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Original Research

Archiving Policies in Institutional Digital Repositories: A Global Scenario

Bijan Kumar Roy
Associate Prof., Library and Information Science,
University of Calcutta, India.
Corresponding Author: bkroylis@gmail.com
ORCID iD: https://orcid.org/0000-0001-9735-9586

Subal Chandra Biswas
Professor, Library and Information Science,
University of Burdwan, India.
scbiswas_56@yahoo.co.in
ORCID iD: https://orcid.org/0000-0002-6047-369X

Parthasarathi Mukhopadhyay
Professor, Library and Information Science, University of Kalyani, India.
psmukhopadhyay@gmail.com
ORCID iD: https://orcid.org/0000-0003-0717-9413

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Abstract

This paper analyzes and compares selected open access self-archiving policies of various repositories of elite organizations registered in OpenDOAR, ROAR, and ROARMAP databases to report a multi-faceted panoramic overview on open access archiving policy. This paper discusses three open-access policies, viz. archiving policies, version policies, and withdrawal policies against different parameters. These policies and related issues have been discussed based on existing scholarly literature and best practice guidelines available at the national and international levels. The purpose of this paper is to suggest best practice guidelines and to provide a roadmap for developing an institute-specific IDR (the institutional digital repository) in the line of global recommendations. A total of 161 repositories were selected after overlap checking and based on the selection parameters mentioned in the methodology section. All these policies mentioned above must be formulated properly as it is found that the majority of IDRs do not have such policy guidelines. Some of the key issues are not properly covered and missing in literature even within the policy. Finally, recommendations have been made against each policy to develop IDRs globally. The paper's outcomes will be useful to future researchers and policymakers who will set up IDRs or have already developed IDRs for their organization. The outputs/results of this study may be used as a guiding tool and helpful to the open-access advocates, including policymakers' library professionals, in developing repository policy for their organization. The policy framework could also be adapted to any institution irrespective of size and geographic location.

Keywords: Open Access Repository, Digital Library, Digital Repository, Digital Archive, Open Access, Self-Archiving Policy, Version Policy, Withdrawal Policy, Institutional Digital Repository.

Introduction

Researchers, scientists, and academicians' "spontaneous" self-archiving rates are generally low due to a lack of self-archiving policies or mandates (Gargouri, Hajjem, Larivière, Gingras, Carr, Brody & Harnad, 2010). About 2.5 million articles are published annually worldwide, and only 15% of them are being self-archived by their authors (Björk, Roos & Lauri, 2008; Hajjem, Harnad & Gingras, 2005). The most significant developments in this area are the growing numbers of academic and research institutes implementing open access (OA) self-archiving policies in the line of BOAI (2002), Berlin (2003), and Bethesda's (2003) declarations/statements (popularly known as 3Bs). One of the first institutional policies requiring self-archiving (a so-called "mandate") was that of the National Institutes of Health (NIH), since 02 May 2005; there was a call to all researchers to submit an electronic version of their final manuscript after acceptance for publication in PubMed Central (Sánchez-Torrago, 2007). OA mandates (from institutions and funding bodies) have almost doubled globally in the year that has elapsed since Harvard's mandate in May 2008 (Nature, 2009), and there are now almost 1075 open access (OA) mandate policies around the world as recorded in ROARMAP database (March 2021). ROARMAP is a searchable international registry charting the growth of open access mandates and policies adopted by universities, research institutions, and research funders. It was found from the database that two-thirds of mandates policies were from universities and research institutes, and Europe leads in terms of OA self-archiving policy mandates.

Millington (2006) concluded that nearly two-thirds of open access repositories (OARs) did not have publicly stated policies throughout the world. The OA deposit rate (%) was over four times as high (13.8%) for mandated organizations as compared to non-mandated ones (3.0%) (Swan, Gargouri, Hunt & Harnad, 2015). Here lies the importance of self-archiving mandate policies for the development of institutional digital repositories (IDRs) (Ware, 2004; Barton & Waters, 2004; Rieh, Jean, Yakel, Markey & Kim, 2008; Shearer, 2005; Baudoin & Branschofsky, 2003; Johnson; 2002; Armbruster, 2011). Therefore, it is the right time for policymakers to ensure that policy documentation is formulated correctly (Asamoah-Hassan, 2010).

This paper covers three important policies, including some key issues (Table 1) closely related to the smooth development of IDRs of any size and type. The nature and purpose of organizations may differ, but the areas and issues are covered here almost the same concern for all the IDRs administrators worldwide. The objective is to suggest common guidelines based on recognized best practices that may be applied to any institution, whether or not the institution has an OA mandate policy.

Table 1
Policies and related issues

Policy	Activities related to Policy
Archiving Policy	Mandatory or optional policy; time of archiving; form & format of archiving content
Version Control Policy	Multiple version control; up-gradation of version; errata and corrigenda lists
Withdrawal Policy	Reasons for withdrawal or removal of content

Materials and Methods

This research aims to explore implementations of policies related to Archiving, Version Control (pre-Print/post-print/published), Withdrawal of objects from the repository, along with several issues related to these policies.

The broad groups of works associated with this study include – a) investigation of experts' opinions as recorded in literature against the major issues/areas mentioned under each of the OA policies related to collection development and organization; the opinions of experts are then grouped and analyzed to crystallize a set of recommendations and/or best practices; b) identification of global repositories that adopted the policy issues/areas as identified as important considerations for the said OA policies. The first part of work (a) is based on an extensive literature review from various scholarly resources, spanning from 2003 to 2019, including 24 journal articles and 61 papers. Furthermore, the second part (b) includes the study to measure the implementation of recommendations/best practice guidelines as provided by experts for the policy issues adopted by the listed OARs and reflected in the OA policy databases. The policy databases at the global scale are presently OpenDOAR (University of Nottingham), ROAR (University of Southampton.), and ROARMAP (University of Southampton). There are these three databases of open access repositories at the global level. There are overlaps in coverage of OA repositories in these three global datasets. Therefore, an exclusive list has been prepared after due duplication-checking of OA repositories from respective databases. The checking duplication was done manually by eliminating common repositories from the aforementioned three databases. The unified list of OA repositories has then been analyzed against a set of pre-defined parameters based on experts' opinions.

The following steps have been taken to accomplish this task:

1. Consultation of three global databases on open access repositories (OARs), namely OpenDOAR, ROAR & ROARMAP databases;
2. Preparation of unified list of OARs as listed in all three above-stated databases after due duplication-checking;
3. Collecting policy datasets of each listed OARs from OpenDOAR, if available (this policy tool is now archived here presently (https://web.archive.org/web/20070831193103/http://opendoar.nottingham.ac.uk/tools/en/policies.php), available up to December 2019);
4. Consulting individual OAR to collect policy data if not available comprehensively on OpenDOAR policy tool; and
5. Developing a dataset related to pre-defined policy issues as derived in a tabular format derived from steps 3 & 4 has been tabulated for analysis.

