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Introduction

The Open Access movement is a social movement. The movement traces its history at least back to the 1960s, but became much more prominent in the 1990s with the advent of digital communications, in particular the Internet. Before the advent of internet, File Transfer Protocol, gopher, and the World Wide Web were used to increase availability of scholarly material by lowering the barriers to distribution. It has since become the subject of much discussion among researchers, academics, librarians, university administrators, funding agencies, government officials, commercial publishers, and learned-society publishers. Prior to the advent of the Internet publishers and academic societies dominated scholarly communication, and researchers channeled their research output solely through authoritative publishers and academic societies. Now different models are being developed to provide access, manage costs, and manage an organization's scholarly output, especially at colleges and universities. The currently evolving model is referred to as Open Access. The two schools of thought within Open Access are the journal reform school, and the self-archiving school.

IR: Some thoughts

Institutional repositories are becoming prevalent in academic sector. In the face of rising costs, flat budgets, and restricted access to information, as well as rapid changes in technology, scholarly practice, and patron expectations, libraries of any type or size have been challenged to maintain their depth of collections and high level of services. IRs are being established for a variety of reasons:

i) to support open access movement;

ii) to provide access to the public funded research;

iii) to provide open access to the institution's output; and

iv) to support preservation and so on.

A repository can hold wide range of materials in different forms and formats for scholarly communications. It can support research, learning, and scholarly communication processes of an organization. If it is properly developed, it advances a number of goals and addresses an impressive range of needs.

Few years ago, Institutional repository initiatives were initiated only in some developed countries. In India, Institutional repository movement was started in 2004 and is gaining momentum and new initiatives are emerging around the country. Institutional repositories are already well established in many IITs, IIMs and other institutes having national importance. Institutional Repository has become an essential part or component of digital library that provides an alternative platform for sharing knowledge globally. Institutional Repository has four characteristics as defined by Johnson (2002). They are mentioned below:

- institutionally defined (as opposed to discipline- or subject-focused);
- scholarly (containing the products of faculty, research staff, and students);
- cumulative and perpetual (the content will be preserved on a long-term basis); and
- open and interoperable (attentive to the Open Archives Initiative—Protocol for Metadata Harvesting).
- *Definition*

In simplest terms, a digital repository is where digital content, assets, are stored and can be searched and retrieved for later use. A repository supports mechanisms to import, export, identify, store and retrieve digital assets.

According to the SPARC (Scholarly Publishing and Academic Resources Coalition) position paper on institutional repositories "an institutional repository is a digital archive of the intellectual product created by faculty, research staff, and students of an institution, with few if any barriers to access"(Crow, 2002)

According to Lynch (2003), "a university-based institutional repository is a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members. It is most essentially an organizational commitment to the stewardship of these digital materials, including long-term preservation where appropriate, as well as organization and access or distribution."

Government Initiatives

University Grants Commission (2005) has already developed a policy document on building University level Institutional Digital Repository (http://www.ugc.ac.in/new_initiatives/etd_hb.pdf) in India. UGC has recommended that all the universities should set up theses repository to facilitate e-submission, archiving, maintenance and access to these repository at the university level. University Grants Commission (2005) enacted "UGC (Submission of Metadata and Full-text of Doctoral Theses in Electronic Format) Regulations, 2005" to strengthen national capability of producing electronic theses and dissertations, and, to maintain university-level and national level databases of theses and dissertations. This Regulation proposed two sets of planned actions, such as:

- Creation of Indian National Theses Database (INTED):
- Submission of PhD Theses in Electronic Form

Another government organization, National Knowledge Commission (2007) strongly advocates open access to public-funded research literature and recently has taken initiative for building nation wide institutional Repository. Bangalore declaration (2006) drafted a model National Open Access Policy for Developing Countries also support this view and advocated for open access institutional repository. Some professional associations and societies like Developing Library Network (DELNET), INFLIBNET (Information Library Network) are also involved in modernization of libraries, training and setting up the IRs.

