A Review of Open Access Self-Archiving Mandate Policies

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abstract: This article reviews the history of open access (OA) policies and examines the current status of mandate policy implementations. It finds that hundreds of policies have been proposed and adopted at various organizational levels and many of them have shown a positive effect on the rate of repository content accumulation. However, it also detects policies showing little or no visible impact on repository development, and attempts to analyze the effects of different types of policies, with varied levels of success. It concludes that an open access mandate policy, by itself, will not change existing practices of scholarly self-archiving.

Introduction

Although open access (OA) self-archiving mandates have a history spanning less than ten years, more than three hundred institutions, funding agencies, and other academic programs around the world have implemented a policy requiring scholars to self-archive their research outcomes in a repository or on a website, to promote free access to and wide sharing of information. OA advocates have been optimistic about the prospect of making the content of digital repositories richer and more useful after the implementation of such policies.[1] However, there are also mixed feelings regarding the effects of mandate policies,[2] and institutions have responded in a variety of ways to the call for a self-archiving mandate.[3] Researchers argue that differences in disciplinary culture and the author-pay-to-open model have a greater impact on scholars' attitude and behavior toward participating in OA efforts.[4] At the same time, researchers believe that the scholarly tradition of respecting peer review and valuing a

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tenure and promotion process determines the direction of the OA movement.[5] It is also important to clarify that, contrary to some researchers' assumptions, participating in an OA mandate does not usually require publication in an open access journal.

In order to better understand the importance of OA mandates, this article reviews the history of OA policies and examines the current status of mandate policy implementations. We compiled a list of policies provided by various types of organizations and analyzed the language used in most policies, if available. Furthermore, we compared the accumulation rates of repository items before and after a policy was implemented. Based on the findings, we discuss major factors influencing scholars' perception of self-archiving that are possibly intermingled with the outcome of mandate policies. We argue that merely employing an OA mandate policy, regardless of its level of implementation (institutional or program), will not effectively change the practice of OA self-archiving. Policy compliance will approach full participation only if the entire scholarly communication system is adjusted.

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Literature Review

Scholars discussed the importance of mandate policies in promoting open access scholarly communication as far back as the early 2000s as a response to the slow accumulation of items in many institutional repositories.[6] Researchers argued that a mandate policy issued by funders or institutions would be able to raise scholars' awareness of broad information sharing and improve self-archiving of intellectual outcomes. Stephen Pinfield argued that it would "simply help to overcome quickly the cultural and managerial barriers that currently exist in this area; something that would otherwise take a number of years."[7]

Early surveys among scholars focused on their attitudes toward self-archiving, and showed that more than eighty percent of respondents expressed their willingness to comply with a mandate from their institution or grant funders. A further thirteen percent of the respondents would comply with a policy reluctantly.[8] At the same time, studies comparing repositories with a mandate and repositories without a mandate at the institutional level uncovered an obvious difference in the content size of the repositories. One institution with a mandate, a repository managed by the Queensland University of Technology (QUT) in Australia, had been able to collect a larger amount of items than its peer institutions without a mandate.[9] Mandate policies also seemed to have provided a citation advantage for corresponding articles, repositories, institutions, and contributing scholars.[10]

OA policies take various forms. Those offered by publishers to separate journals into "gold," "green," and "white" are not the same policies related to the participation of individual researchers in self-archiving, and therefore are not the topic of discussion, as they are not OA *mandate* policies. The policies involving OA mandates can be distinguished by content holders (e.g., institution, program, or funder), or by type of deposit (e.g., e-print publications or student dissertations). This complexity of policy type and

implementation makes the discussion of OA mandates multifaceted. While Arthur Sale maintained that a policy adopted by a program is easier to enforce than a policy adopted by an institution, Gavin Baker argued that policy effect will vary in different situations.[11]

Some researchers, however, questioned the appropriateness and applicability of OA mandate policies. Their disagreement generally included the following facts: (1) faculty may be concerned that, according to Baker, "open access policies will restrict their publication opportunities,"[12] (2) scholars' willingness to comply with a policy may not be translated into action because, as Sally Morris and Sue Thorn suggest, "there is much more support for OA publication in theory than in practice,"[13] and (3) an increased rate of self-archiving in an institutional repository may be because of reasons other than the adoption of a policy. For example, by taking a closer look at the items placed in QUT's repository, it becomes obvious that a few librarians were very active in the construction of the repository and, not surprisingly, those librarians deposited or encouraged the deposit of a majority of the items.[14] These researchers found no solid evidence showing an increase of faculty awareness or an increase of self-archiving as the result of a mandate. The advantages of OA mandate policies will be better understood only when a comprehensive picture of their history and current practice is provided in systematic studies.