The above methodology may be illustrated in Table (1A).

Table (1A)
Thematic representation of Methodology

Policies and issues	Review of Literature	Practical Implementation
Archiving Policies (Mandatory or optional; time; form & format)	Articles: 18 Book/Chapters: 6 Online Source: 13 Report: 4 Ph.D. Theses: 1 White paper: 1	OpenDOAR Policy Tool (https://v2.sherpa.ac.uk/opendoar/policytool/) ROAR (http://roar.eprints.org/) ROARMAP (http://roarmap.eprints.org/)
Version control Policies (Multiple version control; up-gradation; errata and corrigenda lists)	Articles: 1 Book/Chapters: 1 Online Source: 2 Ph.D. Theses: 1	
Withdrawal Policies *(Reasons for withdrawal or removal of objects)*	Articles: 1 Book/Chapters: 1 Online Source: 1 Report: 1 Ph.D. Theses:1	

Results

Archiving Policies

Devising the archiving policies for any IDR is the most important component for gathering the archive's content. This policy requires researchers, scientists, and academicians to deposit their peer-reviewed scholarly knowledge resources (e.g., journal articles, conference articles, books/monographs, etc.) immediately upon acceptance for publication into the organizational IDR. Four major issues must be considered in formulating this policy, i.e., *mandatory or optional archiving policy*, *archiving format*, *when to archive*, and which *version to be archived* (Table 1) as proposed by many experts.

Most of the IDRs have covered three important issues - i) 'm*andatory or optional archiving', ii) 'archiving timing and archiving version'*, and iii) a*rchiving format'* in their policy documentation. These three issues have been discussed under two broad headings: researcher's point of view (concerned with the review of existing literature) and *practice point of view* (concerned with the analysis of ROARMAP database).

Archiving Policies: Researcher's point of view

Mandatory self-archiving policies are desirable for acquiring content, but the wide implementation of such policies is another challenge to the repository administrators or policymakers (Xia, 2009; Barwick & Pickton, 2006). Swan (2006) conducted two different international multidisciplinary surveys where he found that 95% of researchers reported that they would self-archive if (but only if) required doing so by their institutions or funders. Whereas 81% reported that, if required, they do it willingly; 14% said they do it reluctantly, and only 5% of respondents do not comply with the deposit requirement. In another study, Swan

et al. (2015) concluded that many of the policies adopted by the organizations are not mandatory but encourage or request depositors or authors to provide OA for their research outputs. He also reported that mandatory self-archiving policies work much better than voluntary ones. In contrast to voluntary policies, mandatory self-archiving policies result in high compliance rates if accompanied by effective support, advocacy, and an e-infrastructure system (MedOANet, 2013). Several studies reported that mandatory policies produce higher levels of self-archiving (Graaf & Eijndhoven, 2008; Ware, 2004; Sale, 2006a, 2006b; Gibson, 2005; Pinfield, 2004, 2005; HCSTCR, 2004; Harnad, 2006a, 2006c; Rowland et al., 2004; Swan & Brown, 2005; Pickton & McKnight, 2007).

Some of the institutes have already implemented mandatory policies in their organizations. For example, the University of Glasgow (Ashworth, Mackie & Nixon, 2004). Kennan and Kingsley (2009) shared experiences of five other Australian universities and finally reported that they are willing to apply a mandatory deposit policy. National Institutes of Health (NIH), USA, and Australia's National Scholarly Communications Forum also applied similar announcements (Chan, Kwok & Yip, 2005). UGC, India (2005) supported this view and recommended that all universities should submit an electronic version of the doctoral thesis (ETDs), mandatory for all doctoral scholars. Sale (2006a), after collecting data from the Australian Department of Education, Science and Technology (DEST), reported that no such Australian universities having a voluntary policy can collect more than 15% of the DEST content significantly and most much less. Gargouri et al. (2010) reported the levels of OA in IDRs with mandatory policies compared to voluntary self-archiving (Figure 1). He further showed that mandatory policies work better than ones that simply encourage authors to deposit content to IDR. It was found from the study that the average deposit rate for institutions not having OA mandates is 15%, while institutions having such a mandate are 60%. On the other hand, Swan et al. (2015) highlighted the current state-of-the-art of mandatory self-archiving policy continent-wise (Table 2 & Figure 2). Figure 3 also gives an overview of the total number of mandatory self-archiving policies against the total number of OA self-archiving policies.

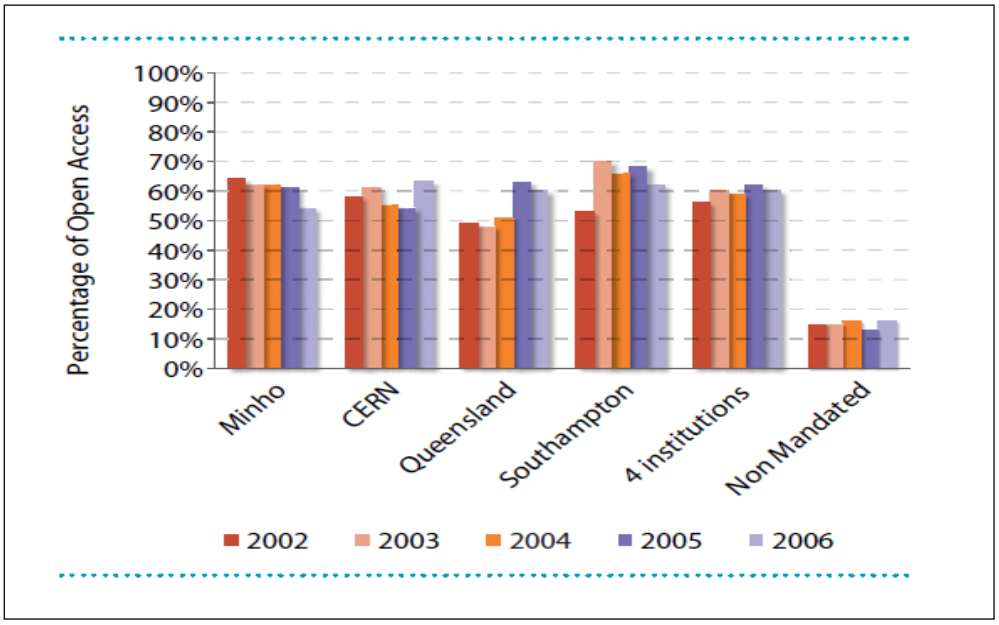
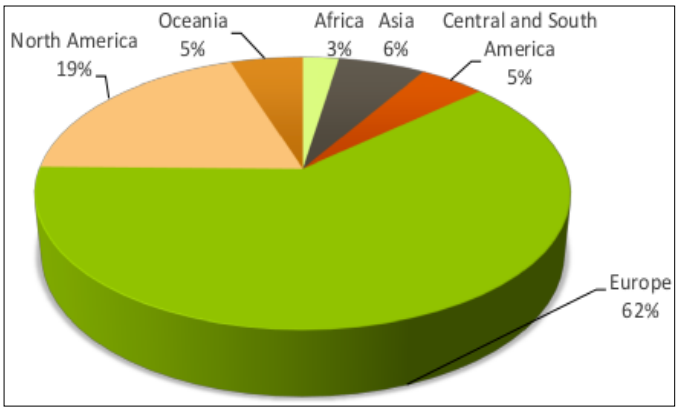


