Degrees of openness: Grey literature in institutional repositories

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Grey Literature in Institutional Repositories

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Abstract

In spite of the growing success of the open access initiative, a significant part of scientific and technical information remains unavailable on the web or circulates with restrictions. Even in institutional repositories created to disseminate the scientific production of an academic institution, broad and open access to more or less important sectors of the scientific production is restricted. In order to provide new empirical evidence, 25 large institutional repositories from different continents were selected in the international directory OpenDOAR. For each repository, the access to the full text for different document types was evaluated, and the statistics were analysed for each site and cumulated. Building on our past work and new empirical data from large institutional repositories on different continents, we distinguish between different degrees of openness. Which are the main reasons, which are the stabilizing functions of this situation? The communication tries to provide some elements of understanding, together with good practices and recommendations.

Introduction

The institutional repository of the University of Nebraska-Lincoln[1] (UNL) is a collaborative service of the university's libraries that aims to provide long-term preservation and world-wide electronic accessibility of digital materials deposited by faculty, researchers and students associated with UNL. It contains 13,296 theses and dissertations from 1897 to 2014 (October 6, 2014). 12,024 dissertations are indicated as "available in PDF" while 1,272 dissertations have no link to full-text. Yet, for "non-UNL users" it is impossible to log into the UNL proxy server and download any of these PDF files, and they have to request the items through interlibrary loan.

The open access principle requires that scientific information be made widely and readily available to society. Defined in 2003 as a "comprehensive source of human knowledge and cultural heritage that has been approved by the scientific community"[2], open access implies that content be openly accessible and this needs the active commitment of each and every individual producer of scientific knowledge.

In spite of the growing success of the open access initiative, a significant part of scientific and

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[1] DigitalCommons@University of Nebraska-Lincoln, available at http@digitalcommons.unl.edu
[2] Berlin Declaration on Open Access, available at http://openaccess.mpg.de/Berlin-Declaration

technical information remains unavailable on the web or circulates with restrictions[3]. Even in institutional repositories created to disseminate the scientific production of an academic institution, broad and open access to more or less important sectors of the scientific production is restricted.

Institutional repositories (IR) have been defined as "tools (…) for collecting, storing and disseminating scholarly outputs within and without the institution" (Jain, 2011) and as "a set of services (…) for the management and dissemination of digital materials created by the institution and its community members (based on) organisational commitment to the stewardship of these digital materials" (Lynch, 2003). With 2,258 sites out of 2,729 (83%)[4], they represent the most important part of the so-called green road to open access.

They contain many scientific documents that were not available previously on the Internet, but some items are under embargo or restricted to on campus access, and for other items there is only metadata, without links to the full text. Following the OpenDOAR, many repositories contain different document types (table 1).

Document type	% of institutional repositories
Articles	72%
Books, book chapters	37%
Electronic theses and dissertations	61%
Communications	37%
Reports	(37%)*
Working papers	(37%)*
Patents	4%
Datasets	4%

Table 1: Part of institutional repositories containing different types of documents (N=2,258) (*OpenDOAR index reports and working papers together as "unpublished")

Most of the institutional repositories contain articles (72%) and theses (61%). One third have books, conferences or unpublished papers (reports, working papers…). Very few hold patents or datasets (4%). Normally, all these items should be at least "gratis" available, ready to view, read and download, if not in "libre" open access with maximum reuse rights. In fact, one part of them are neither gratis nor libre. Open archives are less open than they should be.

Yet, it is difficult to estimate the part of "missing" full text in institutional repositories. OpenDOAR warns "full texts are not available for most results" of its content search tool but does not provide any statistics. Operated by the Bielefeld University Library, the search engine BASE harvests metadata from more than 50 million documents but indicates that the full text is available for only 75% of them.

These are global figures. Recently, Ahmed et al. (2014) reported low availability of electronic theses and dissertations in several Asian institutional repositories. In order to contribute to a better understanding of this situation we conducted a survey of 25 institutional repositories with together more than two million items. Our intention was to evaluate their degree of openness with specific attention to different categories of documents. Some results have already been

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[3] Estimations on the part of scientific publications in open access are difficult and vary widely, between 10% and 50%, depending on type of documents, discipline, country and source of information.

[4] Statistics from the OpenDOAR directory (28 September 2014).

published (Schöpfel & Prost 2014). The following paper shifts the focus on grey literature.

Methodology

The empirical data in our study are from a sample of 25 institutional repositories. All repositories were selected using OpenDOAR, the authoritative directory of academic open access repositories. The following search criteria were applied:

- Repository type: Institutional
- Content type: PhD theses and articles (at least)
- Size: 10,000+ items (preferred)

The search was conducted by region (Europe, Asia, Africa, Australasia, North America, South America/Central America/Caribbean), and only those repositories that are operational (i.e. recently updated), that contain different document types including non commercial literature (theses, reports etc.), that allow for filtering by document type and access options (full-text vs. restricted/no access to full-text) as a browse and/or search functionality and that indicate the exact number of results (retrieved items) were selected.

