

Changing Dimensions in Development of Open Access Repositories: An Analytical Study of OpenDOAR

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Abstract

Paper evaluates the growth and development of open access repositories of the world covered under the umbrella of OpenDOAR. Data gathered from the OpenDOAR website and growth rate has been calculated by the given formula. Several parameters have been identified for the analysis of open access repositories. Scope is limited to the 2729 repositories listed in the OpenDOAR as on given date. Paper concludes with maximum, operational, open access institutional repositories establishment in western continents and countries with the Dspace an Eprints softwares having journal article and electronic theses/dissertations as major contents types in English language interfaces.

Keywords: *Open Access Repository, Institutional Repository, Open Access, IR Development, OpenDOAR*

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INTRODUCTION

Since the evolution of web, there have been various changes observed in the use of web in every aspect of society. In the academic scenario, scholars of various disciplines use it for many purposes. In the beginning of 21st century, the concept of “digital” materials became popular and it created a curiosity in scholars, academicians, researchers and administrator to make things digital for future use and to preserve it for longer time. In this environment, libraries have begun the digitization programs to preserve the library resources and disseminate it to maximum users. Information and Communications Technology (ICT) has played a key role “in libraries” to change the creation, storing, dissemination, preservation and management of scholarly intellectual output. The web based environment created opportunities and platform for scholars, academicians and researchers to work effectively through widespread ICT infrastructure, preserve and disseminate their intellectual output to the society. Due to information explosion, scholarly content creates challenges in the use, management, archiving and application of digital information. Open access institutional repositories are the fastest growing academic phenomena today and mainly focus on free,

instant, everlasting online access to the full text intellectual output of an organization. The establishment and growth of institutional repositories are increasing rapidly throughout the world. Open access repositories are the digital archives of scholarly literature deposited by their respective authors and this is also known as self-archiving. These are created and updated to provide universal and free access to information in electronic format to increase and disseminate research output [1]. In the words of Lynch “it is a set of services which the organization offers to the members of its community or the management and dissemination of digital materials created by the institution and its community members and thus an organizational commitment to the stewardship of these digital materials, including long-term preservation where appropriate, as well as organization and access or distribution”. Nowadays open access repositories have gained popularity throughout the world and more research is being published in open access mode. Due to rapid growth in scholarly literature, it becomes crucial to identify and manage the trends of open access repositories worldwide. In this perspective, the study emphasise on the recent trends in development and establishment of open access repositories by continent, country,

software used, its types, their operational status, content types, interface languages used, and growth in various subjects oriented open access repositories etc.

REVIEW OF LITERATURE

There are number of studies have been carried out on open access institutional repositories to highlight the use, growth, and their importance in fulfilling the real purpose of open access. Shearer (2003) opined that open access is growing towards global movement and governments, nonprofit organizations, and academia are moving towards free/open access to scholarly research that will be fulfilled by institutional repositories establishment and will be determined only to potential users [2].

Bansode (2011) suggested that these are showcasing of reputation of academic institution in terms of research productivity and librarians should take initiatives to increase the reputation through establishment and development of institutional repositories [3]. Jain et al. (2009) explained briefly about the growth and use of different IR software, which they need to be collaborative with Web 2.0 environment [4]. Macha and Jager (2011), in their study, finds that open access institutional repositories can play a very key role in a university as they collect, store, manage, preserve and archive all the university's research output and also enhance the visibility of an institution [5]. Ali et al. (2013) states that open access repositories in developing countries have good growth rate in the terms of usability and growth which shows that these nations become conscious of the need and importance of OA repositories [6].

OBJECTIVES

Present study has the following objectives:

- a) To know the current status of open access repositories establishments worldwide on some selected parameters.
- b) To find the growth rate and recent trends in open access repositories worldwide on some selected parameters.