Figure 1: Percentage of the total institutional journal article outputs made Open Access by self-archiving in repositories at four Institutions (Source: Gargouri et al., 2010)

On the other hand, Swan et al. (2015) gave an overview of the continent-wise current state-of-the-art of mandatory self-archiving policy (Table 2 & Figure 2).



Figureure: 2 Mandatory Open Access policies worldwide by geographical region
(Source: Swan et al., 2015)

Table 2
Mandatory Open Access Policies worldwide by geographical region

Geographical location	Mandatory Policies
Africa	10
Asia	24
Central and South America	18
Europe	237
North America	75
Oceania	20

(Source: Swan et al., 2015)

Figure 3 also gives an overview of the total number of mandatory self-archiving policies against the total number of OA self-archiving policies.

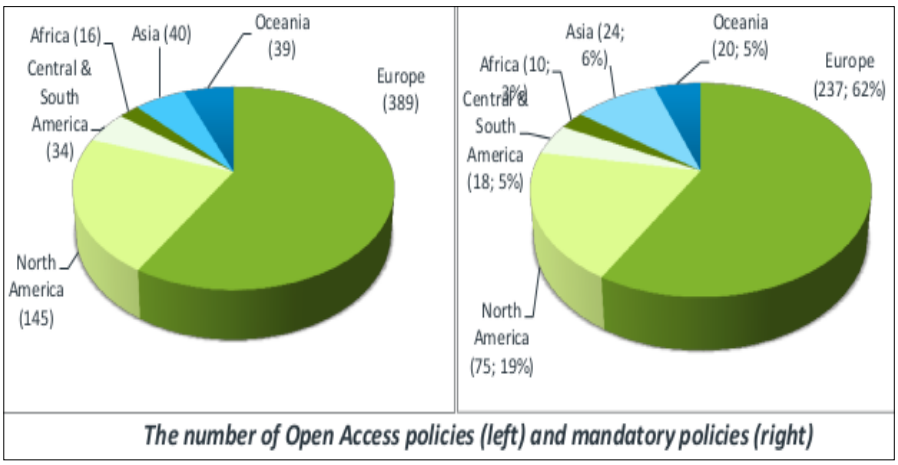


Figure 3: Mandatory Open Access policies worldwide by geographical region
(Source: Swan et al., 2015)

Swan & Brown (2005) concluded after conducting a survey the view of researchers of universities worldwide (Figure 4).

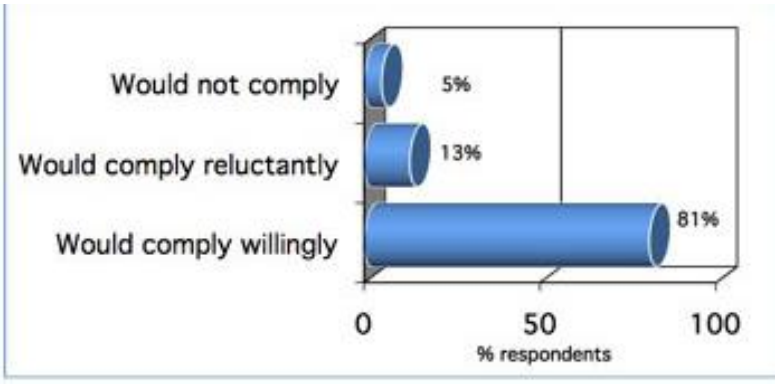


Figure 4: Researchers & Open Access Policies (Source: Swan & Brown 2005)

Roy (2014), in his research study, recommended a mandatory archiving policy. In another work, the author opined that mandatory self-archiving policy is more effective in acquiring content, and the success of any OARs depends on the number of objects (Roy, 2015).

Archiving Policies: Practice point of view

After analyzing the ROARMAP database, Roy (2014) reported that, out of 439 IDRs (as of June 2013), only nine (2.05%) IDRs favored a mandatory archiving policy (Table 3). The database lists 1075 IDRs (as of March 2021), but data regarding this issue is not available.

Archiving Policies: Researcher's point of view

Content should be archived as soon as possible after the acceptance of the publication of such content in any publishing platform such as a journal. The objective is to access the users' metadata and full text of the work (if no other legal matters arise regarding copyrights or embargo) (MedOANet, 2013). It is found that archiving timing varies from publishers to publishers, disciplines to disciplines, and even organizations to organizations (research organizations in case of funded research). Policies vary concerning the time-point they specify for the deposit of items. Swan et al. (2015) reported that only 16% (Figure 5) IDRs (having mandatory policies) and 7% (Figure 6) IDRs (having optional policies) prefer to archive only after the acceptance of the publication of any content.

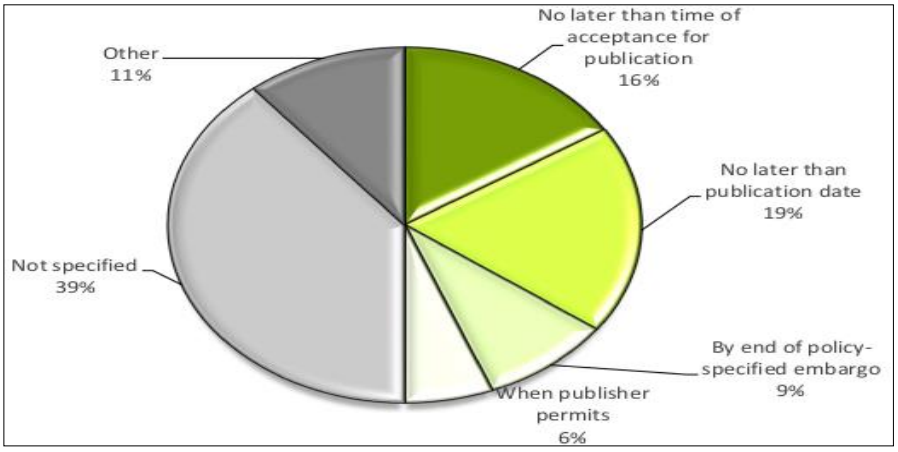


Figure 5: Time-point for deposit specified by mandatory policies (Source: Swan et al., 2015)

Stevan Harnad, another OA advocate, suggested archiving the author's final accepted referred draft immediately after publication (Harnad, 2006b). Sánchez-Torrago (2007) also recommended that the electronic version of the final manuscript be submitted in PubMed Central after acceptance for publication. DINI (2003) proposed archiving author's uploaded files in original format to the IDR.

