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# Global Landscape of Open Access Repositories

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## Introduction

Since the beginning of 21st Century, there has been a major increase in the number of digital libraries and repositories throughout the world. Open Access is a boon for the institutions, authors etc that uses internet to disseminate various types of literature to the world free of cost. The foundation stone for open access (OA) was laid by Paul Ginsparg in 1991 when he established the arXiv repository at the Los Alamos National Laboratory (LAN-L) in order to make preprints in physics freely accessible. Other leading protagonists and co-founders of the OA Movement are Peter Suber, director of the Harvard Office for Scholarly Communication and a faculty fellow of the Berkman Center for Internet & Society and Stevan Harnad, a cognitive scientist, who operates the blog Open Access Archivangelism, among other things (**Open-access.net,2019**). Open access refers to the practice of making peer-reviewed scholarly research and literature freely available online to anyone interested in reading it. Open access has two different versions—Gratis and Libre. Gratis open access is simply making research available for others to read without having to pay for it. However, it does not grant the user the right to make copies, distribute, or modify the work in any way beyond fair use. Libre open access is gratis, meaning the research is available free of charge, but it goes further by granting users additional rights, usually via a Creative Commons license, so that people are free to reuse and remix the research (**Opensource.com,2019**). Open access means free, immediate, permanent online access to the full text research (**Pinfield, 2005**). Open access to the literature, means its free availability on the public internet, permitting users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers (**Budapest Open Access Initiative, 2002**). It facilitates the availability and distribution of scholarly communication and endeavors to solve the problem of inaccessibility primarily due to financial constraints in addition to other factors viz., geographical barrier, political barrier etc. (**Ghosh & Das, 2007**). The open source software, open access and open standards movements are gaining tremendous momentum. 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. (**Roy, Bhiwas & Mukhopadhyay,2013**). Open Access emerged in response to the restrictive access to knowledge in scholarly and scientific journals imposed by commercial publishing houses via subscription fees, license fees or pay-per-view fees (**Christian,2008**).The open-access movement has been around for more than a dozen years. It started with three ambitious proclamations made in the early 2000s following meetings

in Bethesda, Budapest and Berlin. Now, it's more of an institution than a social movement, and the statements have come to serve as a substitute for thought (**Beal 2015**).

However, in order to accomplish the real purpose of open access, there is a need to archive open access content, which has given rise to open access repositories. For some years now there has been a movement towards open access to academic publications which argues that sources of scholarly information, usually in the form of articles, should be freely available to all on the internet. The establishment of repositories contributes towards easy open-access publishing online. By ensuring that access to the results of academic research is not confined solely to subscribers to expensive journals, it allows them to reach a much wider audience (**Chand, Murthy, Prakash & Gohel, 2004**). In 1991 the first Internet-based subject repository, arXiv, emerged (**Ginsparg, 2004**). Repositories are document servers operated at higher education or research institutions in which scientific and scholarly materials are archived and made accessible worldwide free of charge (**Open-access.net, 2019**). Reitz comments on open access (OA) repositories as digital archives of research materials deposited by their authors (also known as self-archiving). These are created and maintained to provide universal and free access to information in electronic format as a means of facilitating research and scholarship (as cited in Bhat, 2010). Open Access repositories form a permanent and critically important part of the scholarly communication process (**Swan, 2005**). Their primary role is to provide open access to research literature. Moreover, value addition is done in the form of services added to repositories for providing extra functionality (**Chan, 2004**) which can enhance global dissemination of information. A repository is a mechanism for centrally storing, disseminating, and preserving digital material. It may belong to an institution, such as a university, or a discipline and can contain a variety of content types and formats, for example, scholarly articles and preprints, reports, theses, audio, video, images, and other materials (**Davis & Connolly, 2007**). Therefore, OA repositories need to be created so as to be seen and emulated by other institutions. Moreover, the escalating cost of journal subscriptions and diminishing library budgets have caused "Serials Crisis" in the field of scholarly communication. To overcome this hindrance, many academicians resorted to publication of their articles in sites, which are open for all and free of cost (**Suber, 2012**).