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Methods

In order to examine the development of OA mandate policies, we were successful in collecting an accurate and complete list of policy proposals and implementations. The main source of data is ROARMap (roarmap.eprints.org), a site created and maintained by the University of Southampton in England as an online location for policy registration. ROARMap invites all repositories to register their policy plan at the site by providing data, including their host institution, country, repository URL, policy text, and the type of policy. Data recorded on the website represent the date of policy registration, rather than the date of policy implementation. This discrepancy decreases the accuracy of our analysis.

In an effort to improve the accuracy level, we consulted with other important sources, one of which is the monthly SPARC Open Access Newsletter compiled by Peter Suber. An archive of the newsletters includes issues dating back to July 2003. Each newsletter contains various types of OA information, including updates of newly proposed and/or implemented policies. Policies recorded in the newsletters have been matched with records on ROARMap; however, several policies are missing from the list. Other sources consulted included Sherpa Juliet's research funders' open access policy list; Kate Kruse's Open Access Mandates; and Simmons College's Open Access Directory, which has a list of unanimous faculty votes for institutional mandate policies.[15] We compiled a total of 349 mandate policies, both implemented and planned.

Upon completion of the policy data collection, we used another website, ROAR (roar.eprints.org), to find additional information related to the repositories: total item counts, date of creation, and record details. Of this information, record details are of particular interest to our research, as this data used a histogram chart to visually display a chronological item count for each repository. Although the chart cannot provide precise numbers of items at any point in the repository history, it allows a comparison of the content development over time (Figure 1). By focusing on the date of policy implementation (or registration) on the chart, we could deduce the trajectory of self-archiving activities resulting from the effect of an OA mandate. During data collection, we became aware of some problems in the comparison, because many repositories with a mandate do not have a corresponding entry on the ROAR database. For example, some policies may be listed under a different name or entered incorrectly. The following analysis took this limitation into consideration.

Mandate History at Present

Academic authors lacking sufficient motivation to self-archive in open access repositories created the need for mandate policy. The earliest OA mandate was a program-based policy (alternately called a departmental or sub-institutional policy by ROARMap), created and employed by Southampton's School of Electronics and Computer Science in January 2003. Shortly after its successful implementation, the UK Parliament's Science and Technology Committee recommended a funder-based mandate policy in its 2003-2004 report: "We recommend that the Research Councils and other Government funders mandate their funded researchers to deposit a copy of all their articles in their institution's repository within one month of publication or a reasonable period to be agreed following publication, as a condition of their research grant." At almost the same time, the US House of Representatives voted to set conditions for federal grant recipients, requiring that all recipients self-archive any articles resulting from government-funded research. That year also saw the first institution-based mandate policy in place at QUT in Australia.[16]

In the following two years, institutions slowly increased the number of repositories and many programs began to adopt a mandatory strategy to promote their repositories. Western European countries, especially France, Germany, and Portugal, implemented most of the mandates in this time. For example, University of Minho in Portugal set a policy in December 2004 that states "teachers and researchers at University of Minho who are authors or co-authors must archive their publications and documents in RepositoriUM at University of Minho Institutional Repository." An April 2004 program-based mandate policy by INRA Department of Animal Physiology and Livestock Systems in France suggests that "all departmental research output (full-text) is to be self-archived in the departmental . . . archive."[17]

Many people have accepted the idea of open access mandates with the peak period of implementation in 2009-2010, with a decrease in the second half of 2010 (Figure 2). Mandate policies evidence a geographic diversity, with many in Australia, Europe, and the United States, but also in Africa, Asia, and South America. In addition to institutional, program, and funding-based mandates, policies created for multiple institutions and for theses and dissertations are also in the planning stages or in practice. Furthermore,

