Institutional Repositories, Open Access, and Scholarly Communication: A Study of Conflicting Paradigms

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The Open Access movement of the past decade, and institutional repositories developed by universities and academic libraries as a part of that movement, have openly challenged the traditional scholarly communication system. This article examines the growth of repositories around the world, and summarizes a growing body of evidence of the response of academics to institutional repositories. It reports the findings of a national survey of academics which highlights the conflict between the principles and rewards of the traditional scholarly communication system, and the benefits of Open Access. The article concludes by suggesting ways in which academic libraries can alleviate the conflict between these two paradigms.

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Introduction

Academic libraries have played a key role in the scholarly communication process for the past 150 years. In the past decade, they have been persuaded by the Open Access movement that this process does not adequately disseminate and promote the work of their own scholarly research communities, and have developed individual institutional repositories, electronic archives of the research output of staff employed at their institutions. However, the evidence shows that despite a considerable investment on the part of academic libraries in these repositories the scholars and researchers whose work it is intended to support have not shown the same commitment to Open Access. The "build it and they will come" philosophy that libraries have adopted has not, as yet, been justified. While some institutions have adopted mandatory deposit as a solution to this problem, others have moved on to other initiatives, leaving their repositories to languish with little growth, and less relevance to the academic community. The situation raises a number of questions, about whether the traditional scholarly communication paradigm and the Open Access movement are actually in conflict; whether, despite complaints about the traditional scholarly communication model, researchers are too wedded to it to take advantage of the undoubted opportunities that Open Access and institutional repositories offer, or whether, faced with such a major paradigm shift, it is too early to judge the success of institutional repositories. This paper sets out to explore these questions through a study of the attitudes and behaviors of a sample of scholars and researchers drawn from all research active faculty in tertiary education institutions in New Zealand.

Background

In the last decade of the twentieth century, existing channels for distributing research publications, particularly in the sciences and medicine, were perceived to be subject to unacceptable time lags. Authors were frustrated by the time from submission to publication, and researchers found it difficult to keep up with new developments in their fields. Existing systems for distributing paper preprints by mail or facsimile, designed to circumvent such problems, were clumsy and slow. In the early 1990s, the emergence of the Internet and the Web made other communication and publishing options possible, starting with email distribution, then moving to the Web. The first web-based preprint server, arXiv, started at Los Alamos National Laboratory in 1991[1] initially focused on physics preprints, and was subsequently extended to include mathematics, computational linguistics, and neuroscience. Its goal was to capture preprints in electronic form, to make them available to the widest possible audience. Other well-known examples which soon followed the arXiv model include EconPapers, and CogPrints (cognitive psychology).

At the same time, journal subscription costs were increasing significantly, particularly in science and medicine,[2] at a time when institutional budgets were already under threat. Many libraries were forced to cancel subscriptions, leading to further cost increases. Researchers reacted by claiming that they had lost access to key material, which their own endeavors as a community had created, and that the publishing industry was no longer serving the interests of research and scholarship, but driven by profit, at the expense of knowledge. Publishers responded, with attempts to justify their real world costs, highlighting the value they added to the scholarly communication cycle.[3] In addition, as journals began to appear in electronic formats alongside print, and eventually only in electronic format, libraries began to find that access to previously purchased intellectual content might be lost if a subscription was canceled. The traditional and long accepted channels of scholarly communication were under threat, but an alternative economic model that would be acceptable to the academic and research community had not yet emerged.

Core principles of scholarly communication

The traditional scholarly communication cycle focuses on the creation of new knowledge through research and scholarship, the submission of findings to a journal in the discipline, rigorous peer review, publication and dissemination (usually through library subscriptions), making new knowledge available to a community of researchers who can further build on it. Although the pattern of creation, organization and dissemination varies from discipline to discipline and may involve monograph as well as journal publication, it has been endorsed by the academic community, and is closely integrated into the promotion and tenure systems that reward academics. Roosendaal and Geurts[4] categorized the four key functions of this process of scientific/scholarly communication:

- registration: identifying the "owner" of the intellectual property;
- certification: establishing the quality of the research;
- awareness: making the research available to others; and
- archiving: long-term preservation to make the results available to future researchers.