### **OpenDOAR**

OpenDOAR was launched in 2005, initially developed as collaboration between the [University of Nottingham](#) and [Lund University](#), home of the [DOAJ](#). Funding was provided by OSI, JISC, SPARC Europe and CURL. OpenDOAR is the quality-assured global directory of academic open access repositories. It enables the identification, browsing and search for repositories, based on a range

of features, such as location, software or type of material held. OpenDOAR has opted to collect and provide information solely on sites that wholly embrace the concept of open access to full text resources that are of use to academic researchers. Thus sites where any form of access control prevents immediate access are not included: likewise sites that consist of metadata records only are also declined. Typically OpenDOAR lists publication repositories, as this is the basis for most repositories. However, OpenDOAR also lists other types, for example of images or data-sets, particularly where these have metadata or documentation sufficient to make the material re-usable. Common reasons for not listing a site in OpenDOAR include (but are not limited to): Site is repeatedly inaccessible, Site is an eJournal, Site contains no Open Access materials, Site contains metadata (bibliographic) references only or solely links to external sites, Site is actually a library catalogue or collection of locally accessible e-books, Site requires login to access any material (gated access) - even if freely offered, Site is a proprietary database or journal that requires a subscription to access (openDOAR,2019).

### **Purpose and importance of the study**

Open access has gained immense popularity throughout the world as majority of research output is being published in open access mode via one of the important platforms i.e. “open access Repositories” which have entered an arena of explosive growth. Hence, it becomes imperative to identify the trends followed by “open access Repositories” worldwide. In this context, the present study attempts to highlight the status of open access repositories globally, describe their characteristics in terms of “Geographical distribution”, “Software usage”, “Language diversity”, “Operational status”, “Repository type”, “Content type” and “Subjects archived”.

### **Objectives**

This study has been undertaken to identify and describe various characteristic aspects of open access repositories by following objectives:

- Geographical contribution: - to explore contributions to OARs by different continents as well as countries.
- Software usage: - to determine various software used for creation of OARs.
- Operational status: - to be acquainted with the operational status of repositories.
- Repository type: - to identify the various types of OARs (institutional, disciplinary, aggregating and governmental).

- Content type:-to identify the core content type in which data is deposited in repositories.
- Subjects archived: - to be familiar with the subject achieved by OARs.
- Language interface diversity: -to determine the language interface diversity in OARs.

### **Methodology & Scope**

The data were collected systematically from the “**OpenDOAR**” (international directory of open access repositories with associated statistics). Data gathered was thoroughly analyzed based on chosen parameters viz:

- Geographical distribution,
- Software usage,
- Operational status,
- Repository & Content type,
- Subjects archived and
- Language interface diversity.

The data was downloaded in May-2017, in “**MS excel**” format and analyzed using various quantitative technique to reveal the findings.

### **Review of literature**

A number of studies have been carried out to highlight the use, growth and importance of open access (OA) repositories in fulfilling the real purpose of open access.

**Pinfield et al (2014)** analyzed the worldwide growth of open-access (OA) repositories. They reveal that some countries, including France, Italy, and Spain, have maintained steady growth, whereas other countries, notably China and Russia, have experienced limited growth. They also found that globally, repositories are predominantly institutional and multidisciplinary. **Singh (2016)** examined the development of open access repositories in India. He reveals that Europe is the major contributor of repositories followed by North America. He further reveals that Asia and Japan has the largest number of repositories followed by India, Taiwan, Turkey, China, Republic of Korea, and Indonesia and the minimum development is shown by countries like Afghanistan, Armenia, Azerbaijan, Bangladesh, Georgia, Hong-Kong, Iraq, Israel, Iran, Kazakhstan, Kyrgyzstan, Lebanon, Malaysia, Nepal, Pakistan, Philippines, Qatar, Saudi Arabia, Sri Lanka, Singapore, Thailand, and Vietnam. **Pinfield, et al. (2014)** carried out the study on worldwide growth of open-access (OA) repositories. The study reveals that United States had the largest number of repositories followed by the United Kingdom and Germany. Moreover, they found that Europe has the largest number of repositories followed by North America, Asia and South America. **Connell (2011)** examined the use of digital materials that have been deposited in