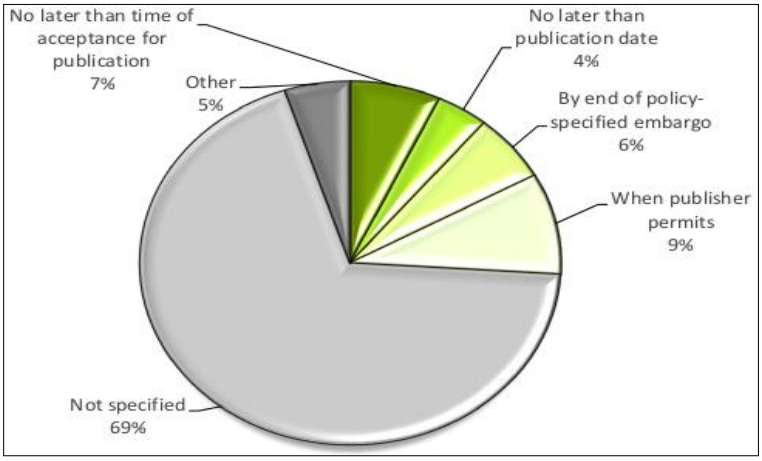


Figure 6: Time-point for deposit specified by policies that 'request' rather than mandate deposit (Source: Swan et al., 2015)

AS per Sherpa/Romeo database (publisher and journal open access policies from around the world), more than 90% of journals publishers allow authors to self-archive a copy of the 'accepted manuscript' version of their papers (http://www.sherpa.ac.uk/romeo/) (http://www.oaklist.qut.edu.au/). A study by SHERPA/RoMEO, as of May 2012, reported that 58% of publishers listed in the database allow authors to deposit final author manuscript (i.e., post-print or stage-2 version) into IDR (http://www.sherpa.ac.uk/romeo/statistics). Now, some publishers even allow self-archiving of published versions in IDR. The objective is to provide global access to their scholarly resources published in journals that will surely help increase their journals' impact.

On the other hand, Björk, Welling, Laakso, Majlender, Hedlund & Guðnason (2010) reported that most global publishers allow submitting the author's accepted manuscript in any IDR even with an embargo period. He further reported that 62% of journal publishers registered

in global databases permit immediate self-archiving by their authors anywhere, 4% of publishers impose an embargo of 6 months, and 13% publishers an embargo period of 12 months. As a whole, about 80% of articles become openly available in the public domain within a year of such publication. MedOANet (2013) also urged authors to archive peer-reviewed research articles immediately upon acceptance for publication with the condition that if it is under publisher embargo, they could be deposited in IDR with secure access until the embargo period is over. Roy (2014) reported that most publishers allow archiving the author's final accepted draft as soon as possible after the acceptance of publication. He further reported archiving the said draft immediately after accepting such work to fulfill the objective of OA philosophy (Roy, 2015). After compiling SHERPA/Romeo database, another study (OAIS, 2012), showed the present self-archiving permissions by journals (Figure 7) and publishers, respectively (Figure 8).

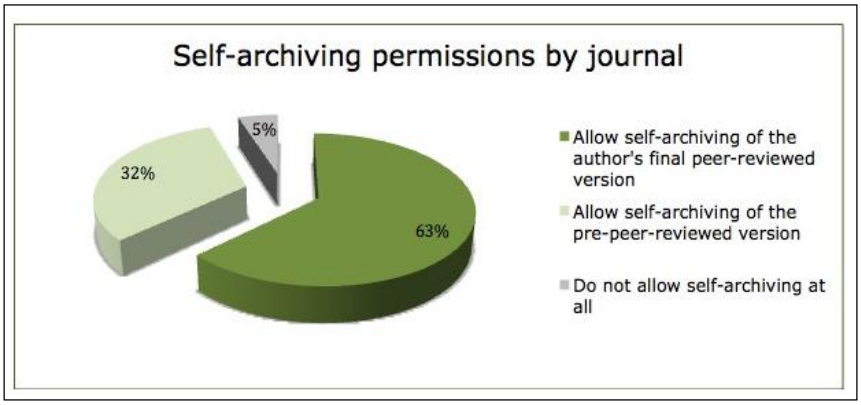


Figure 7: Self-archiving permissions by Journals
(Source: OAIS, 2012)

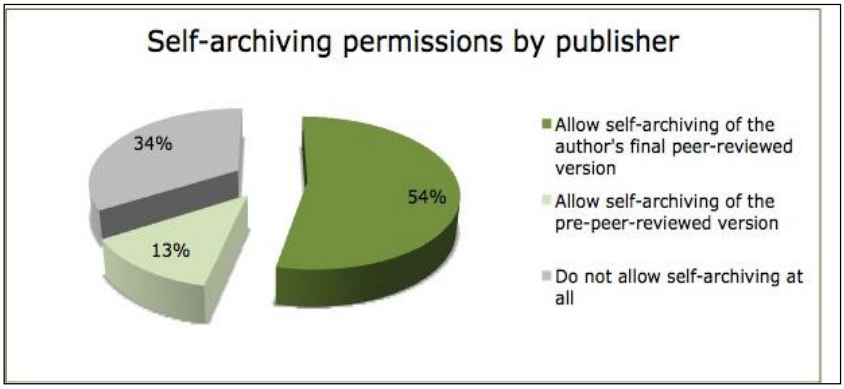


Figure 8: Self-archiving permissions by Publishers
(Source: OAIS, 2012)

Archiving Policies: Practice point of view

In an early study, it was found in ROARMAP database that only 31 (7%) (Out of 439 as of June 2013) IDRs mentioned archiving timing (i.e., when to archive) as reported by Roy in 2014 (Table 2). Furthermore, most IDRs suggested archiving 'a*uthor's final accepted referred draft'*. The ROARMAP database covers 1075 IDRs (as of March, 2021), and nearly 50% of IDRs have no such data on archiving timing. Only 12% to 15% IDRs prefer to archive '*immediately after the acceptance of publication'* whereas 14% to 16%) IDRs suggested *'no later than the*

publication date'. Apart from these, 7% to 9% IDRs prefer to archive '*after the end of policy-specified embargo period'* as suggested by different publishers (in case of journal articles) and funders (in case of funded research). Another 8% to 10% IDR supports archiving when publishers archive the scholarly objects.