These four principles well serve the needs of authors, and their colleagues, all members of an invisible college that constitutes a particular community of scholars within a discipline. However, in developing institutional repositories, academic libraries and proponents of the Open Access movement who have led the movement have focused on somewhat different priorities. They have argued that Open Access to research publications, in either pre or post print format is a more effective means of disseminating research and that it brings benefits to the researcher, to their institution, and to their individual discipline. The key argument is the enhanced exposure depositing in an institutional repository can bring—that by having their research and publications openly available on the Web, not just in fee-based databases, scholarly journals, or books, the work is likely to be used and cited more. As a result, the individual's and the institution's reputation will be enhanced over the long term, due to the recognition they gain from this.[5] Other benefits to researchers include stewardship and the preservation of their publications in digital form, which frees them from the need to maintain this content on a personal computer or website.[6] However, despite these benefits, the academic community has not apparently changed its traditional pattern of scholarly communication. Although the increase in numbers of journal titles and articles published has not been as great as once predicted, there is still a steady increase in the number of journals and published articles (reaching more than 50 million by the beginning of 2010), which strongly suggests that whatever their views on online repositories, the academic community is still committed to journal publication for dissemination of their research.[7]

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The open access movement

The Santa Fe Convention in 1999 at which the Open Archives Initiative was launched, was followed closely by the 2001 Budapest Open Access Initiative,[8] and the publication of a manifesto calling for Open Access to peer-reviewed journal literature.[9] This recommended a new model for scholarly communication, which proposed two strategies for authors and institutions to resolve the problems outlined above: (i) self-archiving of refereed journal articles in open electronic archives, and (ii) publishing in Open Access journals, which publish their content freely on the Web (but may impose author charges). While discontent with the system of scholarly communication and Open Access solutions had long been expressed by OA advocates such as Stevan Harnad[10] and Andrew Odlyzko,[11] Jones et al. suggest that it was the Open Access Initiative that prompted wider uptake of the notion of online repositories. They argue that the rapid and widespread development of institutional repositories was due to lack of confidence in the long-term support for subject-based repositories, such as arXiv, and CogPrints. Institutions, both academic and scientific, might provide a more trusted repository in which their staff could deposit their research,[8] thus capturing some of the benefits noted above, such as exposure and preservation, equivalent to the last two of the principles of scholarly communication, awareness and archiving.[4]

The first academic institutional repository projects, the EPrints archive at Southampton (founded in 2001, and now internationally renowned as e-Prints Soton) and the DSpace initiative at MIT (2002), were begun in parallel with the Open Access Initiative. In the past decade, the majority of tertiary institutions in developed countries and a large number of those in developing countries have followed suit, and established an institutional repository, usually under the aegis and management of the academic library. The OpenDOAR database at the University of Nottingham,[12] which attempts to list all repositories worldwide, records spectacular growth in the number of repositories over the past five years, from just over 300 in mid 2006 to over 1800 by January 2011. Of these, 1508 (82%) are institutional repositories, compared with 219 (12%) disciplinary, or cross-institutional subject repositories. The remaining 6% comprise governmental and aggregating repositories (aggregating data from several repositories). Nearly three-quarters of institutional repositories are found in North America (24%) and Europe (45%), with Asia accounting for 17%, Australasia for 4%, South America 6%, and Africa 2%. These repositories hold a mix of journal articles, theses and dissertations, unpublished working papers, conference papers, books and book chapters as well as multi-media and other audiovisual materials.