the Ohio State University (OSU) Knowledge Bank (KB). They found articles and undergraduate theses are most frequently deposited type of materials. **Roy, Biswas and Mukhopadhyay (2013)** presented the current state of open access institutional digital repositories (IDRs) of India. They reveal that the majority of deposited contents are journal articles followed by Conference and workshop papers, Theses and dissertations, unpublished reports and working papers etc. They also found that most of the institutions are multidisciplinary in nature and cover different subjects to their repositories. Moreover, they reveal that the repositories hold mainly documents in English language and mainly use DSpace and Eprints and the least number of repositories use Greenstone **Wani, Gul and Rah (2009)** examined the growth and development of open repositories registered with OpenDOAR database. They reveal that the majority of repositories hold journal articles followed by theses and dissertations, unpublished reports and working papers. Moreover, they found that majority of repositories are institutional followed by disciplinary, aggregated and governmental in nature. **Abiraz, Noorhidawati and Kiran (2010)** analyzed the current state of open access repositories of Asian universities. They found Japan as the biggest contributor of Asian repositories, followed by India and Taiwan and the majority of deposited content are journal articles followed by theses and dissertations while as the least deposited content type is software. They also found that large institutions essentially hold Multidisciplinary subjects in OpenDOAR. As for the language of the collections in IRs is concerned, they found that English is the most widely used language followed by Japanese and Chinese. **Ali, Lone and Mushtaq (2018)** discovered the composition of the scientific repositories in the Directory of Open Access Repositories (OpenDOAR). They revealed that Europe has contributed the highest number of repositories among the regions whereas the USA tops the list among countries. Most of the scientific repositories are institutional, accept contents in English language, archive journal articles and use DSpace to manage contents. **Roy, Bhiwas and Mukhopadhyay (2012)** presented a broad look at the current state of deployment of OARs in the Asian countries. They reveal that all the continents are now maintaining OARs, but majority of share holders are in Europe and North America. Asia emerges as the third largest contributor. **Shukla (2016)** evaluated the growth and development of open access repositories of the world covered under the umbrella of OpenDOAR. He reveals that Europe has the largest number of institutional repositories followed by North America, Asia, South America, Africa, and Australia respectively. On the observation of growth rate of institutional repositories worldwide, Africa has the highest growth rate among continents followed by South America, Asia and Europe. **Ganie, Jan, Lone and Nisa (2014)** identified the status of Open Access (OA) repositories in the field of Library and Information Science (LIS) worldwide. They found that United States is leading

contributor followed by United Kingdom and Germany respectively and In terms of software used by the corresponding repositories they found that most of them preferred DSpace and Eprints and the English language was seen as the most preferred language in terms of language interface followed by German and Spanish. **Ali, Jan and Amin (2013)** analyzed the status of open access repositories globally. They reveal Europe emerges out as the top contributor followed by North America, Asia, South America, and Australia respectively. They also found that the majority of the repositories use DSpace software followed by Eprints, Digital Commons, DLibra and OPUS respectively, while as least number of repositories use other software. **Wani, Gul and Rah (2009)** throw a light on the growth and development of open repositories registered with OpenDOAR database. They reveal that the USA maintains the highest number of repositories, followed by the UK and Germany respectively they also found that majority of repositories are operational followed by trial and closed while as least score of repositories have been declared broken, moreover, majority of repositories are Institutional followed by disciplinary, aggregated and governmental in nature. **Lone and Sheikh (2016)** assessed open access (OA) repositories in the field of the health and medicine (H&M).they reveal that majority of the contribution to repositories are from USA followed by Japan and the UK and the majority of the repositories are institutional in nature, mostly consisting of articles followed by theses, unpublished documents and books. Moreover, they also found that majority of OARs are still operational and DSpace is the most popular software used by repositories, followed by Eprints and Digital Commons. **Shafi, Gul and Shah (2013)** provide an overview of open access (OA) repositories that have embraced Web 2.0 technologies. They reveal that majority of open access repositories having English as one of the interface/content languages.

