a library consortium for DRDO to meet the multifarious information needs of R&D community. DESIDOC has been assigned the task to develop a mechanism to establish an e-journal consortium for providing online access to S&T literature and strengthening the pooling and sharing of the resources across the organization.

A detailed study was conducted regarding the print journals subscribed by individual DRDO labs. It was revealed that DRDO labs were subscribing to over 1600 unique titles from more than 400 publishers. Out of these, about 100 titles were highly popular as these were subscribed to by 10 to 40 DRDO labs. In 2008, a proposal for accessing about 770 unique titles from 18 publishers through consortium was submitted. A review Committee was constituted to evaluate the proposal and suggest ways and means to meet the requirements. The Committee recommended negotiating with 13 publishers. Proposals were invited from these publishers and final negotiations were carried out with representatives of 10 publishers, as others failed to respond before the deadline^{3,4}.

The DRDO E-journal Consortium came into existence on January 2009 with 446 titles from 7 publishers viz., Association for Computing Machinery (ACM) Digital Library, American Chemical Society (ACS), American Institute of Aeronautics and Astronautics (AIAA), Elsevier Science, Institution of Electrical Engineering/Institution of Electrical and Electronic Engineering (IEE+IEEE), Jane's, and Science. A content browsing service (J-Gate Custom Consortium Content, JCCC) was also added to facilitate browsing and searching the subscribed content of the different publishers. Due focused R&D by some labs, access to the titles of some publishers was restricted while access to IEEE+IEE and ACS titles and JCCC was provided to all labs. Contents of all the subscribed journal titles from 26 major labs were

made accessible through the JCCC services. This service facilitates the ILL of the articles which is available in some other labs^{3,4}. DESIDOC is the nodal agency for implementing the Consortium and centrally carries out the subscription and renewal of the e-resources covered by the Consortium.

At present, the Consortium is in its fourth year of operation covering 10 publishers and one service provider. Presently through the DRDO E-Journals Consortium the labs can access up to 553 e-journals including scholarly journals, transactions, conference proceedings, standards, magazines, etc. New publishers, viz. *Nature* (from 2010), American Society for Mechanical Engineers (ASME, from 2012) and Taylor & Francis (T&F, from 2012) were added to the Consortium making 10 publishers. Table 1 provides online resources subscribed from different publishers by various laboratories through DRDO e-Journals Consortium from

Table 1—Resources subscribed by DRDO Consortium

Sl. No.	Publishers	2012 Jls [Labs]	2011 Jls [Labs]	2010 Jls [Labs]	2009 Jls [Labs]
1	American Chemical Society (ACS)	42 [All]	39 [All]	36 [All]	36 [All]
2	American Institute of Aeronautics & Astronautics (AIAA)	7 [10]	7 [10]	7 [10]	7 [10]
3	Association of Computing Machinery (ACM)	49 [5]	47 [5]	47 [5]	47 [5]
4	American Society of Mechanical Engineers (ASME)	10 [10]	---	---	---
5	Elsevier (Science Direct)*	205 [42]	205 [42]	204 [42]	195 [42]
6	IEL Digital Library	181 [All]	170 [All]	163 [All]	157 [All]
7	IHS Jane's	5 [6]	5 [22]	5 [22]	5 [30]
8	Nature Publishing Group	1 [17]	1 [17]	1 [17]	---
9	Science Magazine	1 [11]	1 [11]	1 [11]	1 [13]
10	Taylor & Francis Group	52 [24]	---	---	---
	Total	553	475	464	448

*For Elsevier (Science Direct), 6 Labs (earlier 8 Labs in 2009) are being provided access to all 205 unique titles (earlier 195).

2009 to 2012. The Consortium is governed by a Monitoring Committee having the representatives from different subject clusters and headquarters. This Committee reviews the use of electronic resources and recommends addition/deletion of titles, discontinuation/substitution of labs for particular publishers and training to be given to those labs where usage is low to enhance the usage.

The Budget for subscribing e-journals in the year 2009 was Rs 10.7 crore (approx) which reached Rs 14.1 crore (approx) by the year 2012 (mainly due to addition of new resources and fluctuating exchange rates against US\$). Figure 1 shows the budgetary details of the DRDO e-Journals Consortium. The figure also provides percentage of annual increase in the budget on a year to year basis. DESIDOC organized several training/awareness programs for scientific/technical personnel in different regions and labs for increasing awareness and solving initial problems in accessing the e-resources by the R&D community in DRDO. During the year 2011 publishers of *Nature*, *Science*, Optics Info Base (OSA—16 titles), and *Scopus* have provided free trial access of their resources to DRDO labs. Free trial access to Knimbus, a content browsing and searching service, is being given to all DRDO labs for one year from November 2011.