Secondly, we conducted a detailed search and/or browsed on each site for specific document types: articles, books and book chapters, conference proceedings and communications, reports, PhD theses, and working papers (unpublished). We also looked for patents and datasets but did not include them in the global analysis. For each document type, we distinguished the items with free and non-restricted access to the full text (open access) from those with restricted access (embargo, intranet, authorized users, etc.) or without full text (reference only). Whenever possible, we also made this distinction for the entire repository content.

The repositories were selected in February 2014. The analyses of each site were conducted in February and March 2014.

Results

Size and openness of the repositories

The selected repositories (IR) are listed in the appendix. For our study, we did not evaluate the whole content of each IR but limited the analysis to six document categories (working papers, theses, reports, articles, communications, books/book chapters). The total number of items in our study is 2,086,622.

The median size of the sample repositories is 26,683 documents, ranging from 1,199 (Amherst) to 775,561 (HAL[5]). Again, this is not the total size but the sum of the selected and evaluated document types, excluding for example courseware, images or Master dissertations. Thus, the true size of the IRs is higher (in average, +9%).

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[5] The French HAL repository is a special case insofar it is a national open repository that integrates several institutional repositories from universities and other research organisations. For this reason it was included into the study.
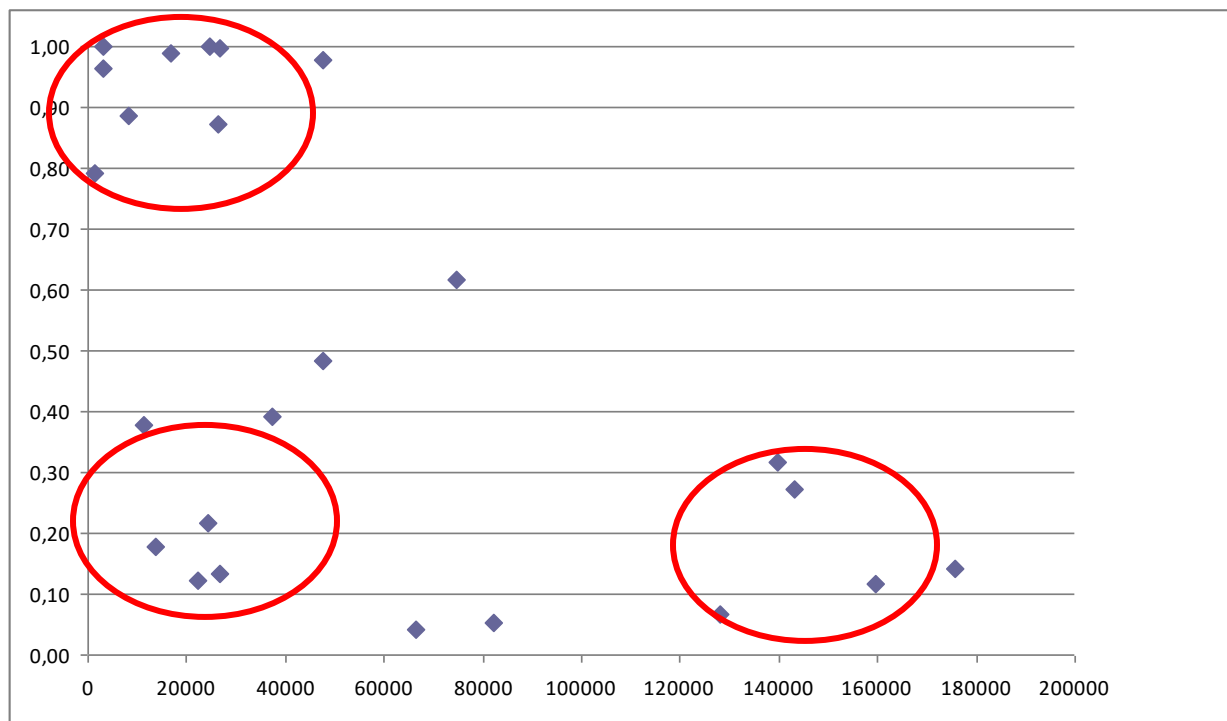
Figure 1: Openness and size of institutional repositories (without HAL)

The median degree of openness of all repositories is 0.38 which means that only close to 2/5 of all items provide open access to the full text. The individual repositories range from 0.04 (only 4% of items have full text) to nearly 1.00 (except for a few items, all deposits have freely available full text). There is no significant correlation between size and openness; yet, all larger repositories have degrees of openness below the median, while the repositories with higher degrees of openness (higher than the median) are generally smaller. Figure 1 shows three different clusters of repositories: smaller repositories with low level of openness (left side, below), smaller repositories with high degree of openness (left side, above), and larger repositories with lower degrees of openness (right side, below). HAL is part of this third cluster, with nearly 800,000 items and a degree of openness of 0.37. Why is there no large repository with a high degree of openness, that is, with a large number of metadata linking to full text? Is access restriction the prize to pay for the development and growth of repositories? At least and obviously, it is a risk.