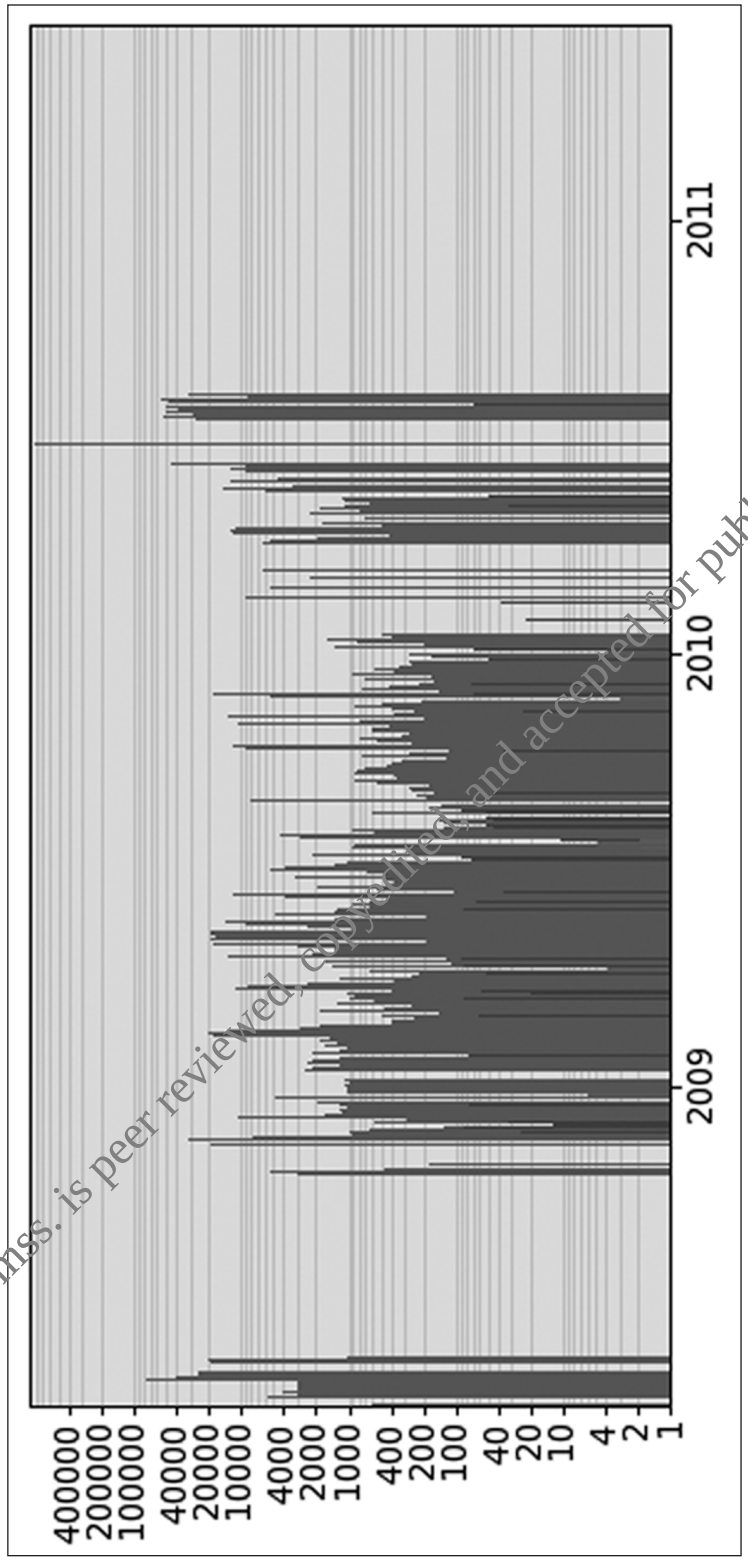

Figure 1. Example of item count history of a repository (Source: http://roar.eprints.org)

following institutional policies, requirements for the deposit of theses have become the second largest group of mandate policies.

Institutions in the United States did not begin extensively utilizing mandate policies until two major benchmarks in 2008: the passage of the Consolidated Appropriations Act of 2008, which instituted a mandate for research projects funded by the National Institutes of Health (NIH), and the Harvard Faculty of Arts and Sciences' decision in February 2008 that established a compulsory mandate for their program.[18] These milestone events are significant in the development of OA mandate policies because they represent the first major adoptions of a mandate policy using the democratic process. Prior mandates had generally been the product of administrative edict, and were therefore not accepted as valid by many individual faculty members. The NIH mandate is the public mandate passed by legislature for a particular subject-based repository: PubMed Central. Suber describes how the NIH initially requested submission of articles in 2005; made submission of NIH-funded articles mandatory in December of 2007; and made the provision legally effective in January of 2008.[19] The Harvard mandate represents a turning point in the fortunes of institutional repositories worldwide, mostly due to the fact that such a prominent faculty was unanimously willing to impose a mandate on themselves. Not long after the Harvard mandate, the number of institutional repositories with a mandate policy jumped from roughly twenty worldwide to more than eight times that number.

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In 2009, the number of repositories registering with ROARMap reached an all-time high. The numbers in late 2010 dropped off markedly from 2009's, but were still higher than those from before 2008 (Figure 2). It was at this time that OA mandates became a global effort. For example, the few African mandates on ROARMap were all registered between 2009 and 2011, while the majority of South American registrations occurred from 2010. Some areas in the world are traditionally behind other areas in technology, resulting in different rates of adoption of OA mandates. This may be a good indicator of how much of a global phenomenon open access has become.

As of spring 2011, a total of 349 policy proposals and implementations have been documented and analyzed (Table 1). Forty-two countries have adopted at least one type of policy (Figure 3). We calculated the percentage of policies per country by dividing the total number of its policies by the total number of its repositories. The results are, however, suspicious because of the discrepancies between listings of repositories on ROARMap, other policy lists, and roar.eprints.org.