After analyzing ROARMAP database, Roy (2014), reported that only 7% to 9% (out of 439 as of June 2013) IDRs mentioned version issues, and most of the IDRs assist archiving '*author's final peer-reviewed version'* (Table 3). Now in ROARMAP database, the picture is almost the same, and almost half of the repositories, 44% to 46% IDRs, did not mention this issue. Only 39% to 40% of repositories support archiving *'author's final peer-reviewed version' whereas* only 10% to 12%) IDRs prefer *'Published edition,'* i.e. '*version of record'*.

Archiving Policies: Researcher's point of view

Generally, most repositories support all types of file formats for archiving content. However, authors are requested to deposit content in PDF or HTML format. The ARL-sponsored survey reported that 74% of ARL libraries accept any digital file type (Bailey Jr., 2006) for archiving objects. On the other hand, some of the IDRs recommended a comprehensive list of file formats applicable to different documents. Jones, Andrew & MacColl (2006) concluded that the best sort of files is the contents and format are human-readable. The PDF file format is widely used in cases (DINI, 2003; Pappalardo, Fitzgerald, Fitzgerald, Kiel-Chisholm, O'Brien & Austin, 2007; Aschenbrenner & Kaiser, 2005; Pinfield, 2002; Cervone, 2004). Rimkus, Padilla, Popp & Martin (2014) studied 118 repository managers of the Association of Research Libraries (ARLs), USA, and reported that PDF is the third preferred choice after TIFF and WAV file format. Roy (2014) suggested that repository managers prefer PDF as archiving format as it (pdf) is suitable for long-term preservation for perpetual access (Roy, 2015).

Archiving Policies: Practice point of view

Roy (2014) analyzed ROARMAP database and found that 31 (7%) (Out of 439 as of June 2013) IDRs prefer PDF format (Table 3). Though, IDRs support almost all open file formats. Now ROARMAP lists 1075 IDRs policy mandates (as of March 2021), but no data regarding archiving format is available in its present structure.

Table 3
Archiving Policies (Source: ROARMAP)

Name of the Repository	Policy related to Archiving			
	Mandatory / Optional	When to Archive	What to Archive	Prefer Format
Anglia Ruskin Research Online				Open formats
Australian National University Research Repository				PDF
Aston University Research Archive				PDF
Australian Research Council		at the earliest possible opportunity		

Name of the Repository	Policy related to Archiving			
	Mandatory / Optional	When to Archive	What to Archive	Prefer Format
Bond university				PDF
Brandeis Institutional Repository			Author's final peer-reviewed version	
British Heart Foundation		accepted for publication	Author's final peer-reviewed version	
Bharathidasan University	Y			
California Institute of Technology			Author's final peer-reviewed version	PDF
California Polytechnic State University				PDF
Canadian Breast Cancer Research Alliance		as soon as possible after publication	Publisher's version /Author's final version	PDF
Canadian Cancer Society		as soon as possible	Any publications	
Canadian Health Services Research Foundation			Published papers	
Canadian Institutes of Health Research		accepted for publication	Author's final peer-reviewed version	
Chief Scientist Office		accepted for publication	Author's final peer-reviewed version	
Cornell University				Plain text, XML, PDF
CRISAT International Crops Research Institute for the Semi-Arid Tropics				PDF
Charles Sturt University Institutional Repository		accepted for publication	final version	
Dublin Institute of Technology				PDF
Dunhill Medical Trust		accepted for publication	Author's final version or publisher's version	
E-prints in Library and Information Science				PDF & HTML
European Commission		accepted for publication	Author's final version or publisher's version	PDF
European Heads of Research Councils		as soon as possible after	post-prints (or publisher's	

Name of the Repository	Policy related to Archiving			
	Mandatory / Optional	When to Archive	What to Archive	Prefer Format
		publication	version if permitted)	
European Research Advisory Board		as soon as possible after publication	post-prints (or publisher's version if permitted)	
European Research Council		at the date of publication	Author’s final version or publisher’s version	
European University Association		accepted for publication		
Fonds de la recherche en sante Quebec		after publication or presentation	peer-reviewed publications	
Genome Canada		as soon as possible	peer-reviewed publications	
Ghent University policy			author's version (postprint)	
Indiana University–Purdue University Indianapolis		accepted for publication	final version or version accepted	any standard format
Institute of Education Sciences		accepted for publication	Author’s final peer-reviewed version	
Joint Information Systems Committee		At the earliest possible opportunity	Author’s final peer-reviewed version or publisher’s version	PDF
Leicester Research Archive Policies				PDF
Macquarie University Digital Repository		accepted for publication	Author’s final peer-reviewed version	
Madurai Kamaraj University		accepted for publication	Author’s final peer-reviewed version	
Medical Research Council		earliest opportunity accepted for publication		
Michael Smith Foundation for Health Research			Author’s final version	
National Health and Medical Research Council		at the earliest possible opportunity	Author’s final peer-reviewed / Publisher’s version	
National Institutes of Health		accepted for	Author’s final	

Name of the Repository	Policy related to Archiving			
	Mandatory / Optional	When to Archive	What to Archive	Prefer Format
		publication	peer-reviewed version	
National Research Council	Y			
Queensland University of Technology	Y	accepted for publication	Author's final peer-reviewed version or publisher's version	
Southampton's ECS departmental repository	Y			
Trinity College Dublin		accepted for publication		
United States Department of Agriculture			final published version	PDF or other standard format
University of Abertay Dundee		accepted for publication	Author's final peer-reviewed version	PDF
University of Barcelona		immediately following publication		
University of Birmingham Research Archive				PDF
University of Bradford				PDF
University of Helsinki			Final published version or the version accepted	Standardized & hardware-independent format
University of Huddersfield				PDF
University of Kansas				Recommend-ded file formats list
University of Loughborough			Author's final peer-reviewed version	Word or PDF
University of Melbourne Eprint Repository				PDF & HTML
University of North Texas		as soon as possible after publication	Author's final peer-reviewed accepted version or as allowed by the publisher	
University of Pretoria				PDF
University of Queensland	Y			
University of Reading				PDF
University of South Australia				PDF
University of Southampton Research Repository	Y			

