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Have digital repositories come of age? The views of library directors

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Abstract

This survey of approximately 150 repositories assessed the achievements, impact, and success of digital repositories. Results show that while the size and use of repositories has been relatively modest, almost half of all institutions either have, or are planning, a repository mandate requiring deposit and small gains have been made in raising the profile of the library within the institution. Repositories, then, have made a good deal of progress, but they have not quite come of age.

Keywords

Institutional repositories; Digital repositories; Open access; Policies; Practices and strategic directions

Introduction

Digital repositories (whether institutional, subject, or format based) have been with us for more than a decade and have become an established component in an increasingly complex scholarly communications landscape. They are commonly used for open access research outputs and regarded as an immediate and valuable complement to the existing scholarly publishing model (Crow, 2002). The digital repository community has big and diverse ambitions and sometimes finds itself in dispute with publishers. The professional and conference grapevine has it that repositories are beginning to bear fruit. So it was thought timely to make them a subject of robust and independent research and establish whether they have come of age and become strategic to scholarly communication, dissemination, and scientific research.

This study of digital repositories is the third in a series of research projects conducted by the Charleston Observatory, the research arm of the annual Charleston Library Conference. The Observatory, established in 2009, is a mechanism by which important topics raised at the Charleston Conference can be researched and the results reported back to the conference to provide a feedback loop. It is a virtual research space where evidence can be collected globally in a robust manner and where all the key information stakeholders (librarians, publishers, vendors, and academics) can come together and share data for the benefit of all. The Observatory's first project looked at the impact on libraries of the world-wide recession. In 2010, the Observatory considered social media and its impact on research practice (Nicholas et al., 2011). Both studies received widespread press coverage and generated a series of reports and peer-reviewed publications.

The broad aim of this study is to take the pulse of digital repositories and establish how far they have come, what they have achieved, where they are going next, and to what extent they are meeting user needs and expectations. We especially wanted to see how they are dealing with emerging issues, such as datasets and supplementary non-textual information, the extent to which they are facilitating scholarly communication now, and whether, in the future, they would be central to its development.

The major part of the survey is an investigation of the views of library directors on digital repositories; directors were targeted because we wanted to learn about the big picture, ambitions, policies, and strategies. A smaller aspect of the study concerned a complementary and comparative investigation of scientific researchers and their use of digital repositories, and while the result of this study has been reported elsewhere, we also allude to some of its main findings here (Nicholas et al., 2012).

The principal objectives of the library director study are to:

- understand what library directors saw as the goals of their digital repositories;
- identify the critical success factors behind effective digital repositories;
- assess the wider impact of digital repositories.

Digital repositories are defined broadly to include:

- institutional repositories that aim to collect widely across a particular university or similar institution, possibly in a wide range of formats;
- subject repositories focused on collecting only within a certain discipline, probably across more than one institution;

- format repositories whose scope is limited to collecting in a particular format, perhaps student dissertations and theses, or research data.

Literature Review

A large body of literature about repositories exists, however, most of it concerns implementation. Few studies have dealt with the evaluation of repositories and we do not know how ‘user-driven’ the development of institutional repositories (IR) has been.

Several articles have been published with users/researchers uppermost in mind. Foster and Gibbons (2005), largely focused on the strategic necessity for establishing IRs. Xia (2007) examined cultural differences among researchers in seven repositories. Devakos (2006) described how a number of research methods were employed to solicit adoption of the IR at the University of Toronto.

The challenge of getting authors to deposit content, seemingly a perennial problem, have been described in a number of articles, including those by Kim (2007) and by Allen (2005). The disciplinary differences in academics’ attitude toward and use of repositories studied by Allen (2005) and by Xia (2007) were later confirmed by other studies such as that of Creaser et al. (2010) Problems with getting buy-in from users were described in an article by McKay (2007), who said “IRs are less frequently implemented, harder to find, and less visible than their advocates would hope or expect.” The author also pointed out that “little is known about the users of IRs.”