This seems on the surface to suggest that institutional repositories have been successfully introduced, and may indeed provide a solution to concerns about the system of scholarly publishing identified above. However, more detailed analysis of the data available through

the OpenDOAR database, and an inspection of the number and nature of items deposited suggests otherwise. Taking the United Kingdom as an example, most institutional databases maintained by UK universities do not appear to contain or reflect the extent of the scholarly output of their academic communities. Apart from the massive DSpace repository at Cambridge, which includes nearly 200,000 items, (the bulk of which are digitized images and research data as well as smaller collections of research articles and theses), a typical university will have between 800 and 8000 items, with only a few (e.g. those at LSE, UCL, Bath, and Southampton) holding over 10,000 items (and these generally include working papers and datasets as well as published research). Only some of the items listed in these repositories are available in full-text, and not all have been through any form of peer review, or other quality assurance process. This is true of most of the institutional repositories listed on OpenDOAR for all countries.

It is clear that the concept of the institutional repository has appealed to professional librarians and university administrators, but seems to have failed to gain much traction with the academic community it was intended to benefit. Setting up a repository is a major undertaking for an institution.[8] It requires a commitment of financial and staff resources both for the establishment and the maintenance of the repository, a well developed process for establishing its authority and value in the institution, and an overt public relations campaign in the academic community to persuade individual academics to deposit their research outputs.[13] However, despite the arguments for significant benefits of institutional repositories for both the individual researcher and the institution, the evidence above suggests that academic communities have been slow to respond. Even with a considerable investment of resources and strong initial advocacy from libraries, institutional repositories have not been as successful as expected. It is important to identify the factors that may have contributed to this, and to understand more about the perceptions of the academic community and their attitudes toward institutional repositories.

Previous research

The rapid uptake of institutional repositories was reinforced by a literature which highlighted the benefits to institutions and individual researchers, focusing primarily on exposure, and stewardship. Kim[14] suggests that these benefits can be categorized as extrinsic and intrinsic, extrinsic benefits being accessibility, increased publicity for the research, trustworthiness of documents, recognition for the individual and the institution, and academic reward, all of which may motivate researchers to deposit. Intrinsic benefits, by contrast, relate more to the altruistic intention of the depositor to make their findings available to colleagues and stakeholders, as well as the value of a knowledge management system for the management of research outputs. By and large, however, the benefits appear to have been more readily recognized by institutional managers, and librarians, and to be at the institutional level. In a survey of academic library directors and senior administrators carried out in 2006, Rieh et al. identified "capturing the intellectual capital of [the] institution" as the most important benefit of a repository, in the view of participants.[15]

Academics and researchers appear to be less likely to perceive the benefits of an institutional repository, and this is identified as one of the factors resulting in low rates of deposits.[14,16] But the willingness of academics to contribute to a repository depends on a number of other factors as well. Historically, particularly in the sciences, specific groups of researchers, keen to share their research findings, and with an element of competitiveness, have led the way.[8] Other early adopters are those from more recently developed academic disciplines, or who are seeking to build an academic community across a dispersed workforce, such as Nursing Studies.[13] In contrast, academics accustomed to the well established pattern of publication in academic journals of known prestige, with effective systems of peer review and dissemination, see less merit in alternative methods of access to the same material. As Hendler notes, prestige of publication venue plays the single largest role in faculty decisions about the destination of their research.[16] Current estimates suggest that only between 15%[17] and 30%[18,19] of eligible scholars and researchers self-archive their work in institutional repositories. Faced with this reluctance on the part of academics numbers of institutions have moved to mandatory deposit for institutional members (262 such mandates are currently reported by ROARMAP),[20] but even in these institutions the number of deposits does not appear to represent anything near full compliance from institutional members, according to statistics gathered by the OpenDOAR registry.[12]