### **Data analysis & interpretation**

#### **Continental contribution towards OARs**

“Europe” is the leading contributor to the largest number of repositories (1558) followed by “Asia” (701) and “North America” (614). However, a satisfactory score of repositories are from “South America”, “Africa” and “Australasia” respectively, while as a least score of repositories are contributed by “Central America”, “Caribbean”, and “others” (**Table 1**). **Singh (2016)** also reveals that Europe is the major contributor of repositories followed by North America. **Pinfield et al (2014)** found that Europe has the largest number of repositories followed by North America, Asia and South America.**Ali, Lone and Mushtaq (2018)** also revealed that Europe has contributed the highest number of repositories. **Roy, Bhiwas and Mukhopadhyay (2012)** found that all the continents are now maintaining OARs, but majority of share holders are in Europe and North America and Asia emerges as the third largest contributor. **Shukla (2016)** reveals that Europe has

the largest number of institutional repositories followed by North America, Asia, South America, Africa, and Australia respectively. **Jan and Amin (2013)** highlights that Europe emerges out as the top contributor followed by North America, Asia, South America, and Australia respectively.

**Table 1: Continental contribution towards OARs**

Continent	No. of Repositories
Europe	1558 (45%)
Asia	701 (20%)
North America	614 (18%)
South America	308 (9%)
Africa	155 (4%)
Australasia	70 (2%)
Central America	19 (1%)
Caribbean	19 (1%)
Others (2)	(0%)
<b>Total</b>	<b>3448</b>

**Note: Figures in parentheses indicate %age and are rounded off to two decimal place**

#### **Contribution towards Repositories by Countries**

The “United States” is the leading country with the largest number of repositories (500) followed by “United Kingdom” (256) “Japan” (217) and “Germany” (202) respectively. However, an adequate number of repositories are from “Spain”, “France”, “Italy” and “Brazil” while as countries with a meager output were tagged under category “others” (**Table 2**). **Pinfield et al (2014)** also revealed that United States had the largest number of repositories followed by the United Kingdom and Germany. **Ali, Lone and Mushtaq (2018)** found that USA tops the list among countries contributing to repositories. **Ganie, Jan, Lone & Nisa (2014)** identified that the United States is leading contributor to OARs followed by United Kingdom and Germany respectively in the field of Library and Information Science (LIS) worldwide. **Wani, Gul & Rah (2009)** found that the USA maintains the highest number of repositories, followed by the UK and Germany respectively. **Lone and Sheikh (2016)** revealed that majority of the contribution to repositories are from USA followed by Japan and the UK.

**Table 2: Contribution towards Repositories by Countries**

COUNTRY	NO. OF REPOSITORIES
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United States	500(15%)
United Kingdom	256(7%)
Japan	217(6%)
Germany	202(6%)
Spain	127(4%)
France	122(4%)
Italy	117(3%)
Brazil	97(3%)
Others (113)	1810 (52%)
<b>Total</b>	<b>3448</b>

*Note: Figures in parentheses indicate %age and are rounded off to two decimal place*