Analytical study of DRDO E-Journals Consortium

Each of the DRDO labs has specific requirements of journals depending upon the lab's focus on R&D.

Due to this, every lab has access to a specific number of e-resources through DRDO e-Journals Consortium. Figure 2 provides the statistics of ten DRDO labs having access to maximum number of titles of e-resources. The bigger the lab, the more are the projects; many bigger labs carry out R&D in diverse subject fields and so the number of titles accessed (only exception is DESIDOC, administrative lab). Many other labs get access to varying numbers but at least 223 titles are accessible to any of the labs.

To find out the usability of e-resources through DRDO e-Journals Consortium, the usage statistics for the period from 2009 to 2011 was collected for all the DRDO Labs from the websites of 8 publishers (ACS, ACM, AIAA, Elsevier, IEEE, Jane's, Nature, Science) and one service provider (Informatics (India)). The statistics were compiled publisher-wise as well as individual laboratory-wise. Analyzing the usability of e-resources over a period of time is highly beneficial to know the relevance of e-resources of a particular publisher to R&D community of the organisation. It further helps in taking decisions for the upcoming years about continuation or discontinuation of the subscription and further negotiations with the publishers related to pricing, etc. In the electronic environment, access to the resource and number of downloads of articles from a particular resource is treated as the usability criterion to judge the relevance of that resource. For a particular publisher, the higher the number of downloads from the resources, more is the usage of its resources.

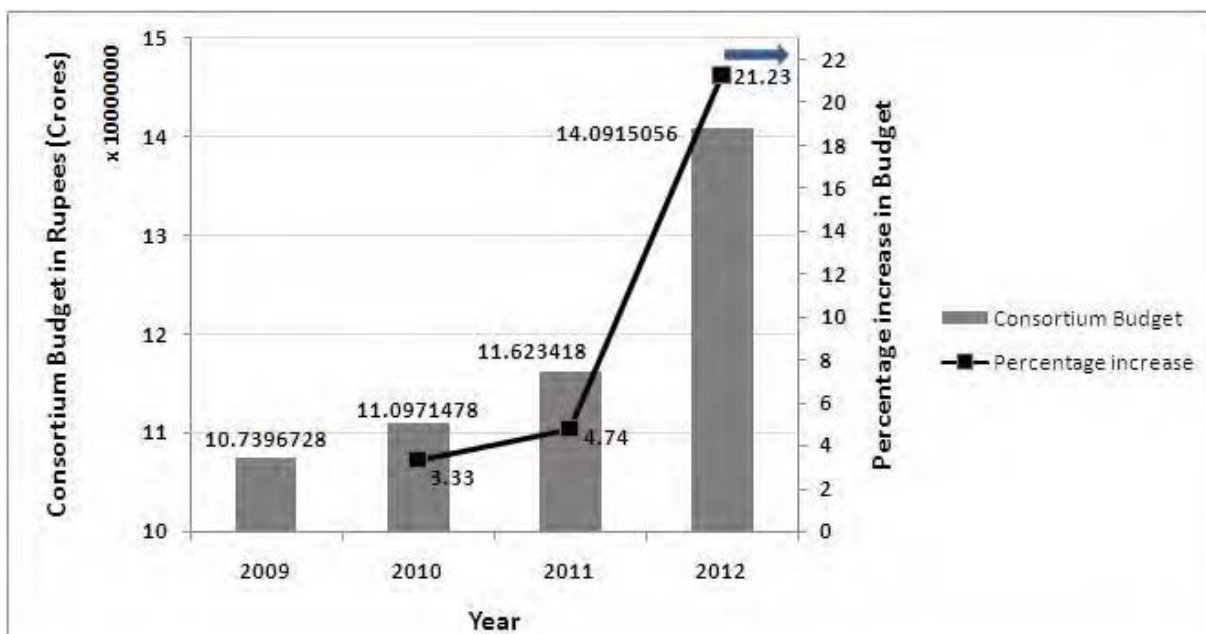


Fig. 1—Budgetary requirements for DRDO e-Journals (2009 to 2012).