A number of recent surveys in the US and the UK of both academic staff and staff managing repositories[18,19,21] confirm that: academics have little awareness of opportunities for Open Access publishing, continue to publish in traditional venues, and identify a major obstacle to change as "the existing reward systems of tenure/promotion (and even grant making) which favor traditional publishing forms and venues".[21] In the UK faculty express considerable interest in depositing articles, but less than 30% had done so.[19] (In some studies only 15% have deposited in a disciplinary repository, and similar proportions have used material in a depository.) Academic staff generally report little knowledge of the concept of institutional repositories, are unaware of their institution's policy (including whether deposit is mandatory or not), and are ignorant of their own and publishers' Intellectual Property rights.[19] The traditional article remains the highest priority as an outlet for research, and the single most important factor for most academics in deciding where to publish is high readership within one's own discipline. Respondents in all surveys appear significantly less interested in their publications being widely and freely available. Additionally, in the UK, the most frequent reason given for choice of publication outlet was the impact of research assessment exercises, which favor high impact journals.[19] (Such exercises are routinely conducted in some other Commonwealth countries, including Australia and New Zealand.)

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Some studies have explored in more detail the differences between the ways arts and humanities researchers use information compared with their colleagues in the sciences and social sciences, and how this affects the way academics view institutional repositories.[22,23] Humanities scholars are shown to have low awareness of repositories and their value to the research community, perceive the value of repositories to be to the reader, rather than the scholar depositing, and have on-going concerns about repositories, such as peer review, plagiarism, and intellectual property ownership. Humanities scholars are less aware and make significantly less use of e-publications and Open Access services than their counterparts in the sciences, but, like their colleagues in the sciences, are not so much interested in the research outputs of a

particular institution, but rather what is available in a particular field.[23]

Barriers to deposit

Carr and Brody,[24] and Henty[25] argue that the key to a successful repository is a sustained rate of deposits, and that to achieve this, the engagement of the academic community is necessary. However, many factors have been identified which mitigate against this engagement. Most studies have identified concerns about copyright and plagiarism, and Kim also found age to be a barrier,[26] but a more significant factor may be the time and effort involved in depositing.[14,26,27] As both Devakos[28] and Davis and Connolly[29] observe, a task that is not done often enough means relearning the technical process, and readdressing IP and copyright issues. In addition, it appears that faculty do not trust their institution to preserve their work, protect it from plagiarism, or charges of breach of IP, and are not convinced that their work will receive adequate exposure lost in a mix of publication types and disciplines; furthermore, an institutional repository is not seen as a prestigious outlet.[27,29] As Kingsley[30] argues, an academic is most likely to seek deposit for their work in forums they would likely use to find the work of peers and colleagues, and that this varies according to discipline. Thus there may be a conflict between the demands of the institution and the values of an academic's invisible college, since repositories are perceived to exist to serve the institution and funding bodies, rather than the individual.

Motivators to deposit

Despite the impact of these barriers, there is some evidence of more positive attitudes to repositories. Some studies show that not only do academics favorably disposed to repositories declare a willingness to deposit in order to enable other scholars to find, use and cite their work (bringing both a personal and institutional benefit), but also that some have a more altruistic attitude, are in agreement with Open Access policies and principles, and believe that knowledge should be openly shared and that publicly funded research should be made publicly available.[13,14,26] This conviction appears to be independent from the disciplinary influences on an academic's decision to deposit. A pilot study for the research project reported here, for example,[31] found that six of eight New Zealand academics interviewed about their attitudes to IRs were aware of the increased exposure that their work would gain from being accessible in an IR, and saw this as desirable because it contributed to the public good. Some of them also expressed frustration with more conventional channels of dissemination for their work, because they felt they did not reach a wide enough audience.