Openness per document type

The sample contains 53% articles and 10% books and book chapters, i.e. items that are generally not considered as grey literature. The other document types included in the analysis are distributed as follows (figure 1).
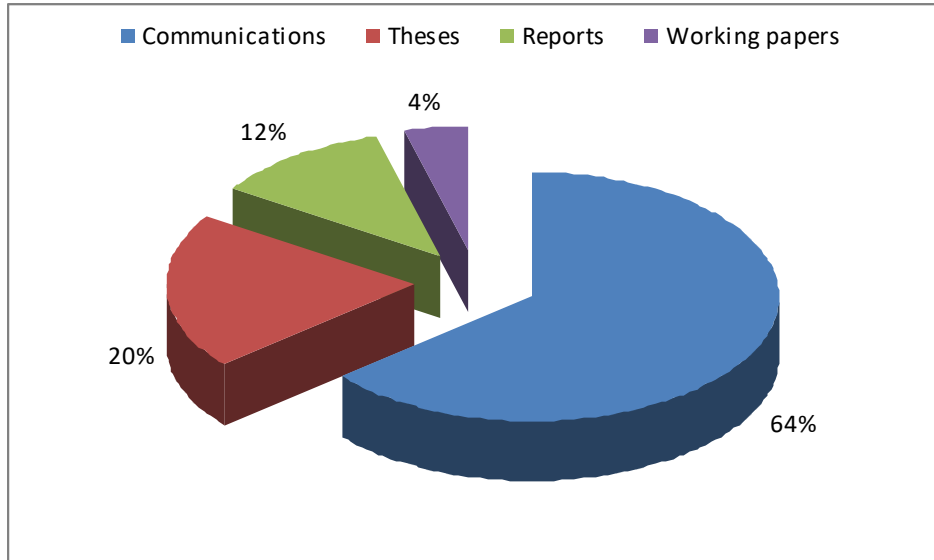
Figure 2: Document types in the institutional repositories (only grey literature, N=769,237)

Additionally to these items, some repositories also contain patents and datasets. These items represent 2.8% (datasets) and 0.4% (patents) of the global content.

The evaluation of their degree of openness – the part of the items freely available on Internet – offers specific values for each document type.

Document type	Number of items	Degree of openness
Communications	490,442	0.21
Theses and dissertations	156,546	0.78
Reports	91,069	0.63
Working papers	31,180	0.96

Table 2: Degree of openness per document type, with number of items

The overall degree of openness of working papers is 0.96, which means that in the entire sample all but 4% of the working papers are freely accessible', followed by PhD theses (0.76) and reports (0.63). Significantly less open are communications (0.21) (table 2).

The median degree of openness per repository confirms the overall statistics. The median is high for working papers (0.98) and theses (0.92), medium for reports (0.63), and low for communications (0.29). The variance of openness (dispersion from average) is low for working papers, medium for theses and reports, but high for communications (figure 3).
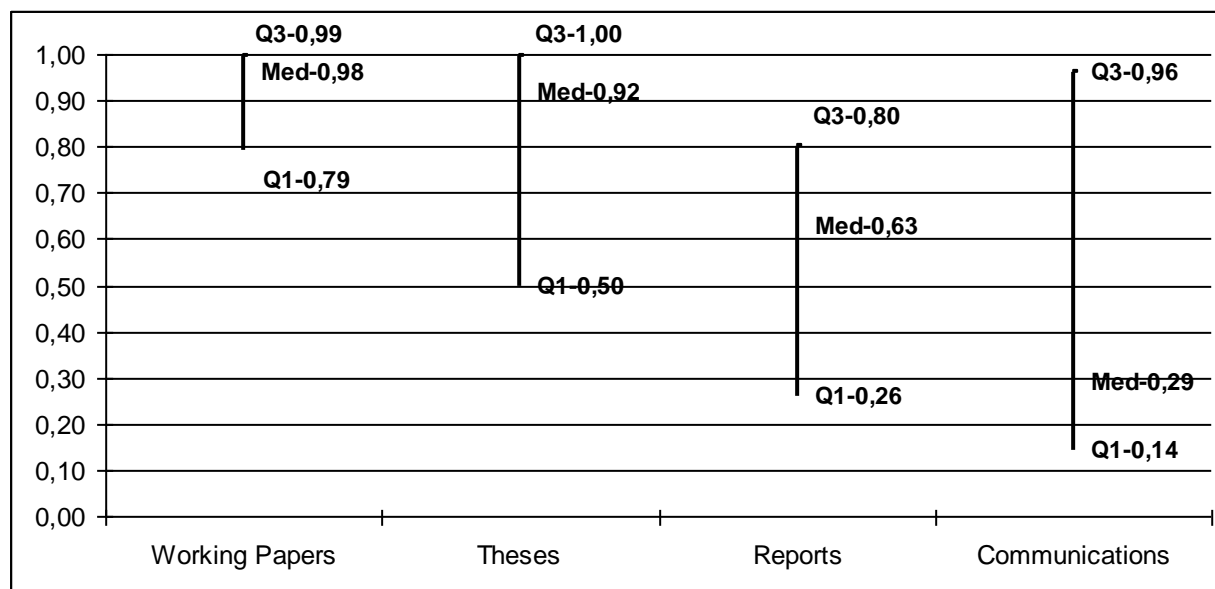
Figure 3: Degree of openness per document type with Median, 1st and 3rd quarter (only grey literature, N=769,237)