Name of the Repository	Policy related to Archiving			
	Mandatory / Optional	When to Archive	What to Archive	Prefer Format
University of Starling (STORRE)		accepted for publication	Author's final peer-reviewed version	PDF
University of Surrey		as soon as possible after publication		
University of Tasmania	Y			
University of Utah's institutional repository			Author's final peer-reviewed version	
Victoria University Institutional Repository	Y			PDF
Wake Forest University			Author's final peer-reviewed version	
Wellcome Trust	Y	as soon as possible	Author's final peer-reviewed version	PDF
Zurich Open Repository and Archive				PDF

Archiving Policies: Analysis and Results

A set of recommendations are drawn as archiving policy based on the discussion made in this particular section:

1. *All authors must submit work to the IDR;*
2. *Author's final accepted refereed draft is to be archived in IDR;*
3. *Paper(s) is to be archived immediately after acceptance of publication; and*
4. *IDR managers will accept paper (s) only in PDF format.*

Version Control Policies

This version policy addresses the issues and uncertainties relating to versions of academic papers in IDRs. Several key questions may arise in this policy, i.e., how version control is to be managed or how complaints are to be explained? Do IDRs allow changes to deposited items, or do IDRs items change after being committed to the repository? Do you allow multiple versions? Can *errata* and corrigenda be accommodated in IDR?

The most important question in this domain is '*version to be archived*' and has been discussed under two sections under two broad headings, namely *researcher's point of view* and *practice point of view*.

Version Control Policies: Researcher's point of view

It is logical to ensure that different versions of files available in different formats are kept in proper location /places (UK Data Archive, 2008). If there is any change in versions or the file's location is altered, the corresponding information in other files also needs to be altered. Different versions may co-exist in electronic form in the IDR environment (http://www2.lse.ac.uk/library/versions/). Green, Macdonald, and Rice (2009) suggested that

the earlier version is to be withdrawn from public view, and there may be a link between earlier and the later versions, with the most recent version identified. They further reported that the item's persistent identifier always links to the latest or current file version. Gibbons (2004) also assists with a link, i.e., persistent URL (Uniform Resource Locator) only with the original version. Roy (2014) suggested that all files or versions (i.e., author manuscript, published version, etc.) must be kept separately in IDR. In another work, the author recommended that all the versions of a file be kept in IDR to show the progress of the scholarly research works (Roy, 2015).

Version Control Policies: Practice point of view

After reviewing ROARMAP database, Roy (2014), in his research work, reported that only 30 (6.8%) IDRs (out of 439 as of June 2013) mentioned this version of policies (Table 4). Some of the IDRs suggested that errata and corrigenda lists be provided with the original file. In such a situation, or if any errors occur, it is the responsibility of the authors to give the corrected files. But it will be improper to allow changes in the deposited items. The database lists 1075 IDRs (as of March 2021), but data regarding this issue is not available. Below are the explanations (Table 4).

Table 4
Version Control Policy

Name of the repository	• Changes to deposited items are not permitted • If necessary, an updated version may be deposited	Inclusion of Errata and Corrigenda lists with the original record
Aston University Research Archive	B	
Bond University	B	
Covenant University	A	√
Edith Cowan University	C	√
HKUST Institutional Repository	C	√
Katholieke Universiteit Leuven	B	
Leeds Metropolitan University	C	√
Leicester Research Archive	C	. √
Loughborough University	C	
Natural Environmental Research Council	C	√
Penn's Institutional Repository	B	
University of Strathclyde Institutional Repository (Strathprints)	C	
TeesRep, Teesside University's Institutional Repository	C	√
Trento University	B	√
Universidad Nacional de Colombia	C	
University of Bath	C	√
University of Calgary: Library and Cultural Resources	A	Exceptions may apply
University of East Anglia	C	Inclusion of Errata and Corrigenda lists with the original record

Name of the repository	• Changes to deposited items are not permitted • If necessary, an updated version may be deposited	Inclusion of Errata and Corrigenda lists with the original record
University of Edinburgh	B	√
University of Leicester	B	
University of Lincoln	C	√
University of Nottingham	A	√
University of Reading	C	√
University of Salford	B	
University of Stirling	C	
University of Surrey	C	
University of Westminster	B	√
Warwick Research Archive Portal	C	√
York St John University	B	

*[**Legend:** A = Changes to deposited items are not permitted; B = If necessary, an updated version may be deposited; C = Both (A+C)]*

Version Control Policies: Analysis and Results

A set of recommendations are drawn as a version control policy based on the discussion made in this particular section:

1. *A repository may/will keep the original updated version;*
2. *Work submitted to the IDR cannot be revised post-publication;*
3. *Changes to deposited items are not permitted. However, authors are allowed to post subsequent versions of their work to show the progression of their research work;*
4. *An updated version may be deposited, if necessary. The earlier version may be withdrawn from public view;*
5. *The original bit stream is retained for all items, in addition to any upgraded formats;*
6. *Errata and corrigenda lists may be included with the original record if required; and*
7. *There will be links between earlier and later versions, clearly identifying the most recent version. The original URL (Uniform Resource Locator) or persistent identifier will be linked to the latest version.*

Withdrawal Policies

A withdrawal policy is an important issue in developing IDR. Several key holders are involved with this policy. Some important questions may arise in this policy, i.e., will IDR allow content to be withdrawn, or how are items withdrawn? If yes, in which circumstances and how this issue will be carried out. Another point is that a withdrawal of content means complete deletion of a metadata record and removal of the offending resource from IDR? Will IDR remove objects or files from the system, or will IDR remove the metadata record describing the contents? Are objects be deleted entirely or removed from public view? Will IDR keep the original record of the file with the corresponding URL? What happens with their publications when a member leaves the institution?

The most important question in this domain is '*reasons for withdrawal of items*' and has been discussed in two sections under two broad headings, namely the researcher's point of view

and practice point of view.

Withdrawal Policies: Researcher's point of view

As per OA philosophy, items submitted will not be removed or withdrawn from the IDR. Many experts strongly discourage the withdrawal of items (Ware, 2004; Probets & Jenkins, 2006) from the IDR because one definition of IDRs is that items should be cumulative and perpetual (Johnson, 2002). Probets and Jenkins (2006) suggested keeping a record of the object, even if removed. Green et al. (2009) explained several reasons/conditions for withdrawing items from the repository. Johnson (2002) concluded that IDRs typically do not remove content once submitted to the IDR. Although, he mentioned several reasons and circumstances under which an item could be withdrawn. Roy (2014) reported that most IDRs allow withdrawal of content on sufficient ground and under certain conditions.