SCOPE AND METHODOLOGY

The scope of the present study is confined to 2729 repositories registered in the OpenDOAR (Directory of Open Access Repositories) as on 14-10-2014. The study is based on collected

data from OpenDOAR (<http://www.opendoar.org>) as on October, 2014 [7]. The collected data are carefully analyzed and investigated on selected parameters viz. current status and growth rate of open access repositories by continent, by country, use of IR software's, open access repositories types, their operational status, their content types, languages used, and growth in various subject oriented open access repositories. To analyze the growth rate, data for the year 2008, 2010, and 2012 are collected from Internet archive (<https://archive.org/index.php>) of OpenDOAR and some data were also verified Wani et al. research paper [8].

The growth rate has been calculated by the formula as mentioned below:

$$GR = \frac{B - A}{A} \times 100$$

where, B is the Data value in year 2014, and A is the Data value in year 2008.

RESEARCH ANALYSIS AND DISCUSSION

Growth of Open Access Repository by Continent

From the analysis of Table 1, it has been observed that Europe has the largest number of institutional repositories establishments during 2008–2014 (1243) followed by North America (542), Asia (503), South America (242), Africa (103), and Australia (64). On the observation of growth rate of institutional repositories worldwide, Africa (442.10%) has the highest growth rate among continents followed by South America (340%), Asia (264.49%), and Europe (107.51%). In terms of growth rate, Europe has moderate growth record (107.51%) and North America has low rate of approximately 48% whereas; Caribbean subcontinent has higher growth rate (approx. 56%) than North America during 2008–2014. Interestingly, during 2012 and 2014, Australia has shown continuous decrease in growth rate (-17.95%) in establishment of institutional repositories than 2010. In between 2012 and 2014, there has been found some (4) new establishments of institutional repositories in other continents and subcontinents.

Table 1: Growth of Open Access Repositories by Continent.

S. No.	Continent	No. of IRs in 2008	No. of IRs in 2010	No. of IRs in 2012	No. of IRs in 2014	Growth Rate (%)
1.	Europe	599	843	1010	1243	107.51
2.	North America	366	441	484	542	48.08
3.	Asia	138	278	374	503	264.49
4.	South America	55	93	153	242	340
5.	Australia	0	78	71	64	-17.95
6.	Africa	19	44	50	103	442.10
7.	Caribbean	0	09	12	14	55.56
8.	Central America	0	08	10	14	75
9.	Others (2)	0	00	01	04	---
Total		1250	1794	2168	2729	

Growth of Open Access Repository by Country

From the analysis of Table 2, it has been observed that United States has the largest number of institutional repositories establishments during 2008–2014 (454) followed by United Kingdom (229), Germany (170), Japan (145), Spain (115), France (89), and other countries (1527). On the observation of growth rate of institutional repositories countrywide, Japan (110%) has the highest growth rate among countries followed by Spain (71.64%), United Kingdom (68.38%), France (58.92%), United States (43.21%), and Germany (31.78%). Besides these countries, group of other countries have 154% growth rate which is more than Japan. The low growth rate is observed in establishment of open access repositories in developed countries like United States and Germany whereas; moderate growth is observed in case of United Kingdom, Spain and France. During 2008 to 2014, there have been found tremendous growth in others countries in terms of establishments of institutional repositories.

Growth of Open Access Repository Content Types

Table 6 analysis shows that Journal Articles (1864) are the major content type in open access repositories followed by Theses/Dissertations (1489); Books, Chapters and Sections (1020); Unpublished/Working Reports (996); Conference/Workshop Papers (965); Multimedia/Audio-Visual Materials (666); Special Items (478); Learning Objects (456); Bibliographic references (426); Datasets (131); Patents (83); and Software (43). On the basis of growth rate of contents of repositories, Patents have shown the highest growth rate of 295.24% among all content types followed by Books, Chapters and Sections (162.89%); Learning Objects (147.83%); Journal Articles (146.24%); Theses/Dissertations (139%); Bibliographic References (132.79%); Other Special Item (125.47%); Multimedia/Audio-Visual Materials (123.49%); Conferences/Workshop Papers (113.97%); Datasets (101.54%) etc.