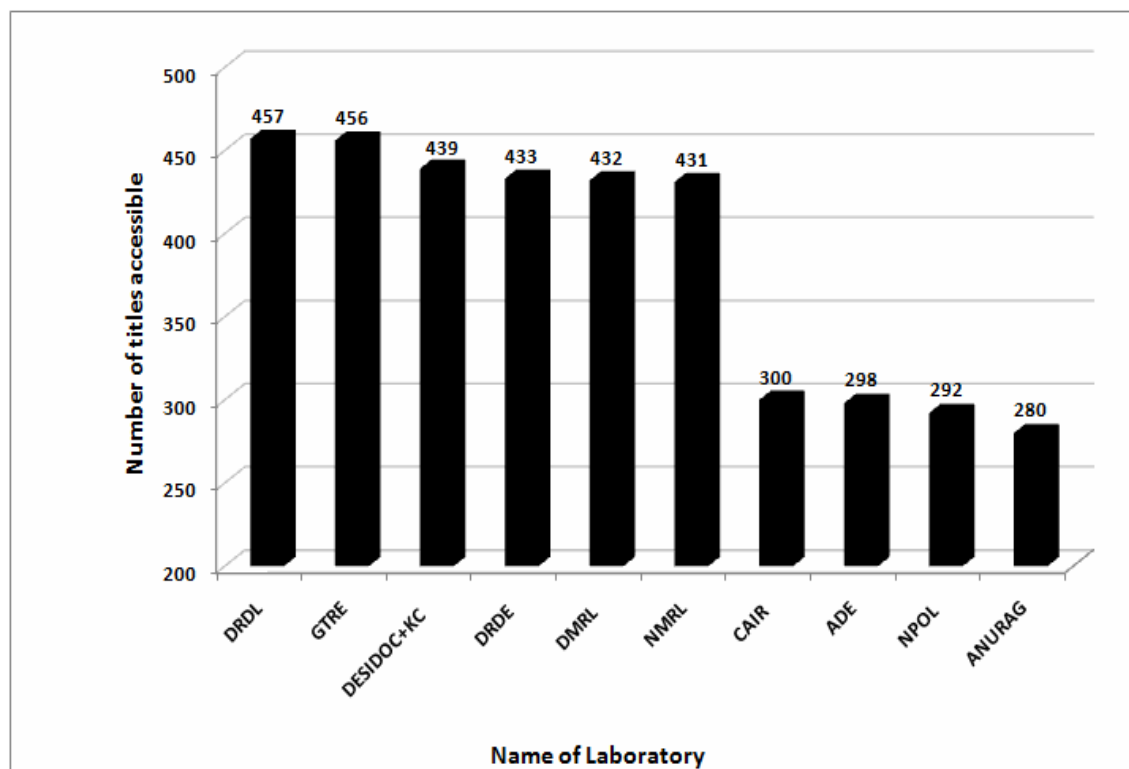


Fig. 2—Top 10 labs based on the number of titles accessed

Analysis of the usage statistics for the period 2009-2011 reveals Defence Research and Development Laboratory (DRDL) tops the list followed by Defence Metallurgical Research Laboratory (DMRL), Defence Research & Development Establishment (DRDE), Research Centre Imarat (RCI), Gas Turbine Research Establishment (GTRE), Electronics & Radar Development Establishment (LRDE), Naval Materials Research Laboratory (NMRL), Defence Materials and Stores R&D Establishment (DMSRDE), Solid State Physics Laboratory (SSPL) and Aeronautical Development Establishment (ADE), in that order. This list includes mainly large labs like ADE, DRDL, GTRE, LRDE and RCI, and labs that carry out research in basic sciences like DMRL, DMSRDE, DRDE, NMRL, and SSPL. The labs carrying out research in basic science publish more research papers while systems labs mainly devote to the development of components, systems, products and new technologies and so publish a lesser number of papers. Vehicle Research & Development Establishment (VRDE), Institute of Technology Management (ITM), Defence Terrain Research Laboratory (DTRL), Centre for Fire, Explosive and Environment Safety (CFEES), Centre

for Military Airworthiness & Certification (CEMILAC), Defence Institute of Psychological Research (DIPR), Recruitment and Assessment Centre (RAC), Defence Institute of Bio-Energy Research (DIBER), and Defence Institute of High Altitude Research (DIHAR) use the resources less frequently. The reason being these labs are dealing in areas like training, high altitude agriculture, psychology, certification, bio-energy, recruitment of personnel, etc which are not viable to be covered by the Consortium since each lab has a unique focus. Their titles cannot be covered by the Consortium as for each resource, a minimum of 5 sites are required which is prohibitively costly and so economically not viable. These labs have access to IEL and ACS; but these journals are beyond the scope of their R&D. Figure 3 shows the number of downloads during 2009 to 2011 from all the DRDO labs. It is evident from the figure that the total number of downloads decreased first in 2010 and then increased in 2011. This is because, when the consortium was established in 2009, the publisher offered free trial access to all of its journals (nearly 2000) for a brief period time to all the DRDO labs. Also, after successful completion some projects were closed leading to the lesser usage of Elsevier Science titles.