A more recent qualitative study of library managers’ views suggested that they are positive about the value of their institutional repository, and the progress made toward recruiting content for it. Yet, this study’s survey also showed that New Zealand academics have been slow to embrace the concept of institutional repositories, and display little interest in using repositories (Cullen & Chawner, 2010). A range of factors seem to influence use of repositories by academics. A survey by Kim (2010) suggested that faculty members are motivated by open access advantages to users, disciplinary norms, and no negative influence on academic reward. However, barriers to self-archiving, including concerns about copyright, the extra time and effort required, technical ability or lack thereof, and age, indicate the necessity for services to assist faculty with copyright management, and with technical and logistical issues, in order to achieve higher rates of self-archiving. Overall, the review of the literature shows that very few studies have evaluated how far digital repositories have developed and what their future might be.

Methodology

To provide the necessary reach and international coverage obtained in the two previous Charleston Observatory studies, online questionnaires were the primary means of collecting data. Invitations were sent out to relevant individuals and organizations to participate in the survey and a link provided to the questionnaire via:

- Charleston Conference e-mail lists – direct mail (North America biased);
- Lists compiled by CIBER using OpenDOAR and providers’ website – direct mail;
- Sconul lis-sconul list – direct mail (UK-focused);
- LIBER list-serv direct mail (EU-focused);
- UKSG e-resources list – direct mail;

- Emerald – direct mail to library directors list;
- Special Libraries Association – blog entry;
- Canadian Library Association – list serv direct mail;
- North American Serials Group – list serv direct mail;
- Oberlin Group – direct mail.

The OpenDOAR database listed, at the time, 2,173 repositories using the above definitions. It is difficult to know how comprehensive this source is, but it has the advantage of being the database with the broadest coverage. If we assume that the number from which we are drawing is 2173, and we received completed responses for only 152 institutions altogether, 106 of which had or planned to have a repository, then the figures in this paper should be interpreted with a degree of caution and interpretation should be broad stroke. Tables do split out the findings by size of repository and by region and, of these factors, size is the more reliable.

Calculating a response rate is very difficult because there must have been extensive cross-posting, and we did not know in advance which libraries have a repository (those that do not are not likely to take part). To the study's advantage, the sheer diversity of lists used means that any bias (geographical, subjects, size) has been minimized. Hazarding an estimate, we would say the response rate was conservatively of the order of two to three per cent. Given that the survey was largely distributed through creditable third parties (for example, Sconul) the response rate can be explained by the fact that: a) directors see repositories as only a minor part of their business (borne out by our later findings on staffing numbers) and not the "big beast" that some publishers fear; b) directors are simply embarrassed at the relative unsophistication of their efforts (again something borne out by the findings in this article). Nevertheless, many of the leading repositories are covered in this study, which remains currently the biggest and most recent of survey of its kind. Where appropriate we have provided indicators of the robustness of the data, and finally, the data concerns 150 odd *institutions* and not 150 individuals.

We have indicated any "statistically significant" differences by size of repository or by region in some of the tables that follow. This should be treated with care and it is probably only worth commenting on those with the largest differences (ANOVA F of 4 or greater) given the limitations of the sample size. Although significances less than this are worth following up in focus groups or interviews, we shall do this at a later stage of the study.

The vast majority (91 percent) of respondents came from universities or colleges. North America was the best represented region of the world (47 percent); Europe accounted for 42 percent of respondents and the rest of the world 11 percent. The US was the best represented country (43 percent) and was followed in rank by the UK (18 percent), Canada (3 percent), Netherlands (3 percent), and France (3 percent).

Results

One hundred and fifty two organizations responded to the survey, with nearly seventy percent of respondents saying that they had implemented a digital repository and another 23 percent saying they are planning to do so. Repositories are, then, very much a feature of the modern day library landscape. This finding ought to be treated with caution, as institutions with, or planning to have, a repository-may have been more likely to respond to the questionnaire on

account of having something to say or prove. Of the seven percent (11) of institutions that provided an explanation of why they were *not* planning to have a repository, mainly small US liberal arts colleges, nearly half said it was due to limited resources, and just over a quarter gave the reason as not being a highly research intensive institution. Other reasons cited were a lack of management support or being unconvinced of the benefits.

Three quarters of the repositories were classed as being institutional, very few were subject based. This is in line with global practice, where there are far more institutional repositories than there are subject-based ones. However, it does mean that our findings largely relate to institutional repositories.