However, we must be careful with interpretation because all of the repositories have theses, most have reports and communications, but only half of them have working papers, a fact which reduces the variance.

A last observation: the number of items and their openness are inversely correlated, in that the more important categories (communication) are less open than the less important ones (table 2). Yet, this inversed relationship is not significant.

Datasets and patents

Some institutional repositories contain datasets and patents. These items are not really grey literature – datasets are not literature, and patents are not hard to find. But as they are not available through usual publishing channels, they are sometimes considered as "in the margin" of grey literature. We identified nearly 70,000 items in our sample; 60,219 datasets and 8,982 patents. While only 3% of the datasets were freely available, patents are disseminated with a degree of openness of 0.61, which means that nearly 2/3 of the patents are freely accessible in these repositories.

This is surprising for two reasons: because of the global tendency in favour of "open data" research data in institutional repositories should be more available but obviously are not; patents are often protected behind pay walls but in our sample, several thousands are freely available.

Embargo and restricted access

Often the real nature of access restriction remains uncertain. Are the documents under embargo and will they be released and openly accessible in the future? Are they restricted to on-campus access only or is it both of these? And what about missing full text, records without documents? From our results we can only make a cautious guess, that embargo periods represent a small

part of access restrictions (in our sample only 2%) and that most of the lack of openness is caused by on-campus only access and by the deposit of metadata without a corresponding document. Embargo decisions are taken in particular for PhD theses while very few reports and even less working papers are embargoed.

Repositories with a high degree of openness to grey literature

In our sample, we identified seven repositories with high levels of openness to all kind of grey literature, i.e. with more than 80% items with full text in each category (table 3).

	Working Papers	Theses	Reports	Communications
DIGITAL.CSIC	0,99	0,93	0,99	0,81
Frankfurt a M	1,00	1,00		1,00
Milano	0,99	0,83		0,97
Dokuz Eylül University Izmir		1,00		1,00
Chiba	1,00	0,99	1,00	0,96
UNTexas		0,92	1,00	
Stellenbosch		1,00		1,00

Table 3: Institutional repositories with high degrees of openness (type 1)

Obviously, these repositories apply an open access policy that prefers unrestricted availability of documents to other objectives, in compliance with the initial goal of direct communication of the open access movement. In particular, the institutional repositories from the Spanish CSIC and Chiba University (Japan) are exemplary and should be taken for best practice, such as those from the Universities of Frankfurt and Milano even if they do non contain (or index) reports.

Other repositories

Six repositories have relatively low level of openness for all document types (table 4). Here, they clearly adopt a policy that prefers exhaustiveness (completeness) to openness. Is this still open access or do these repositories become tools designed to increase impact and facilitate evaluation of the scientific output?

	Working Papers	Theses	Reports	Communications
Torino		0,48		0,04
Ghent		0,39		0,18
INRA		0,15	0,27	0,15
Uppsala		0,39	0,21	0,03
Chalmers		0,17	0,32	0,26
NTUR		0,55	0,28	0,02

Table 4: Institutional repositories with low degrees of openness (type 2)

The other repositories are somewhere in between, with higher degrees of openness for some document types and lower degrees for others. Typically, theses and working papers are "more open" than reports and communications (table 5).