Withdrawal Policies: Practice point of view

It was found in a study by Roy (2014) that only 64 (14.57%) IDRs (against 439 IDRs as of June 2013) registered in the ROARMAP database allow withdrawal of items and outline a variety of legitimate circumstances under which an object may be withdrawn from the archive (Table 5). The database lists 1075 IDRs (as of March 2021), but data regarding this issue is not available.

Table 5
Withdrawal Policy

Name of the Repository	Acceptable reasons for withdrawal of items
Anglia Ruskin Research Online	Publisher's rules; Copyright violation; Plagiarism; National Security; Falsified research
Archive ouverte UNIGE	√
Arizona State University Digital Repository	Legal issues (copyright violation or violation of the terms of the depositor's agreement); Plagiarism
Aston University Research Archive	Publisher's rules; Copyright violation; Plagiarism; National Security; Falsified research
Arts and Humanities Research Council	√
Brigham Young University Library	Publisher or creator requests
California Digital Library	submission errors, rights violations, or inappropriate content
Canadian Cancer Society	Publisher's rules; Copyright violation; Plagiarism; National Security; Falsified research
Canadian Health Services Research Foundation	√
Canadian Institutes of Health Research	√
Centre for Environmental Data Archival Repository	√
Covenant University Repository	√
Cornell University Library	Request of the author legal order due to a violation of eCommons policy
Council of Scientific and Industrial Research	Publisher's rules; Copyright violation; Plagiarism; National Security; Falsified research

Name of the Repository	Acceptable reasons for withdrawal of items
Edith Cowan University	√
European Heads of Research Councils	√
European Research Advisory Board	√
European Research Council	√
European University Association	√
Fonds de la recherche en sante Quebec	√
Fonds zur Foerderung der wissenschaftlichen Forschung	√
Genome Canada	√
Heart and Stroke Foundation of Canada	√
Indiana University–Purdue University Indianapolis	request of the author; IUPUI's discretion; IUPUI libraries' discretion; legal order"
Joint Information Systems Committee	Publisher's rules; Copyright violation; Plagiarism; National Security; Falsified research
Katholieke Universiteit Leuven	√
Khazar University	√
Kwame Nkrumah University of Science and Technology Institutional Repository	√
Leeds Metropolitan University institutional repository	√
Leicester Research Archive Policies	√
Loughborough University	√
Massachusetts Institute of Technology	request of the author; MIT's discretion; MIT libraries' discretion; legal order"
Michael Smith Foundation for Health Research	Publisher's rules; Copyright violation; Plagiarism; National Security; Falsified research
Natural Environmental Research Council	request of the author/copyright holder
National Research Council	Michael Smith Foundation for Health Research
Natural Sciences and Engineering Research Council of Canada	Publisher's rules; Copyright violation; Plagiarism; National Security; Falsified research
Northern Melbourne Institute of TAFE	√
University of Nottingham	√
Ontario Institute for Cancer Research	√
Penn's Institutional Repository	Under special circumstances
Stanford University (School of Education)	Publisher's rules; Copyright violation; Plagiarism; National Security; Falsified research
University of Strathclyde Institutional Repository (Strathprints)	√
Teesside University's Institutional Repository (TeesRep)	√
Trento University	√
Universidad Nacional de Colombia	√
University of Abertay Dundee	discretion of the University; material commercially sensitive or confidential; publisher or funder agreements or conditions; restricted by

Name of the Repository	Acceptable reasons for withdrawal of items
	copyright
University of Bath	Publisher's rules; Copyright violation; Plagiarism; National Security; Falsified research
University of Calgary (Library and Cultural Resources)	Queries from publishers or other copyright owners; Queries from co-authors
University of East Anglia	Publisher's rules; Copyright violation; Plagiarism; National Security; Falsified research
University of Edinburgh	√
University of Florida Institutional Repository	√
University of Helsinki	√
University of Lincoln	√
University of Melbourne Eprint Repository	Plagiarism; request of the author; publishers desire
University of Nottingham	Publisher's rules; Copyright violation; Plagiarism; National Security; Falsified research
University of Pittsburgh	√
University of Reading	√
Niversity of Salford	√
University of Stirling Open Access Institutional Repository	√
University of Surrey	√
University of Virginia	√
University of Westminster	√
Wake Forest University Institutional Repository	request of the author; request of the community; WFU's discretion; Libraries' discretion; legal order
Warwick Research Archive Portal	Publisher's rules; Copyright violation; Plagiarism; National Security; Falsified research
York St John University	√

Withdrawal Policies: Analysis and Results

A set of recommendations is drawn as withdrawal policy based on the discussion made in this section and outlines the circumstances under which withdrawal of contents may be possible.

Falsified research;

1. *National security;*
2. *Copy right violation or plagiarism;*
3. *Journal publisher's rule;*
4. *If the journal in which a paper is formally published requires it;*
5. *In case of submission error;*
6. *In case of inappropriate content; and*
7. *If the academic or copyrights holder decides to remove it.*
8.

Discussion

This paper has discussed some of the key policies (Table 1) and some of the issues (such related to these policies). There is no mention of archiving policies and related issues in any global databases under study. Some issues related to archiving policies such as archiving version, archiving timing, and suitable archiving format have been discussed in existing scholarly literature. But it is not sufficient, and there is no supporting document in IDR sites or OpenDOAR policy tools. There is no supporting document regarding suitable archiving format, especially for non-textual object types. This issue is vital as many IDRS possess non-textual objects like datasets, patents, software, learning objects, etc. So, these policies, along with the key issues, are required to be seriously re-engineering. In version control policies, several versions are available for the same objects. So, which version is to be archived is an important issue as it is directly related to copyrights policy or embargo policies. Sometimes, publishers allow pre-prints or post-prints, or published versions. They impose an embargo on different versions for a certain time. In this case, it is suggested to consult Sherpa/Romeo (https://v2.sherpa.ac.uk/romeo/) or Sherpa/Juliet (https://v2.sherpa.ac.uk/juliet/) databases to check the policies of publishers or funders to avoid any copyrights or legal problems. Generally, academicians upload many versions for the up-gradation of content. In that case, which version is to be displayed, or will IDRs keep multiple versions of an item.

There is no directive in this context. If current versions are kept in IDRs, then there should be a link to previous records or objects so that users can access metadata and the full text of such objects. In withdrawal policy, it is found that items are not generally withdrawn from any IDR system unless or until any legal problems arise. As per the OA philosophy, items should not be withdrawn from the repository, and objects will be there for perpetual access. However, several OA advocates have already suggested that items could be withdrawn on sufficient ground in existing scholarly literature. Once an item is withdrawn, is it searchable, or would the repository take measures to display the withdrawn content for public use? Unfortunately, there is no information in this regard. Before withdrawing an item, sufficient measures are required to keep the interest of the users' community. Another important issue is managing the metadata of withdrawn items. Is metadata of withdrawn items being displayed in IDR? The logic is to provide access to at least metadata, including the abstract of the withdrawn item. It is better to link the withdrawn item to access the said object.