Table 2: Growth of Open Access Repositories by Country.

S. No.	Country	No. of IRs in 2008	No. of IRs in 2010	No. of IRs in 2012	No. of IRs in 2014	Growth Rate (%)
1.	United States	317	375	409	454	43.21
2.	United Kingdom	136	181	208	229	68.38
3.	Germany	129	142	152	170	31.78
4.	Japan	69	120	136	145	110.14
5.	Spain	0	67	87	115	71.64
6.	France	0	56	66	89	58.92
7.	Others*	599	853	1110	1527	154.92
Total		1250	1794	2168	2729	

*87 countries listed during 2010 and 109 countries during 2014.

Table 3: Growth of Open Access Repository Software.

S. No.	IR Software	No. of IRs in 2010	No. of IRs in 2012	No. of IRs in 2014	Growth Rate (%)
1.	DSpace	639	843	1160	81.54
2.	EPrints	293	332	380	29.70
3.	Digital Commons	77	92	127	64.94
4.	OPUS	54	56	70	29.63
5.	Greenstone	24	--	53	120.84
6.	Others*	343	442	648	88.93
7.	Unknown [#]	364	403	291	-20.06
	Total	1794	2168	2729	

*68 countries listed during 2010, 70 during 2012 and 149 countries during 2014.

[#]Repository software name not mentioned by the Institution.

Growth of Open Access Repository Software

On the observation of Table 3, DSpace is the mostly used software (1160) for establishment of open access repository in the world followed by EPrints (380), Digital Commons (127), OPUS (70), Greenstone (53), and other software's (648).

There are some institutions (291) which have not given information about software used for the very purpose. On the observation of growth rate of institutional repository software, Greenstone (120.84%) has highest growth rate followed by DSpace (81.54%), Digital Commons (64.94%), Eprints (29.7%), and OPUS (29.63%).

Others category of software have also shown significant growth rate (88.93%) during the study period while decrease has been observed in unknown category of software's (-20.06%) for establishment of open access repositories.

Further, DSpace is the highest in terms of installation but Greenstone has gained much popularity than DSpace in terms of growth rate (120.84%) during the study period. It has been found that Digital Commons is also popular for open access repository installations after DSpace, in terms of growth, during the study period whereas; EPrints growth rate (29.7%) is as normal with OPUS software (29.63%) but in terms of number of installation, EPrints is second most used IR software in the world.

Growth of Open Access Repository Types

On the analysis of Table 4, amongst the different types of open access repositories, institutional repositories (2258) are more in number of installations followed by disciplinary (297), aggregating (98) and governmental (76). In terms of growth rate, amongst different types of repositories, governmental repositories have shown highest growth rate of 204% followed by institutional repositories (125.57%), disciplinary (78.92%), and aggregating (68.97%).

Growth of Open Access Repository Operational Status

On the analysis of operational status of open access repositories from Table 5, it has been found that operational repositories have maximum number of installations (2548) and are in functional condition with the growth rate of 124.49%.

There are trail based repositories (96) established and having growth rate of 5.49% which is very low for trial purposes also. The number of closed repositories (24) is still increasing with growth rate of 50% than 2008. The broken repositories, increases due to technical malfunctioning, having significant number of physical presence (61) are increasing day by day with the increase rate of 662.5%. The increase in number of broken repositories is not a good sign for future of functional open access repositories though they are only 2.24% of total number of repositories (2729).

Table 4: Growth of Open Access Repository Types.

S. No.	Repository Types	No. of IRs in 2008	No. of IRs in 2010	No. of IRs in 2012	No. of IRs in 2014	Growth Rate (%)
1.	Institutional*	1001	1465	1779	2258	125.57
2.	Disciplinary**	166	213	241	297	78.92
3.	Aggregating [#]	58	76	97	98	68.97
4.	Governmental ^{##}	25	40	51	76	204.0
	Total	1250	1794	2168	2729	

*An institutional or departmental repository, **A cross-institutional subject repository.