Operational concerns

Size and Budget

The resources associated with repositories are relatively modest. Of the libraries that had a repository, two-thirds could be categorized as ‘small,’ having only one or two FTE positions (Table 1). At the other end of the scale just 7.5 percent employed five or more positions.

Table 1. How many staff work on your repository?

	n	%
Small repositories		
Less than 1 FTE	28	26.4
1 to 2 FTE	39	36.8
Medium to large repositories		
3 to 4 FTE	31	29.2
5 or more FTE	8	7.5
Total	106	100.0

Questions were asked about the size of the overall library budget and specifically how much is devoted to the repository. Answers were sparse in terms of detail but we did manage to get a rough indication of how the repository was funded. This data appears reasonably unproblematic and the percentage breakdown is provided in Table 2. This is a collective average and does not mean that all repositories are funded in the same way. The central message is that they are mainly funded within the library. Recurrent spending on digital repositories is relatively low, averaging only 1.8 percent per cent of library operational budgets.

Table 2. How is your repository funded?

Budget breakdown as column percentages	%
Regular budget line for your institution’s library	71.0
Special initiative supported by your institution	15.3
Departmental budgets	6.6
Grant from an external source	4.3
Contributory or membership basis	2.5
Publication budget	0.4
Total (n = 98)	100.0

Type and Quality of Content

Repository content is very diverse, and it is a fallacy to see repositories as simply collections of journal articles. Table 3 demonstrates the different kinds of materials found in repositories, reflecting a more object-oriented approach to research output formats on the part of many academics. In fact, coverage actually expands beyond that shown in the table, with blog posts, interview notes, student magazines, and scanned herbarium materials also being mentioned by respondents.

Table 3. Which types of content are in your repository

	n	%
Journal articles	85	86.7
Conference papers	83	84.7
Student dissertations and theses	80	81.6
Book chapters	70	71.4
Working papers	66	67.3
Books or monographs	59	60.2
Technical reports	57	58.2
Images or photographs	55	56.1
Special collections (e.g. digitized copies of rare books, archives, etc.)	41	41.8
Metadata-only records	38	38.8
Sound recordings	36	36.7
Video recordings	30	30.6
Annual reports	26	26.5
Research datasets	23	23.5
Administrative / corporate records	21	21.4
Learning objects	17	17.3
News or press coverage	14	14.3
Patents	12	12.2
Computer software	10	10.2
Total	98	100.0

The numbers sum to more than 100% since people could choose more than one format.

Those respondents with a repository that ingests journal articles were asked about the versions of the articles deposited. Many repositories will take any version of an article, but there is a preference for later versions. When journal articles require a substantial effort in obtaining permissions before they can be placed in repositories, comments suggest this is usually the responsibility of the author. Free text comments also reflect a general unease about when and whether articles require publisher permission, due perhaps to confusion surrounding the language of copyright law.

Library directors were asked how they maintained the quality of content in their repository, a concern to both depositors and users. The answers suggest librarians are not pro-active in this area and there is a presumption that if the content was generated by staff and students of the institution it must be acceptable. Thus nearly seventy percent said that they accepted everything without review. Of the rest, nearly sixteen percent said there was a post

acceptance review or rating, and nearly fifteen percent said they used peers to review quality. In addition, some academic subject communities establish their own criteria for what is acceptable to deposit.

Mandates

Approximately half of the institutions either have, or are planning, a mandate that requires researchers to deposit their work into the repository. This situation calls into question the sufficiency of the current effectiveness of repositories. Mandates take a number of forms, but the severity of a local mandate will vary in accordance with the attitudes of the researchers on campus. Many mandates are watered down in terms of the sanctions given for non-compliance. In practice, there are probably few really binding mandates. Most have a proviso allowing the researcher to deposit under the terms of the agreement they have with their publisher and often allow the researcher to opt out with written notice. None of the interview subjects reported any attempt to force researchers to comply. One university librarian confidentially disclosed that he saw the role of mandates as educational. He thinks that scholars will gradually get used to depositing their work, but that if he tried to force them, he would come up against academic freedom questions.