Comparing the effect of a mandate policy both before and after its introduction reveals a significantly positive impact. Self-archiving rates rose in many repositories after they implemented a policy. It is worth noting that only 95 policy-ready repositories in our dataset have matchable data for their history of item self-archiving, and that proposed policies are not included. The comparison is thus only suggestive. Much of the unusable data is from organizations instituting policies in 2009 or later, and as a result,

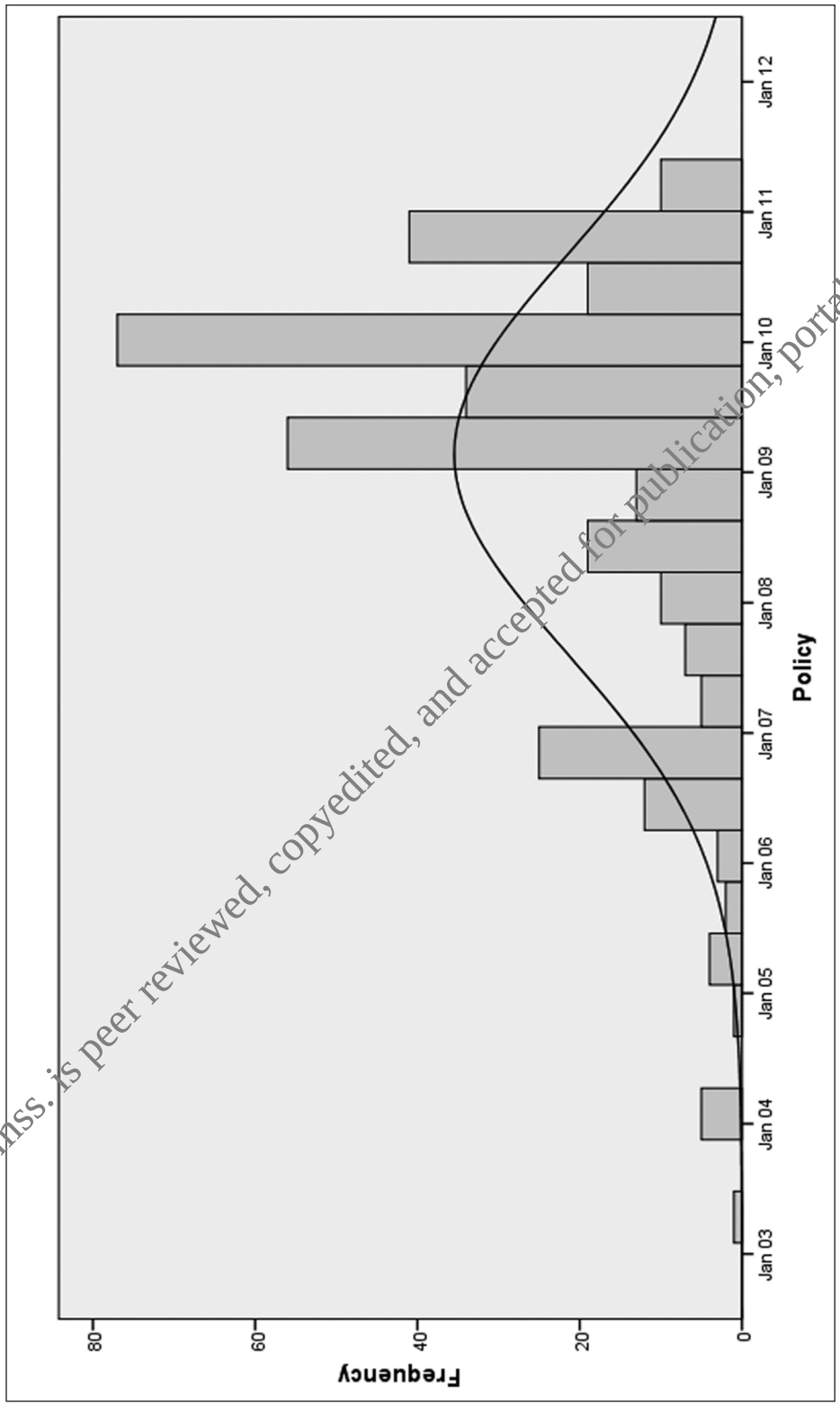

Figure 2. A historical view of OA mandate policy implementations ($n = 349$)

Table 1
Number of mandate policies by type

Total Policy	Institutional	Multi-Institutional	Program	Funder	Thesis	Unspecified
349	122	6	35	55	78	53

they had not generated enough data. Nevertheless, awareness of mandatory policies continues to increase at most repositories – perhaps as a consequence of the large number of articles generated by OA advocates. These data also allude to richer results for a study conducted a few years in the future.