[#]an archive aggregating data from several subsidiary repositories.

^{##}A repository for governmental data.

Table 5: Operational Status of Open Access Repositories.

S. No.	Operational Status	No. of IRs in 2008	No. of IRs in 2010	No. of IRs in 2012	No. of IRs in 2014	Growth Rate (%)
1.	Operational*	1135	1697	1989	2548	124.49
2.	Trial**	91	66	108	96	5.49
3.	Closed [#]	16	16	18	24	50.0
4.	Broken ^{##}	08	15	53	61	662.5
	Total	1250	1794	2168	2729	

*Fully functional, **Trial repository. [#]Not accepting depositions. ^{##}Technically malfunctioning.

Table 6: Growth in Content Types of Open Access Repositories.

S. No.	Content Types	No. of IRs in 2008	No. of IRs in 2010	No. of IRs in 2012	No. of IRs in 2014	Growth Rate (%)
1.	Journal Articles	757	1147	1447	1864	146.24
2.	Theses/Dissertations	623	929	1142	1489	139.0
3.	Books, Chapter and Sections	388	568	769	1020	162.89
4.	Unpublished Reports and Working Papers	599	722	803	996	66.28
5.	Conferences and Workshops Papers	451	631	753	965	113.97
6.	Multimedia/Audio-Visual Materials	298	414	508	666	123.49
7.	Other Special Item	212	293	347	478	125.47
8.	Learning Objects	184	277	338	456	147.83
9.	Bibliographic References	183	275	376	426	132.79
10.	Datasets	65	77	80	131	101.54
11.	Patents	21	33	61	83	295.24
12.	Software	27	32	34	43	59.26
	Total	3808	5398	6658	8617	126.27

Table 7: Language Interface of Open Access Repositories.

S. No.	Languages*	No. of IRs in 2010	No. of IRs in 2012	No. of IRs in 2014	Growth Rate (%)
1.	English	1408	1587	1926	36.79
2.	Spanish	167	233	350	109.59
3.	German	170	182	217	27.65
4.	French	108	126	179	65.75
5.	Japanese	121	137	146	20.67
6.	Portuguese	65	107	141	116.93
7.	Chinese	57	96	112	96.50
8.	Polish	18	74	84	366.67
9.	Italian	53	67	79	49.06
10.	Russian	22	--	64	190.91
11.	Ukrainian	16	--	55	243.75
12.	Norwegian	41	--	49	19.52
13.	Swedish	41	48	46	12.20
14.	Turkish	10	--	45	350
15.	Arabic	13	--	34	161.54

*Study includes top 15 languages interface.

Table 8: Subject Coverage of Open Access Repositories.

S. No.	Subjects/Disciplines*	No. of IRs in 2010	No. of IRs in 2012	No. of IRs in 2014	Growth Rate (%)
1.	Multidisciplinary	1140	1338	1623	42.37
2.	Health and Medicine	134	186	267	99.26
3.	History and Archaeology	108	168	224	107.41
4.	Business and Economics	74	119	212	186.49
5.	Law and Politics	79	131	201	154.44
6.	Technology General	91	138	199	118.69
7.	Science General	110	141	198	80
8.	Social Sciences General	86	117	173	101.17
9.	Geography and Regional Studies	66	112	168	154.55
10.	Education	58	--	166	186.21