	Working Papers	Theses	Reports	Communications

HAL	*0,98*	*0,97*	*0,73*	*0,24*
KNAW	*0,79*	*0,28*	*0,65*	*0,32*
Geneva		*1,00*	*0,74*	*0,85*
Macquarie University Sidney	*0,99*	*0,50*	*1,00*	*0,20*
Swinburne	*0,34*	*0,93*	*0,26*	*0,24*
Monash	*0,54*	*0,75*	*0,02*	*0,01*
RMIT		*1,00*	*0,00*	*0,07*
Brisbane	*0,93*	*0,64*	*0,82*	*0,67*
HKU	*0,80*	*0,99*		*0,13*
SMU		*1,00*	*0,07*	*1,00*
UMassAmherst		*0,70*	*0,65*	*0,87*
Western Kentucky University		*1,00*	*0,60*	*1,00*

Table 5: Institutional repositories with mixed degrees of openness (type 3)

There are probably different explanations and reasons for these "IR profiles", combining ETD policies, disciplinary particularities (working papers) or a large number of communications published by commercial publishers. Figure 4 illustrates the average differences of these three types of repositories.
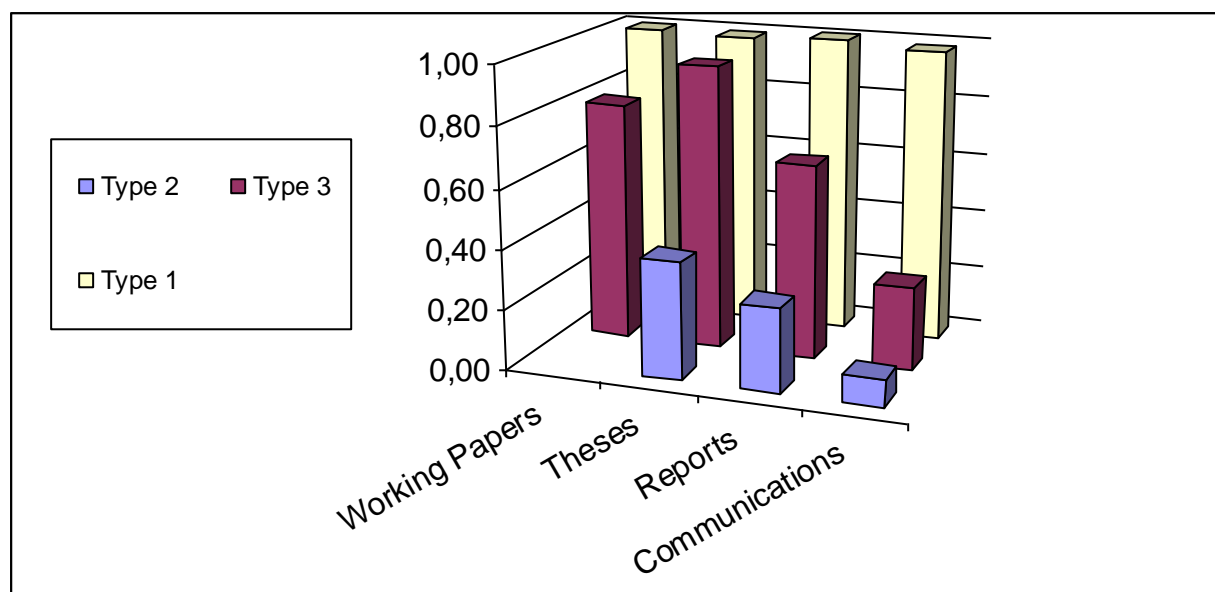

Figure 4: Three types of institutional repositories (median of openness)

However, if we compare this reality with past expectations about the Internet as "the solution for grey literature", we must admit that this is right for one part of the institutions and collections but not for all. A significant part of communications, reports and even theses still remain "hidden" and "hard to get" items.

Discussion

Methodological shortfalls

Three aspects limit the reliability of our data: (1) The different repositories do not index their content in the same way, document typologies are not consistent, and the interpretation of items as "grey literature" is not always easy. (2) Statistics on the content of repositories are often not available or not complete; thus our sample is already a somewhat biased selection of "best practice sites". (3) Only one part of the repositories clearly inform about the nature of restricted or denied access to the full text.

Typology of institutional repositories

Institutional repositories can be described and distinguished in many different ways. Our survey invites to four different typologies:

Size: Even if our methodology puts the focus on larger repositories, the sample includes the whole range of repositories[6]:

Small (<1,000): 1 repository

Medium (1,001-5,000): 8 repositories

Large (>5,001): 16 repositories

Openness: Following our data, we would suggest three categories:

Low degree of openness (<0.30): 11 repositories

Medium degree of openness (0.30-0.80): 6 repositories

High degree of openness (>0.80): 8 repositories

Document profiles: The openness criteria can be further differentiated by document types (theses, working papers etc.). As we showed above and limited to the field of grey literature, we can distinguish three different repository types (figure 4). Including commercial publication, this typology can be quite different and shed another light on repositories (see below).

Repository types: In the past, we suggested four different types of institutional repositories (Schöpfel et al. 2012). Even if we did not match our sample against this typology, it seems obvious that some of them are similar to type 4 repositories ("institutional deposit") while others are more like type 1 ("publishing grey literature") or type 3 ("scientific heritage") repositories.

These different typologies may allow in the future profiling of open repositories, in order to improve knowledge and understanding of open access but also to enhance marketing and service development.