User Services Provided

Most repositories offer a wide variety of services, from assistance with deposit to personalized web pages (Table 4). While library directors see a major role for themselves in providing assistance with the deposition of articles, this still seems an effort undertaken on a shoestring. Perhaps library directors are waiting to see at what speed digital repositories take off, before committing themselves wholeheartedly to what is as yet an unclear phenomenon.

Table 4. What services do you offer to your users? (tick as many as apply)

	n	%
Assistance with deposit	93	87.7
Assistance with metadata creation and management	88	83.0
Assistance with copyright clearance	66	62.3
Download statistics	59	55.7
Personalized web page or cv	33	31.1
Total	106	100.0

Strategic Concerns

Goals, Achievements, Impact, and Success

Library directors were asked what the goals for their repositories are and whether they have met their goals. Three goals were highlighted as being very important: 1) to make the formal scholarly literature more openly available; 2) to create a research shop window; and 3) to ensure long term preservation of their institution's research outputs (Table 5). Interestingly, though, they felt that they are most successful in achieving another goal, only rated fourth in importance, which was helping change the culture of the library. Expectations in the digital publishing arena are low.

Table 5. To what extent do you judge the following goals important, and to what extent have they been achieved for your repository?

Mean ratings on a scale where 0=Not at all important (or successful) and 3=Very important (or successful) (n=106)

	IMPORTANCE	SUCCESS
To make the formal literature more openly available	2.38	1.43
To provide a research shop window for your institution	2.34	1.53
Long term preservation and curation	2.33	1.45
To help change the culture of the library	2.03	1.58
To manage informal literature better	1.49	1.14
To provide management information on research productivity	1.48	1.06
To provide access to rare materials	1.38	1.07
First steps to becoming a digital publisher	1.01	0.94

Breaking this analysis down by size of repository makes no difference to any of the answers provided above, but there are some important regional differences:

- The goal of long term preservation and curation is attributed significantly more *importance* in North America (ANOVA $F=4.38$, $p<5$ percent), although, interestingly, there was no difference in reported *success* by region. This is not surprising, as librarians in North America have already developed the Trustworthy Repositories Audit & Certification (TRAC) and Trusted Digital Repository (TDR) Checklist, which are concerned with long term preservation responsibilities.
- The goal of providing a research shop window is rated as significantly less important in North America (ANOVA $F=4.89$, $p<1$ percent) and North American library directors also reported significantly less success in achieving this goal (ANOVA $F=10.76$, $p<1$ percent).
- The goal of making the formal literature more openly available is rated as significantly less important in North America (ANOVA $F=8.29$, $p<1$ percent). There are no significant differences in reported success by region.
- The goal of providing access to rare materials, which is generally rated fairly low, is rated as significantly more important in Europe and North America than the rest of the world (ANOVA $F=9.11$, $p<1$ percent). There is no difference in reported success by region.
- The generally very lowly rated goal of providing management information on research productivity is rated as significantly more important in North America (ANOVA $F=9.96$, $p<1$ percent) and North American library directors also reported significantly less success in achieving this goal (ANOVA $F=11.56$, $p<1$ percent).

Respondents were asked to self-evaluate what level of impact they feel they have achieved inside and outside the institution. The consensus, given the scale used, is quite moderate, somewhere between 1 and 2, between something “small” and something “significant.” The larger the repository, the greater the perceived impact, especially outside the institution.

Table 6. To what extent do you agree or disagree with the following statements regarding the impact of your repository?

Mean ratings, where 0=No impact and 3=Highly significant impact (n=106)

	Overall rating
It has raised the profile of the library within my institution	1.67
It has raised the profile of the library outside my institution	1.47

No difference by region, but size makes a significant (ANOVA $F=3.91$, $p < 1\%$ *within*, and ANOVA $F=6.42$, $p < 1\%$ *outside*) difference.

Directors were asked to rank (rather than rate) six critical success factors for a digital repository. As Table 7 shows, directors consider attracting material and users to be the most important success factors of the six options provided. The size of the depository is not a significant factor in the response.

Table 7. What do you consider are the most important critical success factors for a digital repository?