*Study includes top 10 subjects/disciplines coverage

Growth of Open Access Repository Language Interface

From the analysis of Language Interface supported by open access repositories in Table 7, it has been found that English is the most prominent language interface amongst open access repositories around the globe. From the total 2729 repositories, English has been used by 1926 repositories followed by Spanish (350), German (217), French (179), Japanese (146), Portuguese (141), Chinese (112), Polish (84), Italian (79), Russian (64), Ukrainian (55), Norwegian (49), Swedish (46), Turkish (45), and Arabic (34). As per growth rate of language interface of repositories, Polish language interface has the highest growth rate of 366.67% during the study period followed by Turkish (350%), Ukrainian (243.75%), Russian (190.91%), Arabic (161.54%), Portuguese (116.93%), Spanish (109.59%) etc. From the analysis, it can be observed that English is most prominently used language interface but the growth rate is 10 times less than Polish language during study period. Polish (366.67%), Turkish (350%), Ukrainian (243.75%), Russian (190.91%), Arabic (161.54%), Portuguese (116.93%) and Spanish (109.59%) are fast growing languages interfaces while English (36.79%), German (27.65%), French (65.75%), and Japanese (20.67%) are less growing language interfaces in open access repositories.

Growth of Open Access Repository Subject Coverage

From the analysis of subjects/disciplines covered by open access repositories in Table 8, it has been found that Health and Medicine (267) emerged as most dominant subject among open access repositories in terms of

number of repositories followed by History and Archaeology (224), Business and Economics (212), Law and Politics (201), Technology in General (199), Science in General (198), Social Sciences General (173), Geography and Regional Studies (168), and Education (166). Majority of repositories (1623) archived under multidisciplinary subject coverage due to multiple subject domains covered by them and which cannot come under any specific category. From the analysis, amongst top 10 subject disciplines Business and Economics is fast growing subject category during the period of study with growth rate of 186.49% followed by Education (186.21%), Geography and Regional Studies (154.55%), Law and Politics (154.44%), Technology General (118.69%) etc. Amongst top 10 subject disciplines, interestingly, Science General (80%) subject has shown less growth than other subjects during period of study.

CONCLUSIONS

Western part of the world especially European, North American and South American continent has major establishments (74%) of open access repositories of world total. The number of establishment of open access repositories in European, North American, and South American continents obviously higher but the growth rate of establishment of repositories in African and Asian continents is much more than western part of the world during study period. It seems like western part of world is much more open to disseminate their research publicly by establishing open access repositories than eastern part and in another side, economically, there is a big digital divide between western and eastern part

of the world has been observed which leads to less number of establishments of open access repositories in eastern part of world since beginning. From the Asian countries, only Japan (145) has the highest number of open access repositories whereas maximum number of installations is coming from western countries especially from USA, UK, Germany, Spain, France etc.

African countries are not coming in the picture in terms of number of installations. USA, UK, and Germany have shown very remarkable number of installations but Japan has the highest growth rate amongst all countries of the world during study period. Institutional repository software DSpace is the highest in terms of installation followed by EPrints but Greenstone is growing more than DSpace in terms of growth rate. Digital Commons is also popular in terms of growth rate after DSpace. Amongst the repository types, institutional repositories are much more than other repository types. Governmental repositories have shown highest growth but overall progress is still very slow. Academic institutions have to spread and promote their research outcome through open access repositories thus lead to maximum number of installations of institutional repository types followed by disciplinary types and growth of institutional repository types are sufficient enough than other repository types.

Numbers of operational repositories are still much more than trial based installations, closed installations and broken installations. The growth of broken repositories is the highest (662.5%) amongst all types of repositories that are not a good sign for future of open access repositories though their number is very less. Amongst all the world repositories journal articles, theses/dissertations, book chapters, reports and conference papers are the major available content type. Patents are fastest growing content type followed by book chapters, learning objects, journal articles and theses/dissertations. English is the most prominent language interface amongst open access repositories around the globe whereas; Spanish, German, French, and Japanese have remarkable presence. Polish is the fastest

growing language interface followed by Turkish, Ukrainian, Russian, and Arabic etc. English is most prominently used language interface but the growth rate is 10 times less than Polish language during study period.

Multidisciplinary subjects based repositories are highest in establishment than specific subjects based repositories. Amongst specific subjects, Health and Medicine emerged as most dominant subject followed by History and Archaeology, Business and Economics, Law and Politics, Technology in General, Science in General, and Social Sciences General. Business and Economics is the fastest growing subject category during the study period followed by Education, Geography and Regional Studies, Law and Politics etc.

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