Grey and white literature

We conducted the same analysis for published articles, books and book chapters (Prost & Schöpfel 2014). Compared to grey literature, their degree of openness is generally lower:

	Openness
Working papers	0.96
Theses	0.78
Reports	0.63
Articles	0.31
Communications	0.21
Books, book chapters	0.17

[6] For the categorization, see Kindling & Vierkant (2014)

Table 6: Degree of openness per document type (N=2,086,622)

Only one third of all articles in our sample repositories is available in full text and without any restrictions, and less than 20% of all books and book chapters can be downloaded by any user. Obviously, regarding openness there is a significant advantage of grey literature over so-called white (commercially published) literature. Figure 5 shows this advantage on the level of each repository.
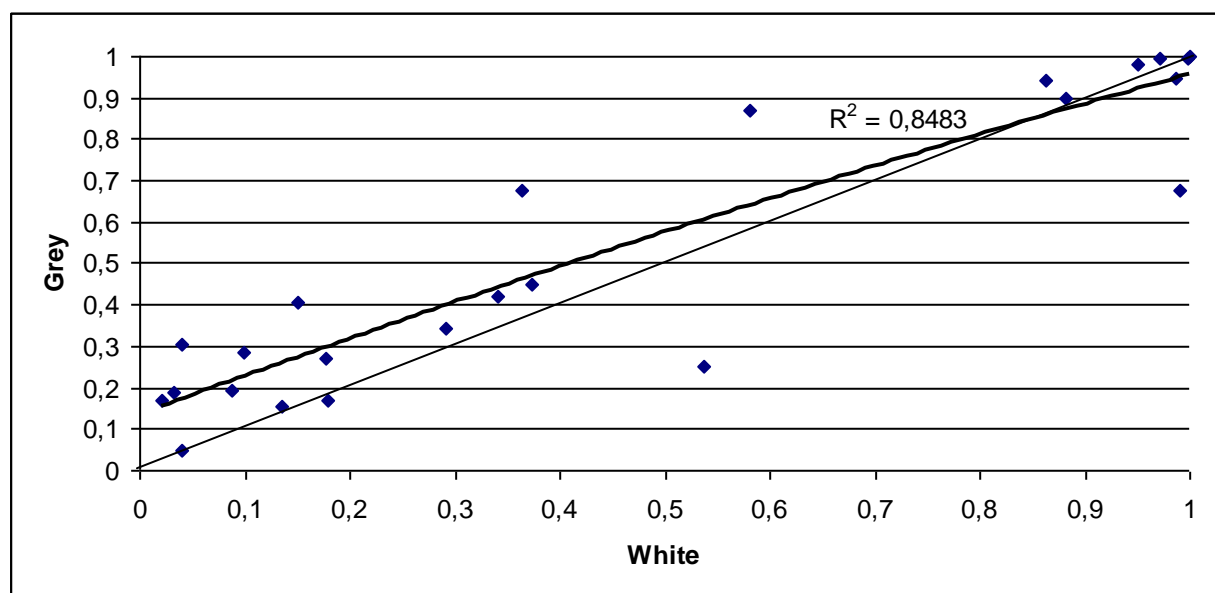

Figure 5: Degree of openness for grey (vertical) and white literature (horizontal) per repository

Except for two repositories (Chalmers and Amherst), the cumulated degree of openness of grey literature is at least as high as for published items; most often, it is significantly higher. The reason for the two "special repositories" seems different; Amherst is a small repository where most items, in particular articles, are in open access while the availability of some dissertations and reports is restricted to the campus. Chalmers appears to accept (and probably foster) deposits that can not be disseminated freely on the Web so that especially dissertations, reports and communications can not be accessed off campus. The tendency shows a strong relation between the two variables (determination coefficient R^2=0.85).