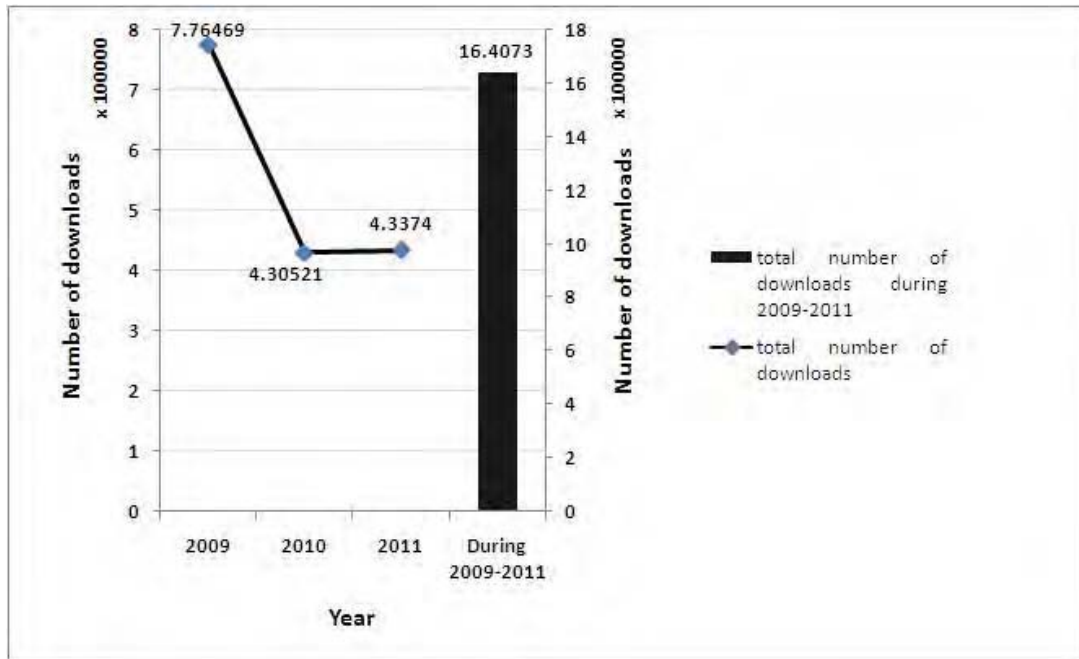


Fig. 3—Total number of downloads from 2009-2011.

Figure 4 illustrates the usage pattern of eight publishers and one service provider (Informatics). While there is a marked increase in the usage of e-resources of AIAA during 2009 and 2011, in the case of ACS, ACM, and IEL the number of downloads increased in 2010, but decreased in 2011. The number of downloads for Elsevier, Jane's and number of hits for JCCC decreased during 2009 to 2011. For Elsevier journals the number of downloads fall significantly from 2009 to 2010 as the number of Elsevier titles is constantly modified; a few were replaced, a few were discontinued and a few new titles added depending on the demand of the user labs. In the case of Jane's titles, which are core journals for latest information for security and defence-related developments, news and R&D, the reduced usage is primarily due to the heavy use of print versions which many labs subscribed despite access to online version. Although online resource is updated on daily basis, retrieved information is devoid of figures, photographs and other add-ons which was not appreciated by users. Even now, many labs prefer to continue with print subscription rather than online access for obvious reasons leading to the reduction of the number of labs accessing from the initial 30 in 2009 to 22 in 2010 and 2011, and to only 6 labs in 2012. In the case of *Science*, the number of downloads first decreased during 2009 to 2010 as the access to it was discontinued from two labs and in

2011 its usage increased. The usage pattern of *Nature* shows the upward trend in 2011 from 2010 when the access to this journal was included in DRDO Consortium⁴.

In any consortium, the titles subscribed by the different libraries from a particular publisher are clubbed together and pricing negotiations are made based on number of sites having the access and number of titles accessible to these sites. The cost effectiveness of the e-journals subscribed through a consortium can be judged on the basis of (1) average cost of an e-journal for an individual institution having access to that e-journal, and (2) cost per article download. Figure 5 provides the average cost incurred to the DRDO Consortium on a single e-journal from a particular publisher for the year 2012 on the basis of total number of sites having access to the titles of various publishers and number of titles accessible from these publishers for each of the labs. It is clearly shown that the average cost of a single title from T&F is the highest amongst various publishers, followed by *Nature*, *Science* and Elsevier, the average cost of a single title from ACM is the lowest. The titles from ACS (42 titles) and IEL (181 titles) are accessible to all the DRDO labs while the titles from other publishers, viz., Elsevier, T&F, *Nature*, *Science*, Jane's, AIAA, ASME and ACM are accessible to only selected labs on the basis of their individual needs. However, for IEL (IEE+IEEE), 11 subscriptions are