Based on the records with workable data, a little more than half of the repositories (around 54 percent) display an increase in their content size. Conversely, about 29 percent of repositories show a decrease in their content accumulation rate after the implementation of a mandate. The rest of the repositories either do not have an obvious change or are in a mixed situation (Table 2). Separating the policies into different types for comparison reveals a positive effect from institutional, program, and thesis policies involving self-archiving activities (Figure 4). The results for funder policies appear perplexing, because the numbers for content increase, no change, and decrease are equally distributed. The data for funder mandates become clarified if we realize that most funders do not manage an actual repository, but instead require fundees to deposit their work in a repository associated with various institutions at different locations.

Upon an examination of the text of individual mandate policies, we found slight variations in language for different types of policies. Institutional mandates targeting faculty and others in the academic community usually do not mention a time limit for deposits. Although a few repositories suggest depositing six months after publication, others encourage depositing at the time of publication, upon institutional request, or after a publisher's embargo period (typically six-months following publication). Many institutions encourage the deposit of specific items into an institution-mandated repository. These often include journal articles and conference proceedings in the form of pre-print or post-print articles. Some institutions specifically request the inclusion of bibliographic citation information and full-text. Deposit of multimedia items is often particularly encouraged. In some cases, policies emphatically state that all items produced while employed are to be deposited. With regard to copyright issues, many institutions ask for copyright-free licensure on items, such as the Creative Commons (CC) non-commercial license. Deposi-

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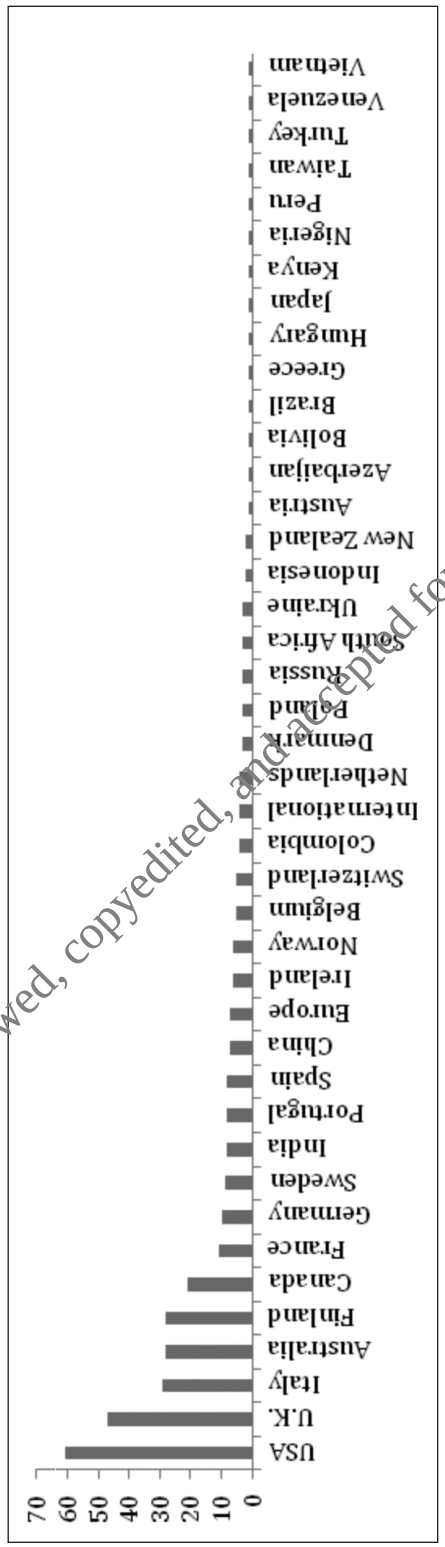