### Software used by Repositories

“DSpace” (1524) is one of the foremost software used by repositories followed by “Eprints” (469). However, a good number of repositories use “Digital Commons” and “WEKO” while as a least score of repositories use “OPUS”, “DLibra”, and “HAL” software’s respectively. Moreover, also the satisfactory number of repositories has not specified the type of software used by them and have been put under the category “Unknown”. (Table 3). Roy, Bhiwas and Mukhopadhyay (2013) found that Indian institutional digital repositories mainly use DSpace and Eprints and the least number of repositories use Greenstone. Ganie, Jan, Lone &Nisa (2014) found that most of the repositories preferred DSpace and Eprints software in the field of Library and Information Science (LIS) worldwide. Ali, Jan & Amin (2013) also found that the majority of the repositories use DSpace software followed by Eprints, Digital Commons, DLibra and OPUS respectively, while as least number of repositories use other software’s. Lone and Sheikh (2016) reveal that DSpace is the most popular software used by repositories, followed by Eprints and Digital Commons.

**Table 3: Software used by repositories**

<b>SOFTWARE</b>	<b>NO. OF REPOSITORIES</b>
Dspace	1524 (44%)
Eprints	469 (14%)
(Unknown)	275 (8%)
Digital Commons	164 (5%)
WEKO	93 (3%)
OPUS	84 (2%)
DLibra	60 (2%)
HAL	56 (2%)
Others(176)	723 (21%)
<b>Total</b>	<b>3448</b>

*Note: Figures in parentheses indicate %age and are rounded off to two decimal place*

### Open Access Repositories Operational Status

The maximum amounts of repositories are operationally “Functional” (3280), followed by “Trail” (85) and “Broken” (64) repositories while as least score of repositories are “Closed” (Table 4). Wani, Gul and Rah (2009) found that majority of repositories are operational followed by trial, closed and least score of repositories have been declared broken. Lone and Sheikh (2016) they also found that majority of OARs are operational.

**Table 4: Open Access Repositories Operational Status**

Types	No. of Repositories
Operational	3280(95%)
Trial	85(2%)
Broken	64(2%)
Closed	19(1%)
<b>Total</b>	<b>3448</b>

*Note: Figures in parentheses indicate %age and are rounded off to two decimal place*

### Types of Open Access Repository

Maximum number of repositories are “Institutional” (2952) followed by “Disciplinary” (305), and “Aggregating” (107) repositories respectively while as the least amount of repositories are “Governmental” (Table 5). Pinfield et al (2014) found that globally repositories are predominantly institutional and multidisciplinary. Roy, Wani, Gul & Rah (2009) revealed that majority of repositories are Institutional followed by disciplinary, aggregated and governmental in nature. Ali, Lone and Mushtaq (2018) found that most of the scientific repositories are institutional. Lone and Sheikh (2016) reveal that the majority of the repositories are institutional in nature.

**Table 5: Types of Open Access Repository**

Types	No. Of Repositories (2017)
Institutional	2952 (86%)
Disciplinary	305 (9%)
Aggregating	107 (3%)
Governmental	84 (2%)
<b>Total</b>	<b>3448</b>

*Note: Figures in parentheses indicate %age and are rounded off to two decimal place*

### Core Content types deposited in Open access Repositories

Among the 12 content types identified, the majority of content is in the form of “Journal articles” (2453) followed by “Theses and dissertations” (1942), “Books”, “Chapters and sections” (1327), “conference and workshop papers” (1250) and “Unpublished reports and Working papers” (1216)

respectively. However, “Software”, “Multimedia and Audio-Visual material”, “Bibliographic references”, “Learning objects” and “Other special item” types also constitute an adequate number of contents, while as “Data sets” and “Patents” constitute a minimal amount of content (Table 6). Connell (2011) also found articles and undergraduate theses are most frequently deposited type of materials deposited in the Ohio State University (OSU) Knowledge Bank (KB). Roy, Biswas and Mukhopadhyay (2013) reveal that the majority of deposited contents are journal articles followed by Conference and workshop papers, Theses and dissertations, unpublished reports and working papers respectively. Abiraz, Noorhidawati and Kiran (2010) revealed that the majority of deposited content to repositories are journal articles followed by theses and dissertations while as the least deposited content type is software.