The special case of conferences
Yet, these figures and statistics also confirm the special case of communications. Their overall degree of openness is not only lower than for other types of grey literature but similar to published articles and books. Figure 6 shows the same statistics than figure 5, except for communications with have been deleted from the cumulated degree of openness for grey literature. The result is obvious.
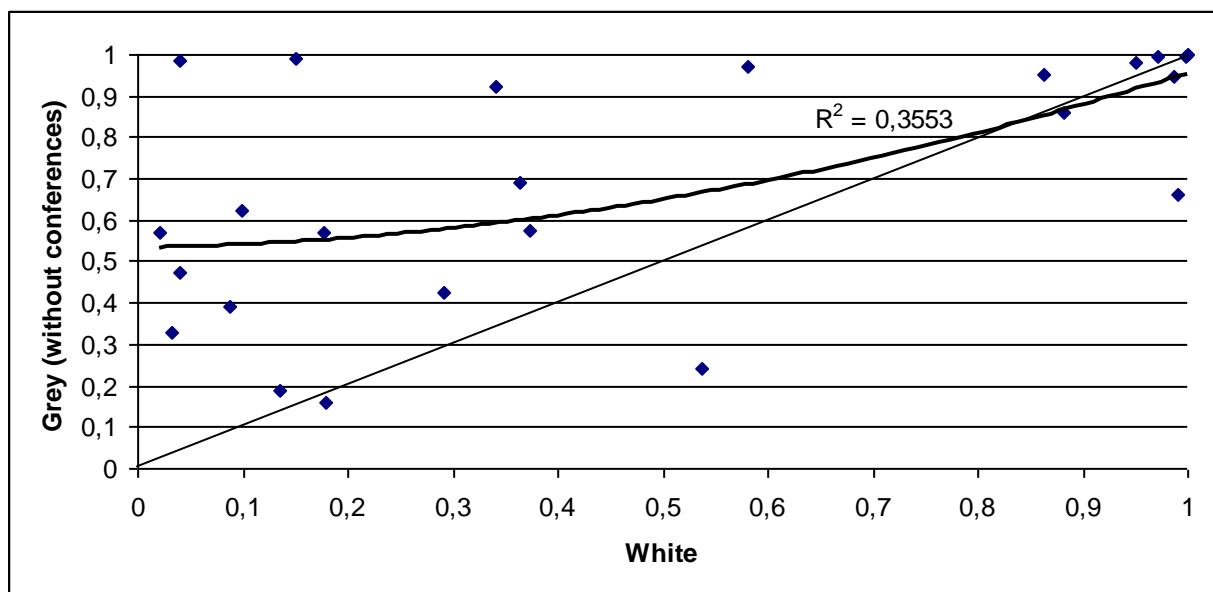
Figure 6: Degree of openness for grey (vertical) and white literature (horizontal) per repository (without communications)

This time, without communications, the difference between grey and white literature is more important, and the tendency line with an R^2=0.36 confirms a relatively low relationship between both document types. The message of this figure is clear: institutional repositories are good for the availability and open dissemination of grey documents, at least better than for published items.

So what about communications? The reason is probably that an important part of communications is edited and disseminated by commercial publishers, in special issues of journals together with articles or as proceedings like monographs. Therefore, one part of them is not grey but white. Following our figures, this percentage can be estimated at 40-60%.

About embargo

Embargo periods and other access restrictions are normally enforced by publishers, in order to protect their revenues by delayed availability of "their" items in open archives, i.e. articles, books and those communications published by commercial publishing houses.

Our figures show that one part of grey literature is also embargoed or limited to on-campus availability, without any pressure from publishing companies. The reasons are different and have nothing to do with licensing or publishing conditions, at least not directly. Privacy and confidential information may play a role, such as third party rights, fear of plagiarism and, especially for datasets, competitive strategies opposed to free sharing of results with everybody and not only with colleagues.

Yet, publishers' open access policies affect indirectly one part of decisions on embargo and on-campus access, because PhD students anticipate these policies and often prefer not to publish in open access before a formal publication of their dissertation by a corporate publisher.

Stabilizing functions

According to published studies and our own surveys, we can distinguish between three main reasons that tend to stabilize the unsatisfying situation with restricted access to grey literature in institutional repositories:

1. For one part of these grey items, especially for communications, the authors have probably transferred their rights to publishers that disseminated the conference proceedings as special journal issues or monographs. This may explain why a significant number of communications are under embargo or cannot be disseminated outside of the campus.
2. In particular for PhD theses, authors may prefer restricted or no access at all because they intend to publish the content as a book with commercial publishing houses.
3. Last explanation, the preference of some hosting organizations for an exhaustive number of metadata that allows for evaluation and studies of the institutional scientific output. Here, the institutional repository becomes a tool for evaluation and a showcase for the institutional productivity, like a web-based bibliographic database while the need of the scientific community and society for access to results (full text, data) is not or only partially respected.

As we showed for PhD theses, embargo decisions can be motivated by many different reasons and people (Schöpfel et al. 2014). For the scientist in need for information, this is all but satisfying.

Best practice

However, these stabilizing functions are not always barriers to open access. Even in the small sample of our survey, some institutional repositories perform better than others, with higher degrees of openness. Benchmark studies should reveal their way of dealing with these problems. Why are they better, i.e. more open? Probably, they are different on six dimensions:

1. Mandatory policies (institutional support, acquisition policy).
2. Selection of deposits (moderation, metadata policy).
3. Specific approach for different document types (ETD policy, working paper publishing…).
4. Institutional workflows (including assistance for submission).
5. Legal environment.
6. Commitment to open access principles.

In the field of PhD theses, such kind of studies will be undertaken by the European H2020 project ETD4OA.