Figure 3. Number of mandate policies by country

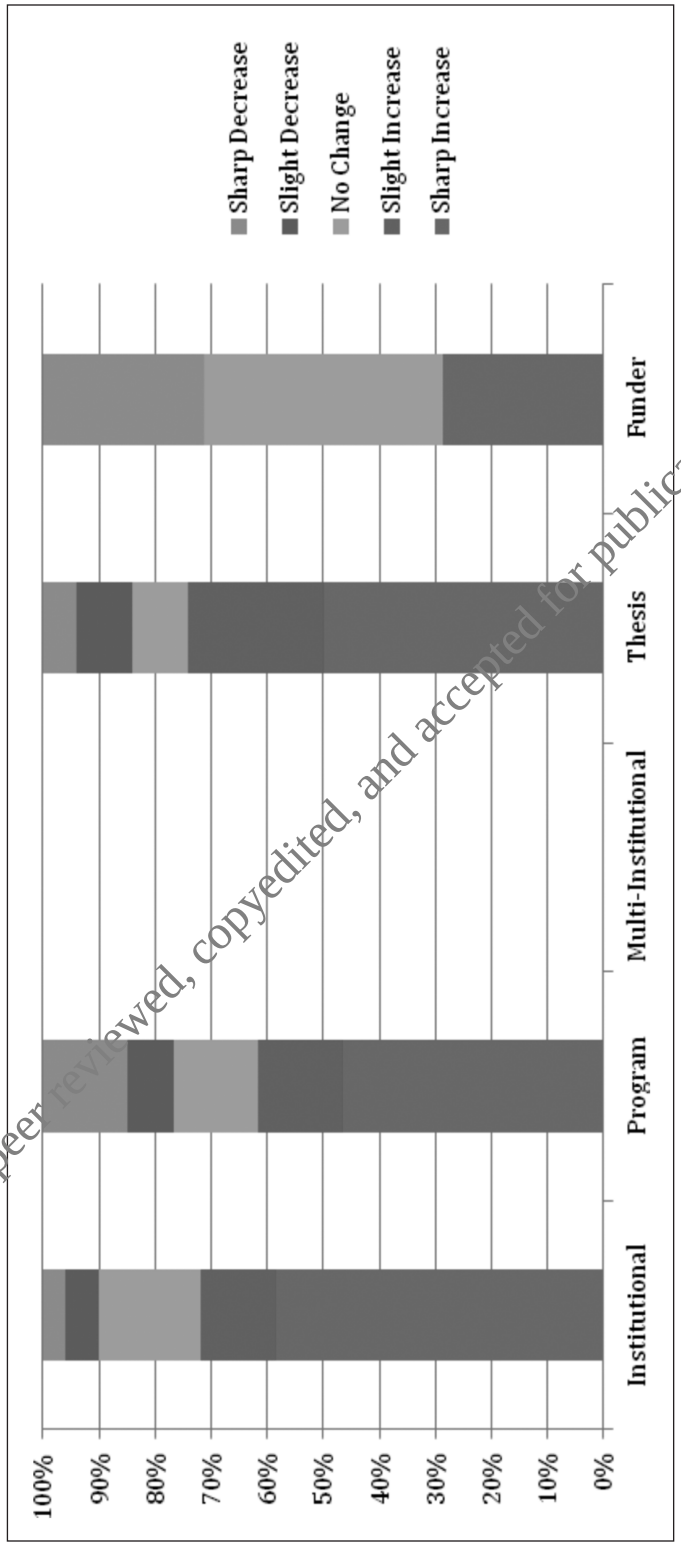

Figure 4. Policy effect on cumulative percentages of self-archived repository items by policy type

Table 2

Policy effect – counts of repositories by policy type

	Institutional	Program	Thesis	Funder	Total
Sharp Increase	24	4	20	2	50
Slight Increase	5	1	10	0	16
No Change	7	1	4	3	15
Slight Decrease	3	1	4	0	8
Sharp Decrease	2	1	2	1	6
Total	41	8	40	6	95

tors are invited to negotiate with publishers for the non-exclusive right to archive and deposit articles after publication, and at least one institution encourages publication in only OA journals.

Program-based mandates control depositing behavior within departments or projects that are part of the institution. The targeted population for program-based mandates is often the same as the targeted population for institutional mandates; both groups share similar limits for deposit. Most policies advocate deposit into a university repository, while a few require deposit into a departmental-level repository. Unlike the institutional mandates, many program mandates specify CC licensure be placed on all articles; the CC 3.0 BY-NC-ND license (author attribution, non-commercial, and non-derivative) was most commonly suggested. Most mandates require journal or conference submissions to be deposited, with very few mentioning any other type of item.

The audience for the thesis mandate usually includes graduate students within a college or university setting. Most of the mandates are very short, stipulating only the type of items to be deposited (including Master's theses, PhD dissertations, or both). Almost none of the mandates mention a deposit time limit. Nearly all thesis mandates require deposit into a university-level repository. In contrast to other types of mandates, students are given more leeway regarding the delay of deposit for theses or dissertations, usually to allow time for publication or patent application. Typical embargo periods end after six months (with an optional six month extension), but may last up to eighteen months. Additionally, some mandates allow students to restrict access to only the university community for short periods of time before the item is released for full open access. These restricted access periods range from six months to five years.

Funder mandates differ from other mandates on several levels. First, the target population of the mandates covers all who are responsible for project funding. These researchers do not necessarily have to be faculty members in a university setting. Second, funder mandates, on average, tend to state more definite time limits for item deposit. Most require deposit within six months of publication, while a very few extend

limits to twelve months. Some mandates advocate an author's freedom to publish with whomever they prefer as long as they are able to deposit items within the time frame set by the mandate. Other funder mandates stipulate initial publication within an OA journal or database. Unlike other mandates, funder mandates tend to mention a wider range of depositable items, including books, book chapters, and software information.