Growth and Development of IDRs

Many universities and research institutes in India have developed institutional repository for archiving documents of their own. It is not only limited to Science and Technology but also on other disciplines. More than 60 academic and research institutions have set up their Institutional Repositories as indicated by ROAR (Registry of Open Access Repository) and DOAR (Directory of Open Access Repository) viz., IISc, IIMK, ISI, NCL, NIO, RRU, NAL, NIT and so on. There are a few institutions have not registered in ROAR or DOAR.

Recently, MHRD (Ministry of Human Resource Development) has also advised all INDEST members (Indian National Digital Library in Engineering, Sciences and Technology) to set up institutional repository using open source software. The following table shows the growth and development of IR in India.

Growth of IDRs

Table 1: Growth Rate of Repository (year-wise)

Year	No. of Repository	Growth Rate (%)
2010	10	16.67
2009	11	18.33
2008	10	16.67
2007	5	8.33
2006	12	20.00
2005	8	13.33
2004	4	6.67
Total	60	100

Figure 1: Growth Rate of Repository (year-wise)

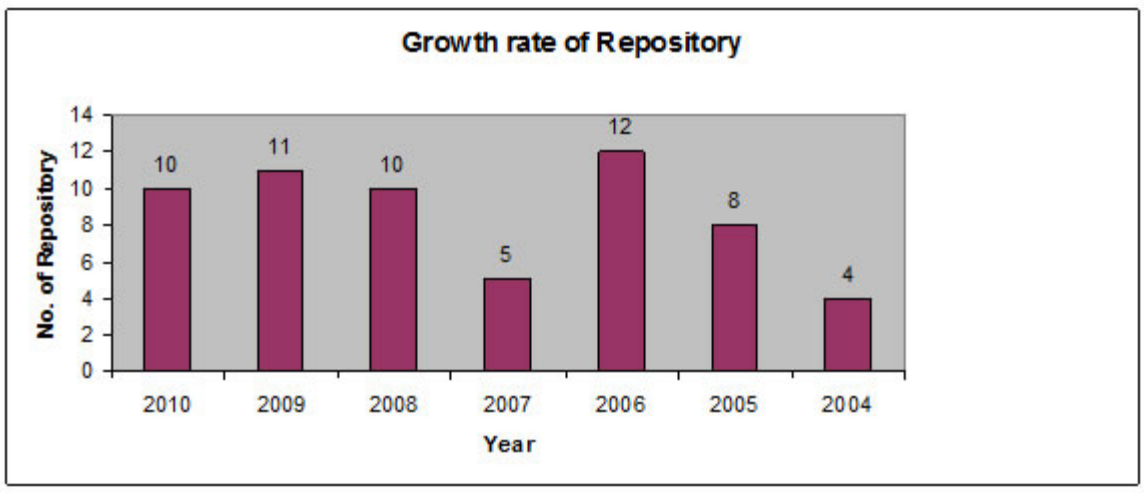
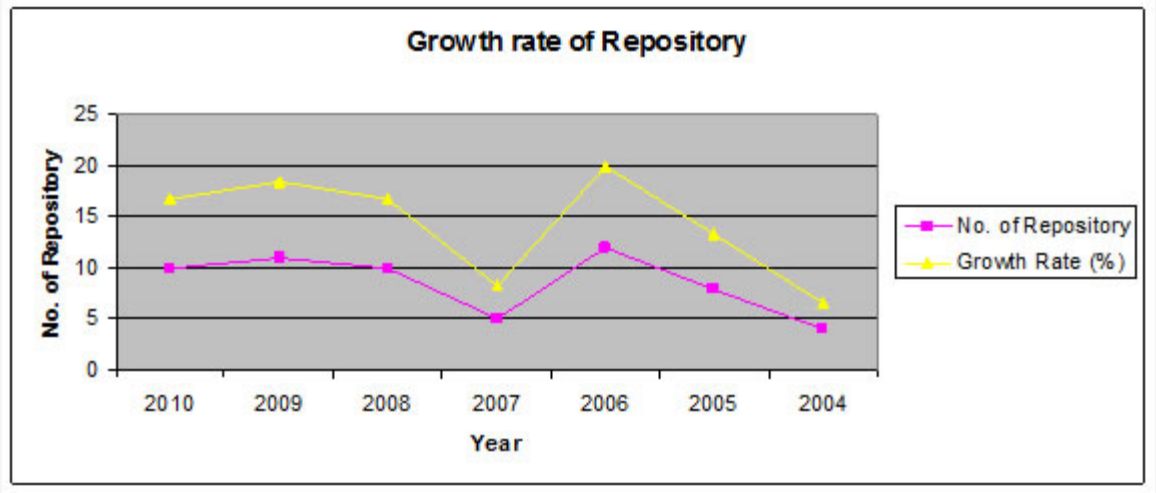