Mean rankings, where 0=Least important and 5=Most important (n=106)

	Overall ranking
People should want to put material in	4.19
People should want to get material out	3.15
Its scope and extent should be clear	2.75
It should have a strong sense of ownership	1.77
It should have a clear, single purpose	1.73
It should serve a clear community	1.41

Advantages, Disadvantages, and Perceptions

The numbers of respondents increase for this section's analysis because we have included those people who are planning a repository. Table 8 describes respondents' rankings of some of the possible advantages of having a repository. Providing access to publicly funded research is given the highest ranking, although long term preservation of institutional materials is a very close second. There are probably no surprises here, but it is interesting that outward facing factors (that is, those that are aimed at specific groups of people outside the institution) generally fare less well. Contributing to the reform of scholarly communication and publishing, the advantage listed that would be most relevant to publishers, came in at a not-too-distant sixth.

Table 8. Thinking about digital repositories in general, how important or unimportant do you consider the following possible advantages?

Mean ratings, where 0=Not at all important, 3=Very important (n=141)

	Mean rating
Providing maximal access to the results of publicly funded research	2.50
Long-term preservation of your institution's digital materials	2.48
Enhancing the external prestige of your institution	2.41
Reducing the time between discovery and dissemination	2.35
Better services to students inside your institution	2.34
Contributing to the reform of scholarly communication and publishing	2.33
Contributing to the changing library culture, more digital	2.21
Maintaining control over your institution's intellectual capital	2.20
Better services to researchers outside your institution	2.17
Provision of identifiers for easier citability of digital materials	2.04
Better services to learning communities outside your institution	2.01
Registration of new ideas	1.53

There are some regional differences as regards importance, but these are relatively small in absolute terms. To determine whether they are real and meaningful we will need to turn to qualitative methods. The differences are:

- a) Europe rated long-term preservation of an institution's digital materials significantly lower as an advantage than North America and the rest of the world (ANOVA $F=3.70$, $p<5$ percent).
- b) North America rated maintaining control over an institution's intellectual capital significantly higher than Europe, but not the rest of the world (ANOVA $F=3.14$, $p<5$ percent).
- c) Europe rated enhancing the external prestige of an institution significantly higher than North America and the rest of the world (ANOVA $F=3.68$, $p<5$ percent).
- d) Europe rated better services to researchers outside an institution significantly higher than North America and the rest of the world (ANOVA $F=3.10$, $p<5$ percent).

What then of the disadvantages of having repositories? Table 9 shows that, of the disadvantages provided, copyright confusion and lack of awareness are ranked as the most significant disadvantages. Long term funding is a relatively close third. Library directors are very clear in that that they do not see repositories as threatening to publishers' interests.

Table 9. Thinking about digital repositories in general, how important or unimportant do you consider the following possible disadvantages?

Mean ratings, where 0=Not at all important, 3=Very important (n=141)

	Mean rating
Confusion and uncertainty over copyright issues	2.20
Lack of awareness by users	2.14
Long term funding and support for repositories uncertain	1.91
Lack of interoperability between repositories	1.88
Costs of long-term preservation and digital curation	1.82
Not comprehensive: lack scale and critical mass	1.57
Fragmentation of access points to the literature	1.43
Confusion caused by different versions of the same material	1.33
Variable quality of material	1.33
Software not comparable with the best that publishers offer	1.22
Fear of plagiarism	1.08
Threatens the business models of publishers	0.78

Smaller repositories differed from larger repositories in two significant regards:

- They rate not being comprehensive: lack scale and critical mass as significantly less a disadvantage (ANOVA $F=4.33$, $p < 5$ percent).
- They rate fragmentation of access points to the literature as significantly less a disadvantage (ANOVA $F=4.04$, $p < 5$ percent).

Of the regional differences, the largest concerned cost. Europe rates this factor as significantly less important than North America (ANOVA $F=5.89$, $p < 1$ percent), which suggests very different levels of concern about long term funding for repositories. Perhaps there is more public money available in Europe as opposed to North America. The second major difference is in regard to the variable quality of material; North America and Europe rates this factor significantly less important than the rest of the world (ANOVA $F=4.46$, $p < 1$ percent). Finally, North America and Europe do not rank highly that repositories threatened the business models of publishers, but the rest of the world indicated some risk (ANOVA $F=3.47$, $p < 5$ percent).