The dominance of subject or disciplinary repositories in the early days of electronic repositories suggests that in some disciplines a culture of deposit of preprints and working papers in order to encourage peer review and communication, may also be a motivating factor in relation to institutional repositories. This is cited by Kim as "a predisposing factor,"[14,26] although those with prior experience of this kind were more likely to use personal websites, and the website of their own research group rather than more general disciplinary sites. However, not all research confirms that membership of a discipline with a prior history of deposit in subject repositories leads to higher rates of deposit in institutional repositories.[32]

Impact of depositing on citation rates

If the assumption that there is a consonance between the locations that academics use as information sources and where they seek to disseminate their own research is correct, then we would expect to find limited use of institutional repositories as information sources, and little detectable impact of publication in an Open Access institutional repository on citations of the work published there. This has been tested by a number of bibliometric studies investigating whether articles published in Open Access sources, freely available over the Internet have greater impact.[33–37] These studies show advantages of the order of a 40 to 80% increase in citations, and appear to vary between disciplines. In a bibliometric analysis comparing the apparent citation advantage of voluntarily deposited articles (which may be selected by authors as their higher quality work), and items compulsorily deposited by institutional mandate, Gargouri et al.[17] showed that the advantage of self-archiving online in freely available archives, whether institutional or disciplinary, does result in higher citation rates for freely available, peer-reviewed post prints, and that this is also true for items that are mandatorily deposited. They also show that advantage of exposure bestowed by depositing in IRs,

> "is real, independent and causal. It is indeed true that the size of the advantage is correlated with quality, just as citations themselves are (the top 20% of articles receiving about 80% of all citations); but what that means is that the OA advantage is higher for the more citable articles, not because of a quality bias from author self-selection but because of a quality advantage that OA *enhances* by maximizing accessibility, and thereby also citability."[17]

This, the authors suggest, demonstrates that the use of institutional repositories can enhance the "research community's existing system for evaluating and rewarding research productivity."

The present study

Objectives

The study was conducted in all eight New Zealand universities, and some larger polytechnics and technical institutes. While New Zealand academics, especially in the universities, are drawn from an international community of scholars, (between 30 and 40% were not born in New Zealand), and are strongly interlinked with their international academic communities, New Zealand's geographical isolation would suggest academics would respond more favorably to any effort to enhance both exposure and citation of their research. This study seeks to investigate whether this is so, or whether they are locked into the still dominant paradigm of scholarly communication which sees their allegiance directed toward their disciplinary group, and invisible college. This would put their aspirations in conflict with those of their institutions, which seek to build repositories for their own interests, as Kingsley suggests, and our own prior research strongly shows.[13]

Institutional repositories were created in all eight New Zealand universities and some of the larger polytechnic and technical institutes, between 2006 and 2008, through four consortium agreements, the majority funded by grants from the Tertiary Education Commission, and sharing expertise and software. Metadata was gathered nationally by the national resource discovery system, Kiwi Research Information Service, (KRIS). In most institutions the institutional repository was managed by the university library, keen to participate in this national endeavor, and to get out among their research community to find prominent champions to secure the success of the venture.[38] In some institutions, the focus was on collecting theses, and these dominate the content of most collections. Rates of collection of research outputs are no higher in New Zealand than in other countries, numbers ranging from around 1300 to 5000 in the university collections[39] and the same questions arise as elsewhere about the viability of institutional repositories, and their relevance to the academic community. This study therefore explores the attitudes of academic staff in New Zealand tertiary education institutions toward institutional repositories. It investigates whether they are aware of and support the concept of Open Access repositories, and

what barriers and motivators would inhibit or encourage them to deposit their work in a repository.

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Method

A survey of academic staff, based on a stratified random sample drawn from each of the eight universities in New Zealand and twelve of the larger polytechnics, was conducted in 2009. The total population was determined from staff lists supplied by the institution, or developed from the institution's calendar if staff lists were not available. These lists were reviewed in order to eliminate staff who were not be expected to be active researchers, and were excluded from the national 6-yearly research assessment exercise. The final population was 7469; respondents were randomly selected from each institution's staff list in proportion to the number of staff who met the selection criteria, to ensure that the final sample represented the overall population. The sample totaled 1991, from which 546 responses were received. The number of responses to generalize findings to the total population of academics in these institutions (6018 employed in the 8 universities, and 1451 in the 12 polytechnics included) equates to a random sample of 556. Thus the data presented here can be generalized to the wider population with a degree of confidence close to 95%.