Conclusion

In the past, we put forward that for grey literature, "open is not enough", i.e., institutional repositories need a set of minimum requirements for grey items such as metadata, selection procedures, quality standards, collection management and clear deposit policy (GL13, Schöpfel et al. 2012). We then narrowed our research on electronic theses, recommended five ways how to add value to theses in open archives (GL14, Schöpfel 2012) and identified access restrictions to theses in institutional repositories (GL15, Schöpfel & Prost 2014). This means, while "open is not enough", that all deposited theses in repositories are not open whatever; or more

specifically, they are available with different degrees of openness, and some are not available at all.

This year, we return to a larger perspective. Building on our past work and new empirical data from large institutional repositories on different continents, we distinguish between different degrees of openness. Based on our empirical data, our recommendations for improved access to grey literature in institutional repositories would be:

- **Typology**: standardize the description of document types in institutional repositories, with a common and accepted terminology. Metadata should clearly index the document type, in terms derived from a controlled and standard terminology.

- **Discovery**: allow browsing and searching with document types.

- **Access rights**: clearly indicate the availability or access restrictions for each document, differentiating (at least) between embargo and on-campus access. Metadata should include precise information on access rights (Neylon et al. 2014).

- **Policy**: foster the deposit of metadata with full text for grey literature whenever possible, in particular for reports, working papers and theses. Submission of metadata without full text should be exception, not default. For the scientific community, access to documents is more important than exhaustiveness of records that are already published and available elsewhere on Internet.

- **Differentiation**: distinguish between the different document types.
    - Reports and working papers should be systematically and by default made fully available in open access, and access restrictions should be the exception.
    - Incentives should help research teams to publish their working papers on their institutional repository and not (exclusively) on other web sites.
    - Proceedings should be published either in open access or with rights that allow immediate open access, at least after a short embargo period (six months). Institutional repositories should be able to publish proceedings as a collection and not only in form of individual papers; perhaps they should also be able to manage the preparation and selection of conference papers (at least they should be linked to these systems).
    - A specific institutional workflow should be created for theses and dissertations in order to facilitate and foster their publishing in open access.

For grey literature in institutional repositories, unrestricted, open access should be the status by default, not the exception or an option among others. Non (or less) controlled by commercial publishers, grey literature should not be disseminated under embargo or on the campus only. Of course, embargoed items are better than no items, and "gratis" open access is better than no access at all. But we should not call open what is not open and transform vectors of direct scientific communication into tools of evaluation and control of institutional output.

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Appendix – List of surveyed repositories

Europe

Chalmers http://publications.lib.chalmers.se/ Chalmers Publication Library contains research publications produced at Chalmers University of Technology, Göteborg, Sweden.

CNRS http://hal.archives-ouvertes.fr HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research papers, including nearly 100 institutional repositories from French HE and research institutions.

CSIC http://digital.csic.es/ Digital. CSIC the institutional repository of the Spanish National Research Council (CSIC)

Frankfurt a. M. http://publikationen.ub.uni-frankfurt.de publication server of Goethe University Frankfurt am Main

Geneva http://archive-ouverte.unige.ch/ Open Archive UNIGE (University of Geneva)

Ghent https://biblio.ugent.be/ Ghent University Academic Bibliography

INRA http://prodinra.inra.fr ProdINRA institutional repository of the French National Agricultural Research Institute

KNAW http://depot.knaw.nl Repository of the Royal Netherlands Academic of Arts and Sciences

Milan http://air.unimi.it AIR Archivio Istituzionale della Ricerca of the University of Milan

Torino http://porto.polito.it PORTO open repository of publications produced by the scientific community of Politecnico di Torino

Uppsala http://uu.diva-portal.org institutional repository of the Uppsala University

Australasia

Macquarie University Sidney http://www.researchonline.mq.edu.au ResearchOnline open access digital collection

Monash University Melbourne http://arrow.monash.edu.au Arrow research repository

Queensland University of Technology Brisbane http://eprints.qut.edu.au/ QUT ePrints Archive

RMIT Royal Melbourne Institute of Technology http://researchbank.rmit.edu.au/ RMIT Research Repository

Swinburne University Melbourne http://researchbank.swinburne.edu.au Swinburne Research Bank

Asia

Dokuz Eylül University Izmir http://deu.mitosweb.com/ open archive

Chiba University http://mitizane.ll.chiba-u.jp/curator/ CURATOR Chiba University's Repository for Access To Outcomes from Research

University of Hong Kong http://hub.hku.hk/ HKU Scholars Hub institutional repository

Singapore Management University http://ink.library.smu.edu.sg/ InK Institutional Knowledge at Singapore Management University

National Taiwan University http://ntur.lib.ntu.edu.tw/ NTUR National Taiwan University Repository

America (North, Central and South America, Caribbean)

University of Massachusetts Amherst http://scholarworks.umass.edu/ ScholarWorks@UMass institutional repository Amherst

Western Kentucky University Bowling Green http://digitalcommons.wku.edu/ TopScholar institutional repository

University of North Texas Denton http://digital.library.unt.edu/ UNT Digital Library

All websites were accessed in March and April 2014.

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