Figure 2: Growth Rate of Repository (year-wise)



The growth rate of IDRs per year is not satisfactory in compare to other developed countries. Few repositories have not registered in DOAR or in ROAR and did not provide information about registration.

Study of IDRs

From DOAR and ROAR, I have recorded 60 (See Annexure – 1) repositories for this study. Although there is a vast difference in number of repositories registered in ROAR and DOAR. As per ROAR the total number of repository is 60, whereas in DOAR only 42 repositories have been registered (as on 24/12/2010). I have not considered those repositories which are hosted on Intranet/LAN. I have not also considered those repositories have not provided information regarding number of records, software used, subject covered, content type etc.

Types of Repository

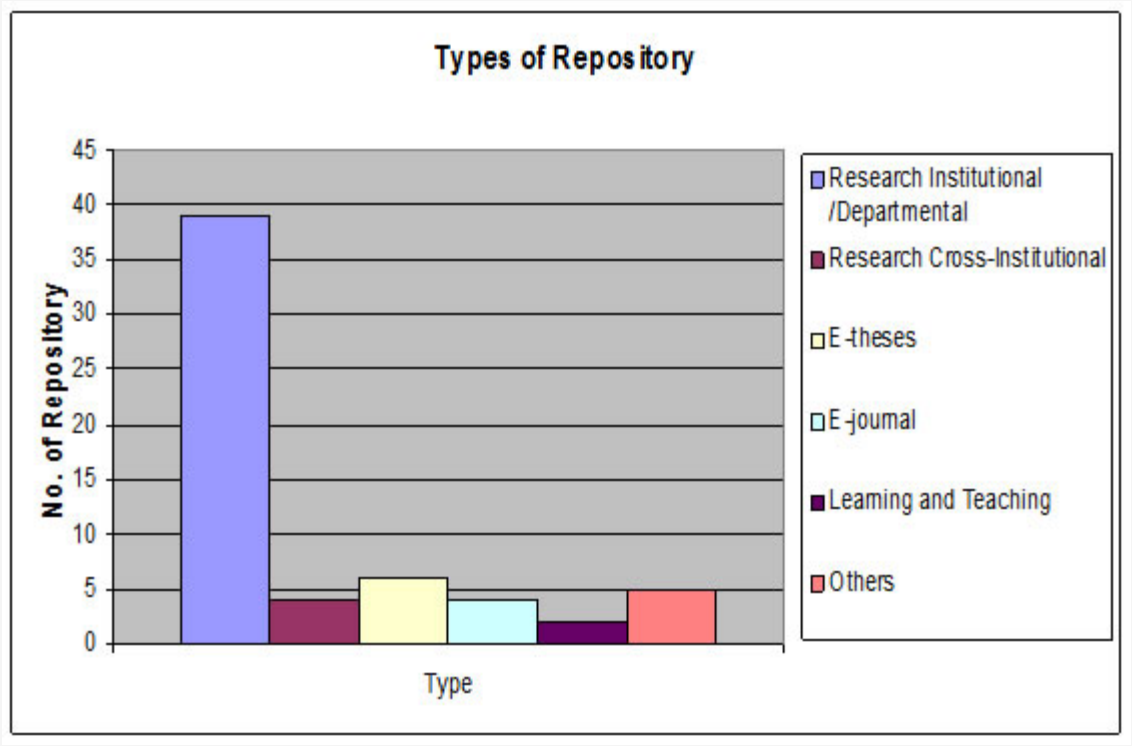
There are different types of repositories available in open access mode. As per ROAR, repositories have been categorized as follow:

Table 2: Types of Repository

Type	No.	Percentage
Research Institutional /Departmental	39	65.00
Research Cross-Institutional	04	6.67
E-theses	06	10.00
E-journal	04	6.67
Learning and Teaching	02	3.33
Others	05	8.33

Out of a total of 60 repositories, 39 (65%) are research institutional, 4 (6.67%) are cross institutional, 6 (10%) are e-theses, and 4 (6.67%) are e-journal and 2 (3.33) are learning repository in nature.