**Table 6: core Content types deposited in Open access Repositories**

Content Type	Score
Journal articles	2453 (21%)
Theses and Dissertation	1942 (16%)
Books, Chapters and Sections	1327 (11%)
Conference and Workshop papers	1250 (10%)
Unpublished reports and Working papers	1216 (10%)
Software	952 (8%)
Multimedia and Audio-Visual material	773 (6%)
Bibliographic references	551 (5%)
Learning objects	533 (4%)
Other special item types	519 (4%)
Datasets	183 (1%)
Patents	104 (1%)
<b>Total</b>	<b>11803</b>

**Note: Figures in parentheses indicate %age and are rounded off to two decimal places**

### Subjects archived by open access repositories

“Multidisciplinary subjects” (2126) leads in open DOAR followed by “Health and Medicine” (328), “Business and Economics” (256), “History and Archaeology” (248), “Science – general” (241), “Technology – general” (240). However, “Education”, “Geography and Regional Studies” , “Computer and IT”, “Arts and Humanities – general” , “Biology and Biochemistry”, “Ecology and Environment”, “Agriculture”, “Food and Veterinary” etc make a satisfactory presence in open DOAR while as “Earth and Planetary Sciences”, “Psychology”, “Mechanical Engineering and

*Materials*”, “*Architecture*”, “*Mechanical Engineering and Materials*” and “*civil engineering*” subjects make a minimal presence (Table 7). Biswas and Mukhopadhyay (2013) also revealed that most of the institutions are multidisciplinary in nature and cover different subjects to their repositories. On the contrary, few repositories hold specialized subjects like Health, Medicine, Mathematics, Physics, Statistics, and Technology etc. In addition, few repositories cover subjects like History, Economics, and Management etc. Abiraz, Noorhidawati and Kiran (2010) found that large number of institutions essentially hold Multidisciplinary subjects in OpenDOAR.

**Table 7: Subjects archived by OARs**

Rank	Open DOAR Subjects	Number
1	Multidisciplinary	2126
2	Health and Medicine	328
3	Business and Economics	256
4	History and Archaeology	248
5	Science – general	241
6	Technology – general	240
7	Technology – general	228
8	Social Sciences – general	197
9	Education	195
10	Geography and Regional Studies	186
11	Computers and IT	175
12	Arts and Humanities – general	171
13	Biology and Biochemistry	157
14	Ecology and Environment	154
15	Agriculture, Food and Veterinary	151
16	Language and Literature	149
17	Philosophy and Religion	131
18	Library and Information Science	126
19	Mathematics and Statistics	124
20	Physics and Astronomy	107
21	Fine and Performing Arts	104
22	Management and Planning	103
23	Chemistry and Chemical Technology	101
24	Earth and Planetary Sciences	90
25	Psychology	77
26	Mechanical Engineering and Materials	69
27	Architecture	62

28	Mechanical Engineering and Materials	54
29	Civil Engineering	45

### Language interface diversity in open access repositories

Among all “English” (2400) is one of the most prominent language interfaces used by OA Repositories followed by “Spanish” (437), “German” (259), “French” (224), “Japanese” (218), “Portuguese” (172), “Italian” (120) and “Chinese” (115) respectively. However, a sufficient score of repositories use “Russian”, “Polish”, “Turkish”, “Ukrainian”, “Norwegian”, and “Indonesian” language while as “Yiddish”, “Irish”, “Nepali”, “Breton” “Maori”, “Azerbaijani” “Vietnamese”, “Sanskrit”, “Amharic”, “Corsican”, “Marathi” and “Byelorussian” languages are used by a very less number of repositories (Table 8). Ganie, Jan, Lone and Nisa (2014) also revealed that the English was seen as the most preferred language in terms of language interface followed by German and Spanish. Shafi, Gul and Shah (2013) reveal that English is an interface language of majority of open access repositories.