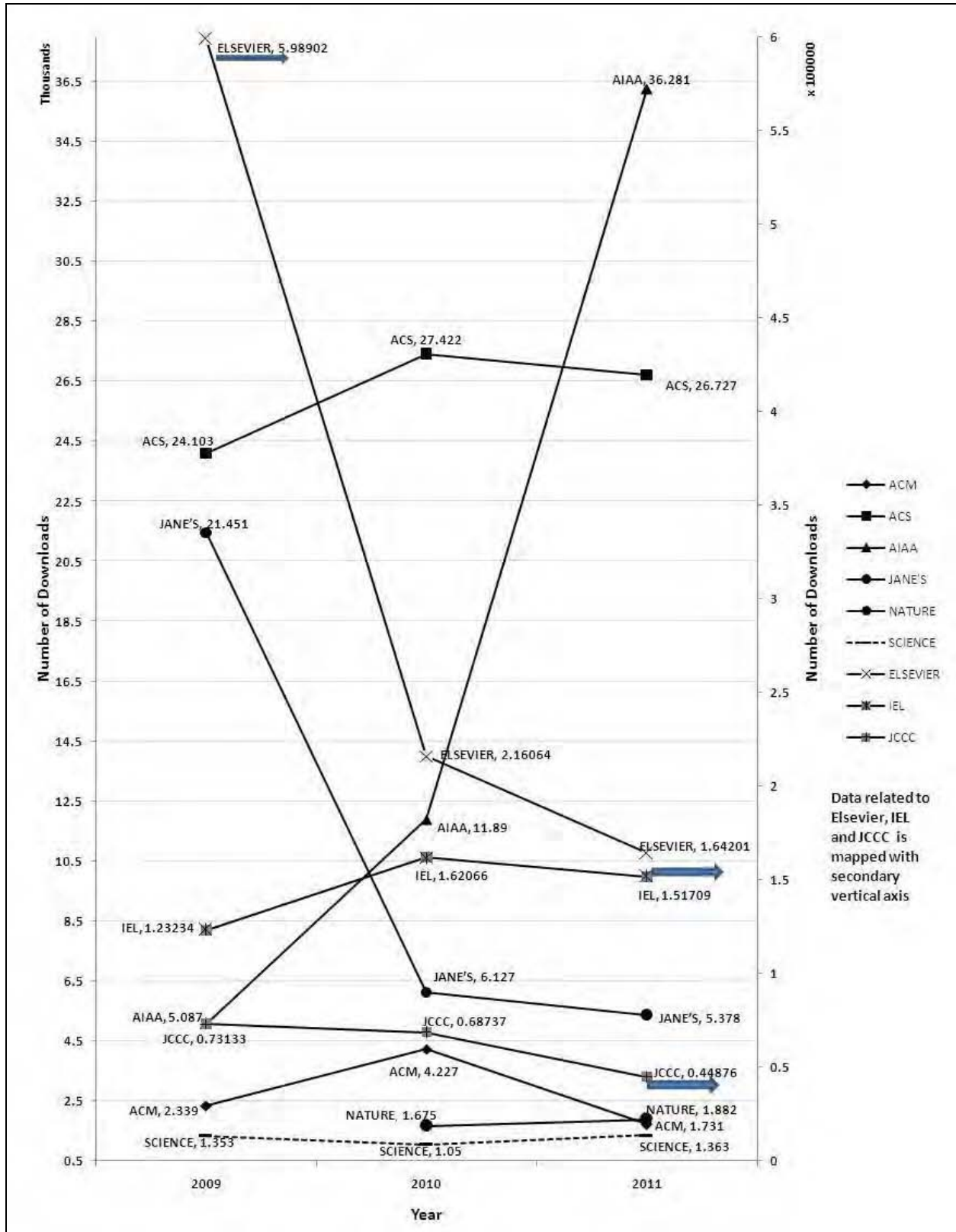


Figure 4—Publisher-wise access of e-resources during 2009-2011

paid with 65 simultaneous users and the access to the IEL titles are extended to all the DRDO labs. To find out the average cost of a single title from ACS and IEL, the number of labs having substantial usage of the e-resources by these publishers was taken in to consideration. In case of ACS resources, labs which downloaded more than 500 (10 in number) and in case of IEL, labs having more than 2000 downloads in two consecutive years, viz., 2010 and 2011 are considered as high usage labs. It is interesting to note from Figure 5 that the average cost of commercial publishers is higher by a factor while the average cost of titles from professional associations like ACM, IEE+IEEE, ASME, ACS etc are moderate. This calls for rationalization of prices whereas resources from commercial publishers as well as professional associations are equally of high quality with good impact factors and highly used, it is the commercial publishers who are exploiting libraries and reaping profits. What is of concern is that the commercial publishers are using the financial surpluses thus profited due to exorbitant prices to buy smaller publishers and publications from professional societies.