Findings

The survey was large and complex and not all participants answered all questions. The sample of 546 respondents comprised 304 (55.7%) men and 238 (43.6%) women (4 respondents did not give gender). Ages ranged from 30 or under (2.9%); 31–40 (20.8%); 41–50 (25.4%); 51–60 (36.4%); 60+ (14.5%); 22 respondents were over 65 and 2 respondents did not give their age. Disciplines covered ranged from standard business subjects (accounting, economics, management and marketing are all well represented), through the traditional arts and humanities subjects, the social sciences, engineering, geography, nursing, psychology, veterinary science, and medicine (those involved in teaching and research, not purely clinical staff). The 8 universities were represented by numbers of respondents between 26 and 101, relative to institution size. Responses were received from respondents at all 12 polytechnics included in the sample, and ranged from 1 to 15 participants per institution.

The academic rank of respondents is shown in Table 1.

Table 1

Academic rank of respondents

Rank	Number	%age
Tutor/demonstrator	25	4.6
Lecturer	140	25.8
Senior lecturer	221	40.8
Associate professor	84	15.5
Professor	72	13.3
Total	542	100

Table 2

Preferred types of repositories used to retrieve information by respondents

Type	Number (%)
A subject-based repository dedicated to a specific field, but open to all	392 (75.10%)
The website of a colleague in the field	362 (69.30%)
The website of an academic department or school	360 (69.30%)
An institutional repository (including your own institution)	300 (57.50%)
The website of a research institution outside of a university or polytechnic	293 (56.10%)
A thesis database, such as the Australasian Digital Theses service	265 (50.80%)
Total	522

Overall this represents a very thorough coverage of the New Zealand academic community, with a slight bias to more senior ranks, although this is a typical profile of tenured staff in New Zealand institutions. It should be noted that although the New Zealand polytechnics have been included in recent government research assessment exercises, they do not all have a strong culture of research and some are struggling to cope with this new research focused environment.

Table 3

Reasons given for depositing in an institutional repository

Reason for depositing	Mean	StdDev
I wanted to make my research available to my students and colleagues	3.99	0.992
I see the act of depositing my work in the repository as a way of increasing its exposure	3.98	1.125
I was asked by the institution to make my work available in this way	3.95	1.055
The institutional repository is a good way to maintain copies and list my research output	3.56	1.227
I like to use new technologies in my research and publishing activities	3.49	1.187
I think that research deposited in our institutional repository may attract research students and other researchers to our institution	3.28	1.107
I saw the benefits colleagues were getting from doing so	3.08	1.181
I think that depositing research in an electronic repository [a] has increased my recognition	2.90	1.113
I think that depositing research in an electronic repository [a] has helped my career advancement	2.50	1.119

(Responses available were very important = 5, important = 4; neutral = 3; not very important = 2; not at all important = 1.) Calculated out of 134 responses.
[a] Your own institutional repository or a discipline-based repository.

Table 4

Benefits of institutional repositories as stated by participants (both depositors and non-depositors)

Benefits of IRs	Mean	StdDev
They give the work of the institution more exposure	4.10	.821
Institutional repositories help institutions organize their research output and preserve it long term	3.94	.867
They give the work of the individual researcher more exposure	3.92	.929
They represent an exciting new mode of scholarly communication	3.52	1.054
They reduce the dependence of tertiary institutions on increasingly expensive modes of scholarly/research publishing	3.29	1.183

(Responses available were graded very important = 5, important = 4; neutral = 3; not very important = 2; not at all important = 1.) Calculated out of 522 responses.