Figure 3: Types of Repository



There are only 4 (four) subject base repository (National Informatics Centre, National Centre for Catalysis Research, Librarians Digital Library and Open Agri) and 5 (five) repositories contain theses and dissertations (Indian Institute of Science, National Institute of Technology, Vidhyanidhi, Mahatma Gandhi University, Council of Scientific and Industrial Research).

Number of Objects

Based on data and statistics as given by 60 repositories, it appears that there is a vast difference amongst repositories in terms of average number of digital objects contained. A few IDRs have strong collections whereas others have uploaded minimum number of objects. Few repositories have not mentioned the number of objects uploaded.

Type of Objects

The selected IDRs considered for this study contains a wide variety of digital objects. Generally it has been found that institutional repository contents full-text contents of journal articles, conference papers, book chapters, monographs, research reports, project reports, theses, dissertations, patents, presentations, computer programs, tutorials, convocation addresses, audio materials, video materials, course materials, multimedia materials, handbooks, data books, technical manuals etc. As far types of the digital objects are concerned, this study groups the digital objects in the following broad groups.

- Published papers (preprints, post prints, conferences)
- Books
- Theses
- Unpublished documents
- Multimedia objects
- Learning objects
- Special items etc. (including datasets, software, patents, references)

Software

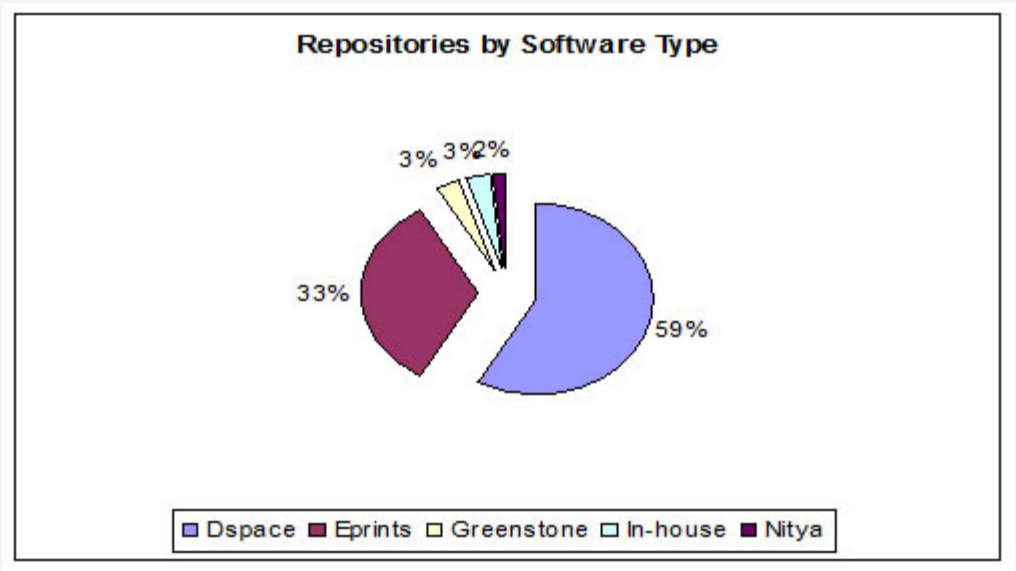
Open source digital library packages are gaining popularity nowadays. The different IRs use different types of open source software like Dspace, Eprints, Greenstone, Nitya, etc. Few IRs have not mentioned about type of software used. It is clear from the study that the DSpace software 35 (59%) has the most

installations followed by EPrints 20 (33%). Greenstone is used by 2 (3%) repository and stands 3rd position. Nitya is used by only 1 repository. The table (3) shows the software used by the different repositories:

Table 3: Repositories by Software Type

Software used	No.	Percentage
DSpace	35	59
EPrints	20	33
Greenstone	02	03
Not Specified/In-house	02	03
Nitya	01	02
Total	60	100

Figure 4: Repositories by Software Type



Special items

Few repositories have accumulated special items other than books, theses, articles, journals, reports etc. The special items are mentioned below:

- Newspaper clippings, Newspaper articles, newspaper reports
- Previous Exam papers
- Case reports, Biographies
- Links

Only a few repositories have customized their interface other than English language and provide email alerting services to notify their users of newly added materials.