Perceptions and Attitudes

Repository managers were asked whether they agreed or disagreed with a number of possibly contentious statements about repositories (Table 10). An interesting finding is that library directors do not see repositories as impacting negatively on publishers' revenues, rather the opposite, and they tend to agree reasonably strongly that repositories help to raise the digital visibility of research materials. They appear to see the two systems as complementary rather than antagonistic. There are no significant differences in responses by size of repository or geographical region

Table 10. To what extent do you agree or disagree with the following statements about digital repositories?

Mean ratings, where -2=Strongly disagree and +2=Strongly agree (n=106)

	Overall rating
Researchers should not link from their own web pages, but from a repository	+0.59
They are the publishers' friends - they raise the visibility of research material	+0.58
They should be organized by region, country or subject to achieve critical mass	+0.26
They are the first step towards universities becoming digital presses	+0.20
They will gradually become redundant as more material becomes open access	-0.64
They impact negatively on publishers' revenues	-0.72

The Future for Repositories

Library directors were asked whether they thought that institutional repositories would be more or less important in three years' time. Having made a considerable emotional investment in IRs, if not a considerable financial investment, it is not surprising that hardly anyone thought IRs would be less important. The vast majority of respondents felt that IRs would become more important (Table 11). Indeed, one fifth expect they will be much more important. There is no difference in response by size of repository or geographical region.

Table 11. Compared with today, in three years' time, do you think that institutional repositories will be more important or less important to researchers? (n=106)

	All respondents
Much less important	0.0%
Less important	3.8%
About the same	20.8%
More important	54.7%
Much more important	20.8%
Total	100.0%
Mean rating	3.92

The positive tone of many library directors is reflected in the following free-text responses:

They are the future and libraries should lead the way – it's what we've always done – but with digital resources not print.

*– Small institutional repository, Higher education, Ireland
Tenure and promotion have become a very important reason that our faculty deposit in our repository – and this will become even more of a focus as junior faculty, who are increasingly committed to sharing their output, become*

tenured and as what counts for tenure and promotion shifts from solely the published literature to a wider variety of content. Also an important shift is the object-based way research is now done, so the broader acceptance for variable quality of materials within a single repository. PLoS ONE, if considered a repository of sorts, has really changed the playing field in this regard, and repositories more generally are embracing this approach.
 – Medium to large institutional repository, Higher education, US

Discussion and Conclusion

Probably the biggest surprise to arise out of the study is the realization of what small enterprises digital repositories really are. The financial commitment to institutional repositories can be reflected in the staffing allocated and, even among very large universities, only 8 of the 106 respondents report that the staff used to run the repository exceeded five FTE. Most IRs run on very small budgets and, given these circumstances, it is a wonder that repositories in their present form have achieved what they have.

The growing movement for campus-based publishing has been confined almost entirely to the US, and although it does involve university presses and institutional repositories working under the general aegis of the library, such publishing has not been embraced as being the work of the repository. In marked contrast, publishers invest considerable sums in the areas of digital logistics, communication of their content to targeted subject communities, reviewer management, seeking permissions for the use of material, and connecting the content into the global scholarly research community through metadata and up to date content platforms.

Despite a number of vocal free-text complaints from respondents about how publishers were exploiting their position within the delivery of research reports, there was overall a muted response on this emotional issue within the questionnaire returns of library directors. By the same token, publishers have been expressing concern that the growth of digital repositories could endanger the existing journal publication system. However, on this score the library directors perceived some potential complementarity between the repositories and the publishers, in that repositories making content increasingly visible and accessible offers an advantage to publishers. And this is indeed borne out in the latest PEER Project research (www.peerproject.eu), which shows repositories boost publisher usage, probably by driving traffic directly to the publisher's site. Only in some of the detailed supplementary commentaries sent in by researchers on the parallel study show a smoldering resentment about the inequity of the existing publisher-controlled system.

This general finding represents a starting point to a quite separate discussion. Thus it is pretty obvious that if all the papers or the great majority were deposited and easily accessible (a harvesting of papers that works) why should anyone buy a journal? However it seems as if the green approach (i.e. repository based Open Access) has just been too difficult to realize with harvesting never working properly. As a consequence several senior librarians have come to the conclusion that green does not work at the more general level and are moving toward the gold OA option (i.e. Open Access journals).