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Locations for deposit vary. Many mandates specify their own OA repository, such as PubMed Central, while others encourage deposit in the nearest convenient repository. If the funded initiative is located on a university campus, the suggested location for deposit is often within a university or departmental repository.The following are excerpts of some OA mandate policies representing each type of mandate:

Institutional Mandate:

"All refereed, revised and final draft research manuscripts are required to be deposited in the CSU Institutional Repository (CRO) [immediately] after they have been accepted for publication except for books which may be self-archived at the author's discretion."[20]

(Charles Sturt University)

Funder Mandate:

"Grant recipients are now required to make every effort to ensure that their peer-reviewed publications are freely accessible through the Publisher's website (Option #1) or an online repository as soon as possible and in any event within six months of publication (Option #2)."[21]

(Canadian Institutes of Health Research)

Program Mandate:

"Researchers in the School of Environmental Sciences commit to making the best possible effort to publish in venues providing unrestricted public access to their works. They will endeavor to secure the right to self-archive their published materials, and will deposit these works in the Atrium (repository – authors)."[22]

(University of Guelph School of Environmental Sciences)

Thesis Mandate:

"From November 1st, 2009, all PhD theses must be self-archived in electronic format in BOA (repository – authors) for worldwide free access. In cases of documented reasons, PhD students are allowed to put a max-36-months embargo only on consultation (ID/OA mandate)."[23]

(University of Milano-Bicocca)

Discussion

It takes tremendous efforts for an OA mandate policy to be discussed, proposed, and implemented, particularly at the institutional and program level. When decision makers are administrators, they need to understand the value and share the vision of free information sharing. When individual faculty members vote for a mandate policy, all of them should have a clear understanding of open access benefits. A good example is

the rejection of a self-archiving policy by the University of Maryland faculty in 2009.[24] Although the proposed Maryland policy simply encouraged deposit in its institutional repository instead of requiring it, faculty still worried that it would impact their ability to publish in certain journals in the future. Miscommunication and misunderstanding played a negative role in the decision-making process.

Once a mandate is in place, repository managers often expect that the behavior of academic authors regarding self-archiving will change, and thus bring an instant increase in the number of items in a repository. Harnad and other early OA advocates expect that "the adoption of official university OA self-archiving policies will help to maximize the number of such archives, as well as the number of articles in them… to reach 100 percent OA." At minimum, argues Pinfield, "making it mandatory would help to accelerate change and make the benefits more apparent across all subject disciplines."[25] The successful stories of Southampton's School of Electronics and Computer Science and of QUT have widely served as examples to support this assumption, although both cases can be interpreted differently. The former has a program-based policy for scholars in a discipline where OA tradition had been popular before the policy, and the latter has a few librarians depositing a large number of documents authored by others. The QUT mandate policy does not demonstrate true faculty attitudinal change with regard toward repositories.[26]

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Our examination of the policy data reveals that OA mandates largely yield a positive influence on the growth of repository content. Evidence shows an increase of content items for more than half of the repositories after a mandate has been in place, although we do not know how the faculty responded to the mandate or whether other factors impacted the accumulation efforts. Regardless, we think that it is too early in the development of OA repositories to theorize a policy effect, especially given the fact that the change in deposit rate of repository content varies among different types of mandate policies. Faculty's compliance with mandates still fluctuates broadly, and our data show that mandate policies have not positively affected a certain percentage of repositories. Changes may not happen spontaneously without further encouragement from administrators, repository managers, and other key stakeholders involved in OA digital initiatives.

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A universal mandate policy is still not the "magic bullet" that many mandate proponents have claimed it to be. In a recent study, a survey among academic authors from a variety of Carnegie-classified doctorate universities indicated that concerns regarding

self-archiving were still shared by many faculty members who were particularly concerned about copyright.[27] Additional issues that prevented many faculty members from contributing to their institution's repository included limited technical skill levels and a lack of additional time to deposit research articles. In other cases, faculty may not know about the existence of a mandate policy even though it has been in position for some time. For example, a survey among the University of California faculty found that 75 percent of the survey respondents were not aware of a proposal forwarded six months ago by the Academic Council "for faculty to routinely grant to the University a limited, non-exclusive license to place their scholarly publications in a non-commercial, publicly accessible online repository."[28] Policies do not simply work by themselves.

In an academic environment, faculty's primary concerns are tenure, promotion, and academic integrity.[29] The vital role of peer review in faculty attitudes and actual publishing behavior still holds value. The academic community has a long way to go before completely changing these deeply embedded values to allow for new systems of digital scholarly communication. Without examining the needs of scholarly researchers and connecting current academic priorities to new principles regarding open access self-archiving, a mandate policy will not succeed. Faculty members do not see the benefit of open access reflected in the tenure process, so they fail to deposit items into the repository. Without changes to the academic system of tenure, faculty will continue to overlook the importance of open access deposits to institutions. Including language reflecting the importance of repository deposits to faculty evaluation (especially during the tenure process) would eliminate this oversight.