Findings

From the above study of 60 Indian repositories, it is found that

Growth rate of IRs per year is quite low in compare to other developed countries;

- OAI-PMH base URLs are not working for a few cases;
- Only a few have included learning objects and multimedia documents;
- There are mainly two search options viz. simple search advance search;
- Users can browse by Author, Title, and Date;
- All the IRs has Boolean search facility;
- Some institutes have not provided total number of records;
- Theses and dissertations are the common objects of all repositories;
- No information regarding year of registration and policy issues are concerned;
- Only a few IR contains special items;
- Only a few IR customized their interface; and
- Only a few IR provides email alerting service.

Conclusion

IDRs are at a critical point in their development. Although growth of IR initiatives is quite satisfactory in compare with other developing countries. Based on the background information and discussion presented in this paper, it is found that there is scope for developing a 'Best Practice Guidelines' for designing institute-oriented IDR. Manpower requirements, quality and quantity of contents, metadata standards, technical specifications, copyrights barrier, and policy issues are major concerns that need to be addressed for developing IDRs as component of open access knowledge movement. However, the findings of our study suggest that IDRs could become a compelling and useful tool for collecting, organizing and disseminating intellectual output of an institute. If properly implemented with the existing practices, IDRs has the potential to fulfill many unmet expectations.

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Annexure – 1: List of IDRs under study

S. L. No	Name	URL	Total Records	Software	Content Type	Subjects

1	Agriculture Research Repository (Openagri)	http://agropedia.iitk.ac.in/openaccess/	NA	NA	Articles; Conferences; Books Chapter	Agriculture, Food and Veterinary
2	Bangalore Management Academy	http://bma.ac.in:8080/dspace	823	DSpace	Learning and Teaching Objects	Multidisciplinary
3	Bharathidasan University Library	http://172.16.1.10:8084/DSpace/	NA	DSpace	Learning and Teaching Objects	Multidisciplinary
4	Bioinformation	http://www.bioinformation.net/	320	NA	E-journal, Articles.	Biological Science
5	Central Drug Research Institute	http://dkr.cdri.res.in:8080/dspace/index.jsp	135	DSpace	Articles; Unpublished	Biology, Biochemistry; Health, Medicine
6	Central Institute of Medicinal & Aromatic Plants	http://kr.cimap.res.in/index.jsp or http://203.190.147.121/index.jsp	121	DSpace	journal articles, conference proceeding articles, Technical reports, thesis, dissertations,	Agriculture, Biology, Chemistry
7	Central Marine Fisheries Research Institute (CMFR) I	http://eprints.cmfri.org.in/	6549	EPrints	Articles; Conferences; Theses; Unpublished; Books; Patents	Agriculture, Food & Veterinary; Biology & Biochemistry; Ecology & Environment; Health & Medicine
8	Cochin University of Science and Technology	http://dspace.cusat.ac.in/dspace/	1912	DSpace	Articles; Learning Objects; Multimedia; Special	Multidisciplinary
9	Delhi College of Engineering	http://202.141.12.109/dspace	326	DSpace	Publications, Learning Objects, Dissertations, Multimedia.	Science & Technology
10	Delhi University	http://eprints.du.ac.in/	172	EPrints	Preprints, Conferences, Books, Articles,	Multidisciplinary