The expenditure incurred on a single downloaded article through the subscription of various e-resources is evaluated by calculating the per article download cost. It is determined by dividing the total amount spent on

subscribing the e-journal titles by the total number of downloads from those e-journals. To find out the cost effectiveness of the titles of various publishers under consortium, the per article download cost is calculated for each publisher and JCCC service. Figure 6 illustrates that per article download cost for AIAA titles goes on decreasing substantially over the period of time making it the most economical resource. However, per article download cost for ACM, IEL and ACS decreased in 2010 which later increased. There is considerable increase in the case of downloads from Elsevier, Jane's, Nature and JCCC (hits only) during 2009 and 2011. In the case of Science, per article download cost first increased in 2010 and then decreased in 2011. However, it is too short a period to draw conclusion about the cost effectiveness of the e-resources provided by various publishers, as the awareness about the e-resources increases, the usage will definitely increase over a period of time. Also in R&D organization download costs does not matter much; what matters is whether a particular problem encountered in designs, technology development or fabrication of systems and sub-systems.

Issues and concerns related to library consortia

The primary objective of libraries is fulfilling the demands of their users having diversified information requirements. Users want up-to-date quality information

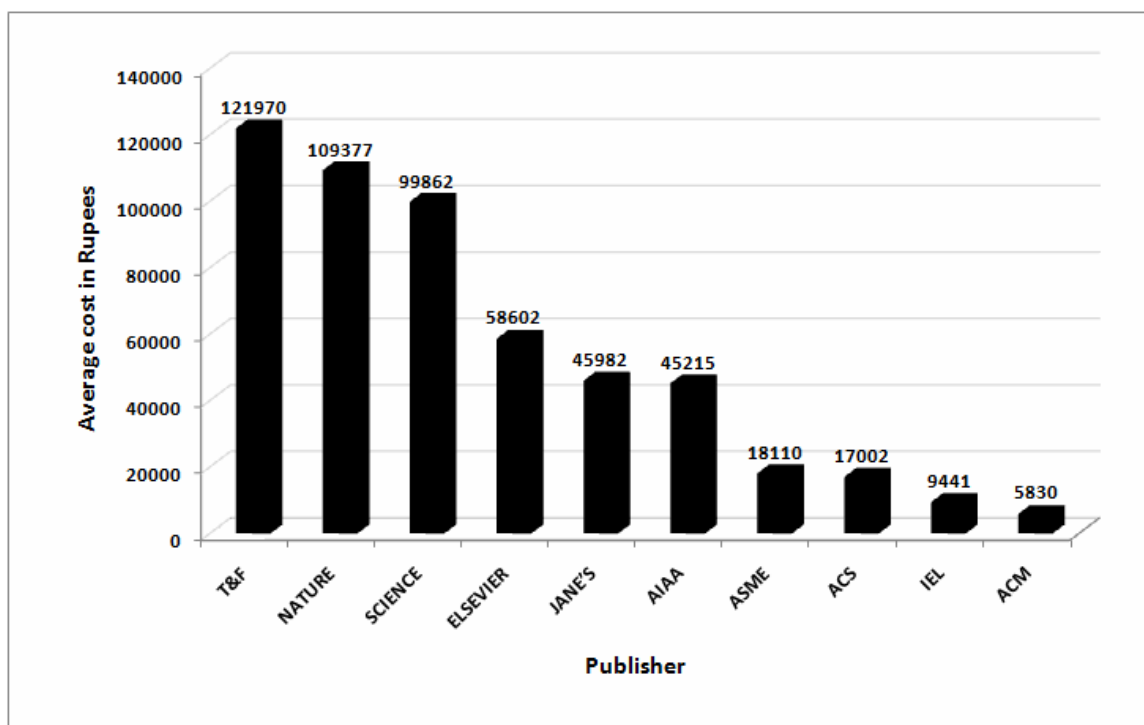


Figure 5—Publisher-wise average cost of journals (2012)