Without examining the needs of scholarly researchers and connecting current academic priorities to new principles regarding open access self-archiving, a mandate policy will not succeed. Faculty members do not see the benefit of open access reflected in the tenure process, so they fail to deposit items into the repository.

While a mandate seems to guarantee increased participation in the repository, in many cases participation largely depends on the existing publishing traditions within a given institution or discipline. Disciplinary culture in scholarly communication is key to the success of most repositories.[30] Disciplines that already encourage information sharing may produce more faculty members willing to self-archive items in their institutional repository.[31] For example, economists, physicists, and computer scientists are very comfortable making regular contributions to digital repositories, while faculty in the humanities and some social science disciplines may show reluctance toward self-archiving, with or without a mandate in place.

For creating a successful OA mandate policy, Suber recommends three principles, two of which relate specifically to institutional repositories.[32] The first principle suggests that the university provide open access to all research output. He recommends the use of mandatory language regarding university expectations; faculty and staff education and assistance; and incentives to use the repository. For his second principle, that uni-

versities should not limit the freedom of faculty to submit articles to preferred journals, Suber explains that repository submission waivers can allow faculty to submit research to journals that prohibit OA archiving.

Baker provides additional advice regarding policy creation and institutional acceptance.[33] He emphasizes being flexible while encouraging faculty commitment to open access policies. He also highlights the importance of perspective when encouraging OA; faculty need to understand that the issue involves more than library policy. A mandate policy that demonstrates for faculty the importance of access will be more easily accepted. He also mentions the importance of carefully crafted policy language and of finding a balance between the official policy needs and understood faculty protection.

Another interesting strategy for encouraging faculty to participate in open access includes providing incentives. At the University of Minho in Portugal, a policy required all scientific work created by faculty to be in RepositoriUM, the institution's repository. This policy involved a financial reward: 99,000 euros the first year (2005), 30,000 euros the second year (2006), and nothing at all the third year (2007). The consequences are obvious: contributions reached 92 percent by 2006, but fell off sharply to about 75 percent in 2007.[34]

The success of mandate policies varies among different types of repositories. Policies are easier to enforce at the program level than at the institutional level, argues Sale, who says that within a program, "there are fewer people involved, and the researchers tend to trust their departmental leaders more. It is also easier to achieve conversion at the departmental level."[35] Sale foresees a new leadership trend in which senior scholars of a program play an important role persuading others to make active contributions to a repository. Similarly, funder-mandated policies may easily convince researchers receiving grant money to deposit research into an open access repository. The success of PubMed Central supports this assumption. The data we collected regarding the effect of funder mandates indicates that a funder policy may also help increase deposit rates for other types of repositories; consequently, funder-based mandates have both an indirect impact and direct impact on repository deposits.

Thesis mandates are among the easiest to implement and apply, because they are usually created at the institutional level and managed by a graduate school. Many universities have developed successful ETD initiatives (Electronic Theses and Dissertations), resulting from both high-level institutional policies and voluntary deposit policies. By analyzing the deposit rates for several Australian institutional ETD databases, Sale found that "a mandatory policy causes deposits to rise to at least fifty to eighty percent, compared to the general voluntary policy rate of five to fifteen percent."[36] In this example, Sale expected the rates for ETD databases to reach 100 percent. However, as with other mandates, how avidly an institution enforces its mandate will determine the rate of success. The Australian example shows, according to Sale, that "mandatory policies established from date of submission are five to six years faster in achieving eighty percent compliance than policies dated from enrollment."[37] Once again, we see that OA mandates cannot magically change the pattern of self-archiving without the implementation of effective policy administration.

Conclusion

Implementing a mandate policy represents a vital step toward enhancing scholars' awareness of and participation in open access, building a sizeable repository, and adjusting academic systems to this type of innovative scholarly communication. The current practice promises further progress: hundreds of policy proposals and adoptions at various organizational levels achieving different types of intellectual outcomes. Open access has become the vehicle for an international effort to stimulate broad information exchange across a diverse socioeconomic and cultural spectrum. Many policies have shown a positive effect on the rate of repository content accumulation.

Despite these successes, such a mandate effect is unpredictable. There are still policies showing little or no visible impact on repository development, and different types of policies have varied levels of success. There is no such thing as a "one-size-fits-all" mandate. In order for open access mandates to perform well, they must reflect the needs of the faculty, many of whom care more about the perceived quality of publications than about information sharing, or who may not be familiar and comfortable with the idea and procedure of open access. OA advocates and managers need to continue to develop strategies for effective mandate policy enforcement if they hope to improve repository services. Our research shows that the "once we create it, they will deposit" proposition is unrealistic. To quote Dorothea Salo, "we cannot keep looking the other way, pining after mandates we cannot realistically achieve unaided, waiting for the great faculty behemoth to awaken from slumber."[38]

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