					Patents	
11	Indira Gandhi National Open University Gyankosh)	http://www.egyankosh.ac.in/	6190	DSpace	Learning Objects	Multidisciplinary
12	GB Pant University of Agriculture & Technology	http://202.141.116.205/dspace	82	DSpace	Research papers, Reports, Articles	Horticulture, Biology, Biotechnology, , MBA(agribusiness)
13	Guru Gobind Singh Indraprastha University	http:// dspace. ipu. ernet. in: 8080/ jspui/ not working	129	DSpace	Articles; Theses; Learning Objects	Multidisciplinary
14	ICFAI Business School	http://202.131.96.59:8080/dspace	171	DSpace	Post prints, Conferences, Books.	Mathematics, Statistics, Economics; Management and Planning
15	IIT Bombay	http://dspace.library.iitb.ac.in/dspace/	15	DSpace	Theses, Dissertations, Publications.	Engineering & Social sciences
16	IIT Delhi	http://eprint.iitd.ac.in/dspace/	2154	DSpace	Theses, Dissertations, Publications.	Physics, Chemistry, Mathematics, Humanities
17	IIT Kanpur	www.cse.iitk.ac.in/gsdl/cgi-bin/library	797	Greenstone	Theses, Dissertations, Projects.	Engineering and Technology
18	Indian Agricultural Research Institute	http://eprints.iari.res.in/	82	EPrints	Articles; Conferences; Theses; Unpublished	Agriculture, Food & Veterinary
19	Indian Institute of Astrophysics	http://prints.iiap.res.in/	1584	DSpace	Theses, Publications, Multimedia.	Physics & Astronomy
20	Indian Institute of Information Technology	http://eprints.iiita.ac.in/	22	EPrints	Research papers, Articles.	Management Science, Electronics communications Technology
21	Indian Institute of Management.	http://dspace.iimk.ac.in/	283	DSpace	Publications, Conferences, Theses,	Business, Economics,

	Kozhikode				Unpublished.	Management & IT
22	Indian Institute of Management Kozhikode Scholarship Repository	http://eprints.iimk.ac.in/	283	EPrints	Preprints, Unpublished.	Multidisciplinary
23	Indian Institute of Science- Electronic Theses and Dissertations	http://etd.ncsi.iisc.ernet.in/	243	DSpace	Theses.	Multidisciplinary
24	Indian Institute of Science	http://eprints.iisc.ernet.in/	18849	EPrints	Publications, Conferences, Patents, Unpublished.	Physics, Chemistry , Astronomy, Mathematics, Statistics.
25	Indian Institute of Spices Research	http://220.227.138.214:8080/dspace/index.jsp	NA	DSpace	research articles, book chapters, project reports, annual reports	Chemistry, biotechnology
26	Indian National Science Academy	http://61.16.154.195/dspace/	818	DSpace	Publications, Images, Reports, conferences	Science General, Technology General
27	The Institute of Mathematical Sciences	https://www.imsc.res.in/eprints not working	41	EPrints	Conferences; Learning Objects	Mathematics and Statistics
28	Institute of Minerals and Materials Technology.	http://eprints.immt.res.in/	33	EPrints	Journal papers, conference papers, reports, theses, patents	Chemistry Metallurgy
29	ICRISAT (International Crops Research Institute for the Semi Arid Tropics)	http://openaccess.icrisat.org/	3372	DSpace	Articles; Conferences; Learning Objects; Multimedia	Multidisciplinary
30	*Indira Gandhi*	http://oii.igidr.ac.in:8888/dspace	193	DSpace	Conferences;	Multidisciplinary