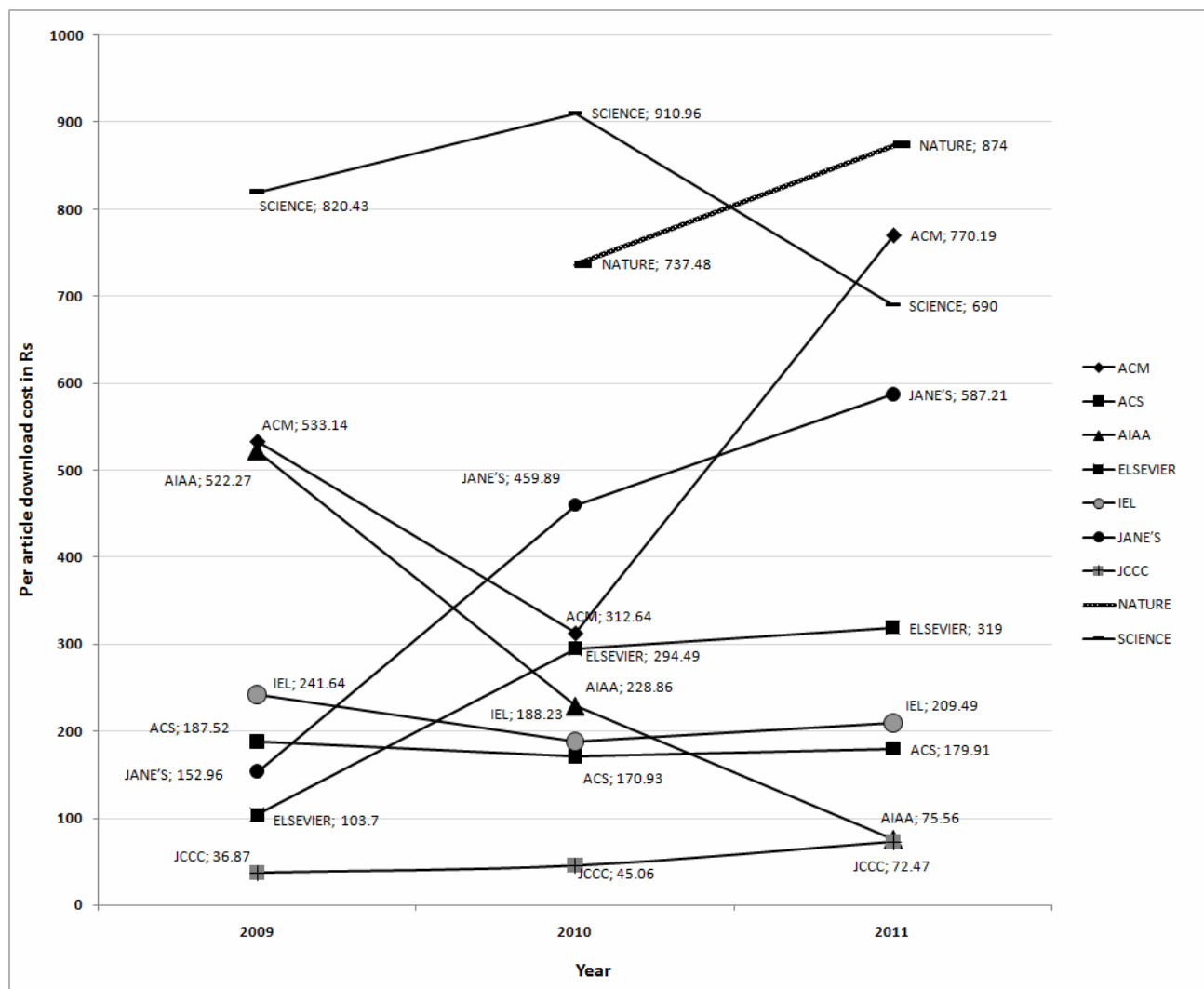


Fig. 6—Cost per article for different publishers during 2009-2011

made available from across the globe. Every subject field has its own core journals providing high quality authoritative research information. The R&D community wants to have access to these journals and libraries have no other option to subscribe to them for whatever price they are available. In the electronic environment big publishers have started to exploit this condition by charging exorbitant prices and adopting “Big Deal” model. Under this model, commercial publishers either make bundling of subscriptions of print journals with its online version, or make a package of several titles (many of them are not of interest to the libraries)⁵. On one hand, libraries have to make a balance between the available budget to them and the resources to be subscribed; and on the other, publishers are pricing their journals irrationally. Publishers charge different prices for different consortia arbitrarily.

Managing consortium is a challenging task which involves many issues that are to be resolved. The commercial publishers insist that the difference in the prices quoted for each consortium is due to the reason that subscription base for every consortium is different. No standard, basic or list price is fixed for e-resources and even the basis of discounts is not standardized. This is not the case with print subscriptions. Base price of each individual title and publishers’ policy on pricing for consortia should be clearly defined so that logical evaluation of pricing can be done by the consortium. Some publishers, particularly ACS, which entered into agreement for unlimited users and unlimited downloads, has chosen to charge differential pricing per site based on number of downloads by that site. If number of downloads is the criterion, then all libraries can stop subscriptions

to journals and download articles required by paying the downloading charges that appears on the Internet. While ACS demanded 19 percent over and above the agreed 5 per cent escalation (i.e., 24 per cent on 2011 prices) from DRDO Consortium for the renewal of service for the year 2012, it charged a staggering 410 per cent over 2011 prices from the National Knowledge Resources Consortium of DST-CSIR. Even for the archival access of back volumes of the subscribed titles usually from 1995, publishers charge 10-15 percent over the basic price on yearly basis. Over the period of time, the cumulative charges for back volumes would surpass the amount of current subscription. At the same time, some publishers provide access to back volumes of 3 or 4 years along with current year even if a library is continuously subscribing for the last, say 10 years. This means the library which paid for the content of 10 years will be able to access only 3 or 4 years' back volumes. Is it not illogical or irrational?