The results do show that there are differences in attitudes of library directors between the main geographical regions on some fundamental strategic issues. Many of these differences

are embedded in the different traditional library cultures – for example, there being more open/public library approaches in Europe compared with the United States. However, the differences are not always significant.

As mentioned earlier, a parallel study looked at the views and behavior of researchers in regard to digital repositories and the full details can be found in the study's final report (CIBER, 2012). However, here we highlight the key differences between the responses of repository providers and users:

- Library directors seem to be looking at digital repositories from a process point of view, whereas the researchers were viewing them as a tool. The librarians were operationally focused, concerned with how the repository can provide a valuable shop window; deal with curation; encourage authors to submit and use the information; provide more support for open access. The researchers focused on the challenges the repositories presented for their research experience – such as uncertainty over copyright or options for when and how to deposit an article.
- As far as the future is concerned there seems to be a stronger feeling by the researchers that 'gold' open access will replace 'green,' and that within the repository movement itself, subject based repositories are better placed than institutional repositories to meet their needs. This differs from the views of the library directors, which show a higher rating of institutional repositories.
- Researchers enthusiastically support the use of digital repositories to store non-article formats, particularly datasets, video clips, and other non-textual supplementary material, though journal articles are seen by library directors to be the main content, followed by conference papers. Other format types seen as being relevant for inclusion are e-thesis and book chapters, working papers, research datasets, and learning objects – all formats not included as part of the current mainstream journal publishing system. Digital repositories are in a unique position to house and make accessible all of these varied formats. Unfortunately, some of the library directors surveyed lack knowledge of these formats, as well being without the resources to hire staff skilled in their handling.
- There is clearly a marketing/promotional issue which has yet to be dealt with in bringing institutional repositories in particular to the forefront of the communication system. As far as researchers are concerned 47 percent of those not currently depositing in repositories do not know about repositories' existence. Sixty-five of the 247 who admitted to be non-users were unaware of its availability and a further 51 lacked knowledge on how to deposit their manuscripts. A further 43 lacked time and inclination
- Many repositories require local researchers to deposit their work – one-third of the 85 directors who responded operated a mandate, and a further fifteen percent were planning to do so. Most authors/researchers (47 percent) willingly submit their manuscripts to the local repository; While mandates might have been in force in institutions where researchers voluntarily contribute their content, only 22 percent responded that they had deposited their work as a direct result of an institutional mandate. Respect for a mandated approach to submissions correlates to age, with younger researchers more likely to contribute if mandated, which points to the advantage of a mandated repository system in the future. There was no strong support among users for a third type of repository – that of individual researchers maintaining their own or departmental web sites of their own publications. Only 11.6 percent were

supportive of this form of repository, which was four times greater than the support given to format repositories.

- The disparate nature of institutional repositories – with differing software, formats, interfaces – and how this meets a need currently being met by Google and other worldwide search engines in achieving one-stop comprehensive coverage –emerged more strongly in the case of researchers.

In general, our study highlights some important issues about the acceptance of the digital repository as a mainstream function within the current research information system. It also dispels some widely held assumptions about the impact repositories are having on the main stakeholders. More work still needs to be done to monitor emerging developments, but this attempt to bring together the views and opinions of administrators and users provides tangible evidence in a sector complicated by new challenges, questions, and a steep learning curve.

Finally, what is the answer to the research question we posed at the outset – have digital repositories come of age? On the evidence of the survey institutional repositories are still in a formative stage. They do seem to have made significant inroads despite their limited resources. However, attitudes still have to change among the main section of the research community for repositories to be seen as having reached any degree of maturity. In the bigger picture of scholarly communication, the big subject repositories, such as PubMed Central and ArXiv, are making more impact on the way scholars work. Our survey shows that the original aim of institutional repositories to offer free access to the academic literature for scholars worldwide has been somewhat supplanted by the pressure from administration to showcase the research from the home institution. The two aims are to some extent complementary, but they are not the same. We also find traces in the responses to the survey which reflect a different take on achieving open access by opinion formers within the senior library community. Librarians are now advocated within their institutions and elsewhere support for open access fees as part of an institutional function of disseminating as well as fostering scholarship: gold open access is seen as not only a route to be taken but also a route which needs to be paid for.

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