**Table 8: Language interface diversity in open access repositories**

RANK	LANGUAGES OF INTERFACE	No. OF REPOSOTORIES
1	English	2400
2	Spanish	437
3	Germany	259
4	French	224
5	Japanese	218
6	Portuguese	172
7	Italian	120
8	Chinese	115
9	Russian	98
10	Polish	91
11	Turkish	76
	Ukrainian	76
12	Norwegian	53
13	Indonesian	51
14	Arabic	49
15	Swedish	44
16	Korean	39
17	Greek	38
18	Hungarian	34

	Dutch	34
19	Croatian	32
20	Czech	18
21	Catalan	14
	Finnish	14
22	Latin	13
23	Malay	12
24	Thai	11
	Hindi	11
	Slovenian	11
	Persian	11
25	Lithuanian	10
	Danish	10
26	Serbian	08
	Romanian	08
27	Estonian	07
28	Afrikaans	06
29	Bulgarian	05
	Basque	05
30	Armenian	04
	Kazakh	04
	Galician	04
	Icelandic	04
	Hebrew	04
31	Bengali	03
	Tamil	03
	Gujrati	03
	Georgian	03
	Slovak	03
	Welsh	03
32	Latvian, Lettish	02
	Sesotho	02
	Malayalam	02
	Urdu	02
	Swahili	02
	Macedonian	02
	Pashto, Pushto	02

	Kannada	02
	Moldavian	02
33	Yiddish	01
	Irish	01
	Nepali	01
	Breton	01
	Maori	01
	Azerbaijani	01
	Vietnamese	01
	Sanskrit	01
	Amharic	01
	Corsican	01
	Marathi	01
Byelorussian	01	

## Findings & conclusion

### Continental contribution towards OARs

It is evident from analyzed data that “Europe” is the leading contributor to the largest number of repositories. For many countries in “Europe” the DRIVER (Digital Repository Infrastructure Vision for European Research) initiative was the critical stimulating activity for Open Access developments. Through provision of guidelines and by establishing a network of OA experts, the project provided the support required to introduce OA practices. The work of INASP and eIFL has assisted in taking these developments further; eIFL in particular has offered an important advocacy role in raising OA awareness and debate. In collaboration with the respective national libraries, eIFL actively provides OA support to a number of developing and transition countries in Europe. In 2015, Europe follows closely with an internet penetration rate of 70.4%. This has created an enabling environment for the development of OA digital repositories and in the regions. Throughout Europe there are currently 1304 OA repositories which are registered in OpenDOAR (**Global open access portal, n.d.**)

### Contribution to Repositories by Countries

Findings related to geographical distribution reveal that the “United States” is the leading country with the largest number of repositories. The USA embraced OA principles in the 1960’s by developing ping ERIC and MEDLINE. Initiatives e.g. PubMed Central continue and offer repository facilities and access to international medical scholarship. As of May 2015, there are 469 OA repositories registered in OpenDOAR and 1053 OA journals from USA indexed

in DOAJ, making it the world's largest OA publisher. There is strong support for Open Access in USA. The NIH mandate mandates the deposit of medical research. As of May 2015, USA has 4 funding mandates registered in ROARMAP and over 50 institutional mandates at public and private institutions, research universities and liberal arts colleges. **(Global open access portal, n.d.)**. The USA has large number of institutions related with research and development with good technologies and equipments and invests more funds on research and development, since 2000 gross domestic expenditure on research and development (GERD) In USA has been increased by 31.2%. Finance and resources available in USA universities and institutions enables them to hire and retain the best researchers and provide proper equipments and other resources to them **(Economy of the United States, 2018)**.