Awareness of the concept of institutional repositories was relatively high. A total of 345 (63.5%) respondents stated they were aware of the concept (198 were not aware, and there were 3 non-responses). A smaller percentage (238, 44.3%) knew that their own institution had a repository; over 55% were unaware of the existence of their own institution's repository, and in many cases respondents answered "No" although their institution did have a repository. While 193 (35.5%) respondents indicated that they had accessed an institutional repository to search for material, 153 (28.0%) had done so through Google or Google Scholar, and only 16 (2.9%) had done so through the national metadata harvesting service KRIS. Respondents were also asked where they would look for research if they suspected it might be available in some form of online repository. Table 2 ranks responses (respondents could nominate all or any of these), and responses show a clear preference for subject-based repositories and those within their invisible college (see Table 2).

Only 131 respondents, 24% of the total sample, had ever deposited a research item in their institutional repository. Of these, 40 recorded only one deposit, and a further 32 reported between 2 and 5 items, while 28 respondents had deposited numbers of items ranging from 5 to 16. Over 20 items were deposited by 9 respondents, some of whom reported depositing more than 50 items, and in one case over 200

Table 5

Disadvantages of institutional repositories as stated by participants (both depositors and non-depositors)

Disadvantages of IRs	Mean	StdDev
Depositing in an IR adds extra workload for staff	3.46	1.016
Institutional repositories are not as easy to use as journal indexes and databases	3.18	.934
Institutional repositories may breach the confidentiality of data in some research	3.16	.961
Institutional repositories risk reducing the value of the peer review process	2.94	1.039
Institutional repositories will expose more work to plagiarism	2.92	1.019
When everyone is required to deposit their research in an institutional repository there will be no competitive advantage in doing so	2.69	.927

(Responses were graded as very important = 5, important = 4; neutral = 3; not very important = 2; not at all important = 1.) Calculated out of 524 responses.

Table 6

Benefits of institutional repositories comparing responses of depositors and non-depositors

Benefits of IRs	Yes (Mean)	No (Mean)
They give the work of the institution more exposure	4.13	4.08
Institutional repositories help institutions organize their research output and preserve it long term	4.08	3.88
They give the work of the individual researcher more exposure	3.98	3.51
They represent an exciting new mode of scholarly communication	3.55	3.52
They reduce the dependence of tertiary institutions on increasingly expensive modes of scholarly/research publishing	3.29	3.33

Table 7

Reasons discouraging participants (depositors and non-depositors) from depositing in an institutional repository

Issue	Yes (Mean)	No (Mean)
I did not know about the existence of the repository	2.68	3.40
My institution does not have an institutional repository	2.63	3.06
I don't see the value of an institutional repository	2.42	2.31
I am not comfortable using new technologies	1.86	1.79
I haven't had time to consider the issue	2.84	3.15
I have had time, but haven't had time to make a deposit	2.77	2.81
I don't know how to deposit my research in a repository	2.71	3.10
No one has asked me to deposit my work in an institutional repository	2.40	3.63
I am concerned that plagiarism is made easier by depositing publications in this way	2.45	2.51
I do not believe that copyright policies of the journal I publish in permit electronic deposit in an institutional repository	3.04	3.20

(Responses available were very important = 5, important = 4; neutral = 3; not very important = 2; not at all important = 1.) Calculated out of 499 responses.

Table 8

Numbers depositing in a repository, by rank

Rank	Number	Have deposited in a repository
Tutor/demonstrator	21	0
Lecturer	131	27 (20.6%)
Senior lecturer	197	55 (27.9%)
Associate professor	78	30 (38.5%)
Professor	63	18 (28.6%)
Total	490	130 (26.5%)

items (clearly these were not confined to research publications only, and more than one respondent commented that they had placed datasets in the institutional repository). Out of the 159 people who responded to this question, 89 (73%) indicated that they had deposited items following formal publication, 50 (41%) after peer review, and 20 (16.4%) prior to peer review, using the repository as a working papers repository. Of the 131 respondents who had deposited, only 24 reported that they had checked numbers of downloads of their items. The data therefore suggests that only 37 individuals or less, from a sample of 546 respondents (that, is 6% or less of the sample) used their institutional repository in any meaningful way; those who had deposited between 1 and 5 items accounting for more than 54% of depositors.