Based on the SHERPA/RoMEO database meant for publishers' sites, Roy (2021) reported that almost 62% of publishers allow post-prints, i.e., accepted manuscripts to archive in IR. Though most elite publishers have explicit pre-print policies, commercial publishers are the most restrictive in permitting self-archiving of the published article in IR. Even in some cases, specific information regarding different article versions is commonly missing. Author also clearly stated when, what and where to archive, including a suitable format for long-term preservation, including re-use rights of such content. After reviewing COAR members' repositories, Roy, Biswas and Mukhopadhyay (2018) reported that 70.5% OARs have mentioned archiving policy. The majority of these repositories allow archiving an author's final peer-reviewed version immediately after acceptance of publication.

On the other hand, some repositories recommended archiving the published edition (i.e., version of record or the version finally published) and some other repositories allow deposition of any version 'no later than the publication date'. Moreover, there are differences among repositories concerning the 'time-point of deposit' of an item to IR. Some repositories allow

deposition of items 'by the end of policy-permitted embargo' specified by the publishers. Some other repositories recommended deposition of items 'when publisher permits'. Another group of repositories recommended the time-point of deposit as 'No later than the time of acceptance'.

In another study, after reviewing COAPI members' repositories, authors (Roy, Biswas & Mukhopadhyay, 2016) reported that nearly 50% of repositories have mentioned this archiving policy and suggested archiving an 'author's final version immediately after acceptance of publication'. However, some other repositories advocated for archiving 'any version no later than the publication date'. And, only one repository clearly stated that an article has to be archived 'within 6 months to 2 years after the acceptance of a publication'. Interestingly, not a single repository has mentioned whether they follow a mandatory or optional deposit policy. Authors also suggested following the "Immediate Deposit/Optional-Access' (IDOA) policy to ensure 100% deposition of contents into the repositories keeping in mind the 'spirit and meaning of open access philosophy.'

Roy (2021) proposed in the line of open access view that withdrawn items will stay accessible in the future for perpetual access. In our study on COAR members' repositories, only a few repositories suggested withdrawal of items on sufficient ground. This view is also supported by COAPI members' repositories as suggested by the authors. We will try to link our findings with the current study to show the ground reality.

Based on the discussion made in the earlier paragraph, a list of suggestions for OAR related to archiving policy may be suggested as follows. Only 67 (41.61%) OARs support this policy in archiving policy. Though, all OARs do not support all the issues covered in the archiving policy. Many OARs prefer pdf format but support archiving in all formats. In the version, control policy, only 29 (18.01%) OARs support this policy. But it is impossible to know which OAR supports which versions, viz. Pre-print, post-print, published version. In withdrawal policy, 65 (40.37%) OARs support the withdrawal of items on sufficient ground. In this policy, all OARs do not support the withdrawal of items, but the reasons for the withdrawal of items are almost the same. So, all these issues need further reworking against existing best practice guidelines because these policy issues may affect the repository services and may impact policy formulation.

Conclusion

It is well established that OA resources are growing worldwide because of their potential benefits to the academic community. It increases the research's visibility, accessibility, discoverability, and impact and supports the wide sharing of information. Furthermore, OARs as a green path to OA play a vital role in this open knowledge movement by providing immediate access to the public-funded research outputs to the scholars. In our previous paper (Roy, Biswas & Mukhopadhyay, 2022), we discussed five important OAR policies: content policy, collection organization, and management policy, metadata policy, submission policy, and multilingual policy. And, the overall picture was not satisfactory when the policy issues were concerned. Many issues (such as using standard subject schemes or vocabulary control tools, use of domain-specific metadata schema, submission workflow, authorized submitter, quality control mechanism, incorporation of non-English knowledge objects in IDR) were not considered in the existing literature, and still, there are no standard guidelines regarding these issues. Our objective was to identify the literature gaps and address issues relating to such policies while setting up an institutional repository. Another two papers (Royet al., 2018, 2016) have also discussed such policies of OARs of different COAPI and COAR members'

organizations and finally concluded that the majority of the OARs were not in a good position in terms of their policy implementation.

In this paper, we have covered another three policies closely related to the development of OARs on a global scale. To satisfy the mission of OA to knowledge movement, an institutional-level OAR policy guideline is essential in enhancing scholars' awareness of and participation in the open access movement. Many initiatives have already been taken at the national and international level to promote open culture among the academic community by bringing all the publicly funded research outputs freely available under open licenses to the public to use, re-use, and share in any media in open formats. Following the recommendations made by 3Bs (BOAI, Berlin Declaration, and Bethesda Declaration), Plan S has recommended that from 2021, scientific publications funded by public grants must be published in compliant OA platforms such as publishing in open access journals or archiving articles in any open access repository (https://www.coalition-s.org/). In our country, India has also implemented Delhi Declaration (http://openaccessindia.org/delhi-declaration-on-open-access-brief/), DBT & DST (http://dst.gov.in/sites/default/files/APPROVED%20OPEN%20ACCESS%20POLICY-DBT&DST (12.12.2014) _1.pdf) policy to support the open movement by adopting open technologies for sharing science and open scholarship. In a recent study, Roy (2021) has also proposed best practices against each policy covered in this paper based on international guidelines, and this may be a guiding tool for the repository administrators in devising IDR policies at the institutional level.

However, after the successful journey of over 30 years since 1991 (the first subject repository arXiv started functioning), OARs are in a critical situation when policy matters are concerned, and the adoption rate of policies by repositories is not up to the standard. Even OA policies first began to appear in 2002 in a sub-institutional policy from the School of Electronics & Computer Science at the University of Southampton, UK. The first research funder policy, a mandatory policy from the Wellcome Trust, appeared in 2005. Still, we are far from the reality of adopting the OA philosophy, and we could not achieve as much as we expected in this context. We are not getting desirable responses from the academic community, publishers, funded organizations, or the government in devising policy proposals. As a result, no such mandate has developed at the institutional level, forcing organizations to submit public-funded research outputs in any open platforms such as institutional repositories. Even no such legislative provision exists to make archiving mandatory to share information and broadly improve self-archiving of intellectual outcomes. So, devising a common set of mandates/policies, i.e., "one-size-fits-all," against pre-defined issues based on existing best practices, has become a key concern for the repository developers. Finally, if we want to achieve 100% OA of research outputs, we need to adopt sound OA policies or mandates at the institutional level to open up the possibility of achieving some measurable success in promoting the discovery of available content.

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