	Institute of Development Research				Theses; Unpublished	
31	INFLIBNET	http://dspace.inflibnet.ac.in/	486	DSpace	Conferences, Learning Objects.	Multidisciplinary
32	ISI Library	http://library.isibang.ac.in:8080/dspace/	191	DSpace	Publications.	Mathematics and Statistics
33	Librarians' Digital Library (DRTC)	https://drtc.isibang.ac.in/	357	DSpace	Publications, Conferences, Theses, Multimedia.	Library and Information Science
34	Madurai Kamaraj University Repository	http://eprints.mkuoa.in/ eprints. bicmku. in	21	EPrints	Articles	Biology and Biochemistry
35	Mahatma Gandhi University - Online THESIS Search	http://mgutheses.org/	913	Nitya	Theses	Multidisciplinary
36	Management Development Institute	http://dspace.mdi.ac.in/dspace	325	DSpace	Postprints, Conferences, Books.	Multidisciplinary
37	Medknow	http://eprints.medknow.com/	NA	EPrints	E-journal, Publications	Medical Science
38	National Aerospace Laboratories	http://nal-ir.nal.res.in/	2518	EPrints	Publications, Conferences, Patents Theses, Learning Objects, Multimedia.	Mathematics, Statistics, Mechanical Engineering
39	National Center for Antarctic Research	http://dspace.ncaor.org:8080/dspace/	582	DSpace		Antarctic Science, Environment and ecology
40	National Centre for Catalysis Research	http://www.eprints.iitm.ac.in/	1478	EPrints	Publications, Conferences, Theses.	Chemistry and Chemical Technology
41	National	http://ncralib.ncra.tifr.res.in/dspace/	22	DSpace	Research	Astronomy,

	Centre for Radio Astrophysics				papers, Theses, Articles.	Physics, Astrophysics
42	National chemical Laboratory	http://dspace.ncl.res.in/dspace/	407	DSpace	Theses, Unpublished, Patents.	Chemistry and Chemical Technology
43	National Informatics Centre (NIC)	http://openmed.nic.in/	2412	EPrints	Publications.	Health and Medicine
44	National Institute of Immunology	http://eprints.nii.res.in/p	10	EPrints	Articles; Unpublished	Biology and Biochemistry
45	National Institute Of Oceanography	http://drs.nio.org/	605	DSpace	Publications, Conferences, Theses.	Science & Technology General, Arts and Humanities General;
46	National Institute of Technology (NITR)	http://dspace.nitrkl.ac.in/dspace/	412	DSpace	Publications, Preprints, Conferences.	Chemistry, Physics and Astronomy
47	National Metallurgical Laboratory.	http://eprints.nmlindia.org/	1750	EPrints	Patents, Theses, Report, Articles	Applied physics, Computer science, Materials Science
48	NISCAIR ONLINE PERIODICALS REPOSITORY (NOPR)	http://nopr.niscair.res.in/	9473	DSpace	Journals, Magazine, Articles; References	Multidisciplinary
49	OneWorld South Asia Open Archive Initiative	http://open.ekduniya.net/	91	EPrints	Publications; Conferences, Patents, Theses.	Computers, IT, Library and Information Science
50	Open Access Repository of Indian Theses (CSIR) Unit	http://eprints.csirexplorations.com/	630	EPrints	Theses, Patent, Article	Multidisciplinary
51	OpenMED	http://openmed.nic.in/	1298	EPrints	Publications,	Health and Medicine
52	Institute of Petroleum Management	ibrary.pdpu.ac.in:8080/xmlui/	64	DSpace	Articles; Unpublished	Multidisciplinary

53	Physical Research Laboratory	http://www.prl.res.in/~library/		Greenstone	Journals, Bulletin, Theses, report	Physics, Astronomy
54	Rajiv Gandhi Center for Biotechnology	http://www.rgcb.res.in/	NA	EPrints	E-journal.	Biotechnology
55	Raman Research Institute Digital Repository	http://dspace.rri.res.in/dspace/	3763	DSpace	Postprints, Unpublished, Learning Objects	Physics and Astronomy
56	Sri Venkateswara University, Tripathi	http://202.141.117.109:8080/DSpace	1086	DSpace	Learning and Teaching Objects	Multidisciplinary
57	S.V. National Institute of Technology Repository	http://eprints.svnit.ac.in/	14	EPrints	Articles; Conferences	Technology General
58	Thapar University	http://dspace. thapar. edu: 8080/ dspace/	938	DSpace	Articles; Conferences; Theses	Multidisciplinary
59	University of Hyderabad	http://202.41.85.207:8080/dspace	396	DSpace	Theses, Dissertations, Research paper.	Multidisciplinary & Multilingual
60	Vidyanidhi Digital Library & E-Scholarship Portal	http://dspace.vidyanidhi.org:8180/dspace/	1835	DSpace	Theses & Dissertations	Multidisciplinary