Other issues of concern are jurisdiction and arbitration clauses where different publishers have different policies. Some agreed to Indian jurisdiction, some didn't, while others agreed for reciprocal jurisdiction and arbitration (claim of one party should be settled in court of law of other party)⁴. There are several pitfalls in the business models for subscribing e-content and it is not at all customer- (user) or library-friendly. There is a need to tame the commercial publishers who are exploiting the current business model to increase their profit margins.

The only way to come out of this condition is the cooperative efforts made by the libraries and library professionals at the national level. Visualizing the present situation, two rounds of meetings of coordinators of library consortia in India have been organized (one by NISCAIR, CSIR in March 2011 and another by DESIDOC, DRDO in April 2012). The recommendations made unanimously by the representatives include forming a coalition of all consortia under the name "National Coalition of Knowledge Resources Consortia in India (NCKRCI)". It was also decided to adopt "online only" subscription model for consortia in future and to subscribe the content directly from the publishers as far as possible rather than subscribing through the vendors. The need for ensuring the complete and perpetual access of the subscribed content, even after the contract with publisher will terminate in future was discussed. To cope up with this situation it was

decided to have a meeting with PORTICO representatives or LOCKSS so that agreement with the service providers/publishers will be made in upcoming time to ensure the back-up of the subscribed e-resources by different consortia in India⁶. There was a unanimous view that pricing policies of the e-journal publishers should be rational and transparent so that the libraries/consortia can take a judicious decisions regarding subscription of particular resources. Also, the publishers should host the basic price, discounts offered and terms & conditions for licensing e-resources on their websites. It is also necessary to discuss the issues of backup policy and uniform license agreements with common jurisdiction and arbitration across publishers, etc⁶. A Federated Search Engine to search the e-resources subscribed by all consortia is proposed to be developed to facilitate the effective document delivery for those who have no access to a particular resource. Need for a National Licensing Policy which should provide the model agreement/licensing terms to be executed between publishers and consortia was felt during the discussions.

Conclusion

Consortia have multifarious advantages which strengthen the R&D in an organisation by providing up-to-date information and competitive edge for better negotiations with the publishers. Libraries can save a huge amount in terms of stopping the print subscription and subscribing the e-resources through deep discounts in a consortium. An amount of more than Rs 5 crore has been saved by the DRDO labs in the year 2009; this amount is recurring annually. As the download statistics and its usage analysis has shown, the R&D community of DRDO is utilizing the resources in a positive way which has left a good impact on their minds. In some cases where usage is not up-to the mark, training programmes are conducted from time to time. Realizing the benefits of the DRDO e-Journals Consortium, many DRDO labs are now requesting to broaden the scope of this service by including titles from other publishers such as Professional Engineering, Royal Society of Chemistry, Sage, Springer, Wiley, World Scientific, etc. Efforts are now on the way to add some databases and standards from some more publishers in the coming years. The case of R&D in DRDO is different from other academic/R&D institutions/organizations. In these organizations the expenditure on R&D can be justified/recovered through patents, publication of

research papers, technology transfer, etc. whereas in DRDO each lab has its own focus area of research based on the needs of the three services (Army, Air force and Navy) to strengthen the defence preparedness of the country. Further, developed countries through sanctions, missile control technology regimes and so on, prevent export/transfer of defence technologies to our country and importing critical components at times is difficult. It requires totally a different kind of approach as each and every research cannot be made open to the public due to security implications. Therefore, in the case of DRDO, it is rather inappropriate to compare economics, cost per download, and the expenditure incurred on procurement of information resources. But, the advancement in the scientific area depends on the access to the strategic information, the total cost incurred to access that information is of worth if it can solve the purpose of the research in the process of designing and developing the systems and subsystems. Most of the labs in DRDO have requirement for different set of journals and it is hard to fulfill their demands and to negotiate with the publishers for better terms. However, with DESIDOC as nodal agency to foster collaboration among different labs in library and documentation services, already there is an effective mechanism to share the resources among different labs. Each library/ information resource centre of the labs has accessibility to DESIDOC resources through a well connected and dedicated intranet. Users from any of the DRDO labs across the country can request for the

required information including articles, patents, standards, etc. These requests are serviced immediately if available with DESIDOC. In case of non-availability, the information is procured or got through inter library cooperation/loan and sent. About 85 per cent of requests are effectively delivered within 48 hrs of the request received. DRDO e-Journals Consortium has strengthened the resource sharing and provided information on 24X7 basis with improved quality and quantity.

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