### **Software used by Repositories**

The study reveals that “DSpace” is one of the foremost software used by repositories. “DSpace” is the software of choice for academic, non-profit, and commercial organizations building open digital repositories. It is free and easy to install “out of the box” and completely customizable to fit the needs of any organization. “DSpace” preserves and enables easy and open access to all types of digital content including text, images, moving images, mpegs and data sets. With an ever-growing community of developers, committed to continuously expanding and improving the software. “DSpace” is has the Largest community of users and developers worldwide. DSpace software Include a core set of functionality that can be extended to or integrated with complementary services and tools in the larger scholarly ecosystem **(DSpace, n.d.)**.

### **Open Access Repositories Operational Status**

The study reveals that the maximum amounts of repositories are operationally “Functional”. Digital preservation is vitally important and a mission of digital archives, it is just one of many functional areas that can impact a repository's overall sustainability. While there exists a number of audit frameworks that exist to measure maturity in digital preservation (such as OAIS, TRAC/ISO 16363, DRAMBORA NESTOR, DSA) there are fewer that offer recommended and sustainable engagement in other functional areas. This is certainly possible as many digital repositories are built within the organizational framework of a physical library, where they would benefit from the support of other units and divisions. However, as digital repositories are growing, they are growing more and more operationally complex. It's true that many digital repositories grow symbiotically with a host organization, where work teams may benefit mutually from the each other's expertise and products (and hopefully withstanding only a small amount of redundancy). Other digital repository operations grow so large that they may begin to replicate entirely services that were traditionally offered by other departments. **(Collie, 2018)**



### **Types of Open Access Repository**

The study shows that the maximum score of repositories are “*Institutional*”. Institutional repository is the marquee of an institution in the world, where institution displays its worthwhile research programmes, projects, and initiatives to the broad spectrum of audience in the world. An institution outreaches its findings that in turn encourage other institutions and organizations to collaborate and to share their knowledge, expertise and skills. Institutional repositories offer seamless access to documents and reflect past and present research interests of the institution as well as its future research goals. It makes the publications more usable by contemporary and future scholars as well as other professionals like policy makers and social workers. The pace of scholarly communication would be highly accelerated if the IR holds research papers, research reports, etc as soon they are made public. This also have publications in receiving more citations, since the research findings are quickly available to the fellow scholars. The IR are used throughout the institution and collaborative institutions (**LIS BD network, 2018**).

### **Core Content types deposited in Open access Repositories**

From an analyzed data it is evident that among the 12 content types identified, the majority of content is in the form of “*Journal articles*”. “*Articles*” from journals are preferred for research purposes because they are generally written by scholars in a particular field. Unlike magazines or newspapers, where journalists are being paid to write articles, or opinion-based pieces, journals are often based on original research being done by professionals (**Libguides, 2018a**). Articles tend to be brief and often report on developments and news within a field and might summarize current research being done in a particular area (**Libguides, 2018b**).

### **Subjects achieved by open access repositories**

It is evident from the study that “*Multidisciplinary subjects*” leads in open DOAR. Due to multiple subject coverage in repositories “*Multidisciplinary*” is widely used by discipline among open access repositories.

### **Language interface diversity in open access repositories**

The study reveals that among all “*English*” (2400) is one of the most prominent language interfaces used by OA Repositories. In academic publishing the use of English has a longer history especially in Sciences. In 1980 only 36% of publications were in English. It had risen to 50% in 1940-1950, 75% in 1980 and 91% in 1996 with the numbers for Social Sciences and Humanities slightly lower (**Open Learn, 2018**). English is nowadays the official language of USA, UK, Ireland, Canada, Australia, and New Zealand, Bangladesh, Ghana, India, Jamaica, Kenya, Malaysia, Nigeria, Pakistan, Philippines, Singapore, South Africa, Sri Lanka, Tanzania and Zambia. The first five countries have English as their official language by choice; the rest by way of imperialism. For political reasons,

as well as reasons of convenience, English is also the main medium of communication for International organizations (Klimczak-Pawlak, 2014).

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