The reasons indicated by depositors for depositing are given in Table 3. Responses to questions reported in Tables 3–7 were all in the form of a Likert scale and a higher score indicates stronger support for the statement. Although the standard deviations here show that overall the responses represented a range of views, the chief reasons for depositing clearly reflect an interest in making work available, increasing its exposure, and meeting the demands of the institution; there was less support for the personal benefits resulting from this enhanced access to a researcher's work.

Also interesting in the results included in Table 3 is the fact that the last two reasons in this set, which invite respondents to consider repositories more widely, and include disciplinary repositories in their response, are of least interest to participants.

All respondents were asked about the benefits and disadvantages of institutional repositories, and their responses are summarized in Tables 4 and 5.

While the benefits noted by respondents focus on benefits to the institution, the disadvantages noted relate to the individual required to make the deposit, and lack of ready access to the resource (Table 5).

Table 6 separates out the responses of those who had previously deposited, from those who answered "No" to that question, in relation to the benefits of institutional repositories.

Those who had deposited rated the benefits of depositing more highly than their non-depositing colleagues in relation to exposure and knowledge management, but not in terms of the impact on scholarly communication. Non-depositors rated all disadvantages, or barriers, more highly than depositors.

All participants (both depositors and non-depositors) were asked whether they believed that deposit should be compulsory (mandatory). A majority of respondents were not in favor of compulsory deposit—nearly three-quarters (73.7%, or 356 out of 483 replying to this question) do not support it, while only 127 respondents (23.3%) support mandatory deposit. In contrast, 62.6% (342 out of 496 respondents) support voluntary deposit of peer-reviewed conference papers, journal articles, and theses. Concerns about quality control however, remain. Only 221 respondents, (44.9% of the 492 respondents who answered this question) supported the deposit of anything the academic wished to deposit, with 271 (55.1%) against the idea. In reply to the question asking whether they would encourage their PhD or Masters students to deposit their thesis in the institutional repository, 422 (79.6% of the 530 who responded to this question) indicated that they would do so. However, an overwhelming majority (491 or 94.2%) believed that articles reached a wider audience in online journals, and 734 (70.4%) were comfortable with readers' comments being available alongside articles online (compared with 260 (51.5%) who believed this should be allowed in institutional repositories).

Respondents were also asked about the issues that would decrease their willingness to deposit, creating further barriers to depositing. Analyzing responses according to those who had deposited and those who had not, Table 7 highlights the key barriers for both groups. (These are reported in the order they appeared on the survey, not in order of preference.)

For non-depositors, lack of awareness, and the fact that the institution had not asked them to deposit dominate responses.

Table 9

Benefits, by age, showing means (based on Likert scale of 1–5), showing (StdDevs)

Age (number)	IRs give the work of the researcher more exposure	IRs give the research output of the institution more exposure	IRs reduce dependence on expensive modes of scholarly publishing	IRs are an exciting new mode of scholarly communication	IRs help institutions organize and preserve their research output
26–30 (15)	4.27 (.799)	4.20 (.862)	3.60 (.986)	3.60 (1.121	3.87 (.915)
31–35 (51)	3.80 (.849)	4.10 (.755)	3.39 (1.266)	3.41 (1.080)	3.96 (.720)
36–40 (59)	3.75 (.975)	4.07 (.640)	3.10 (1.195)	3.45 (.921)	3.78 (.937)
41–45 (63)	3.90 (.900)	3.97 (.861)	3.23 (1.055)	3.40 (1.108)	3.84 (.872)
46–50 (73)	4.03 (.912)	4.18 (.822)	3.40 (1.199)	3.64 (1.059)	4.00 (.898)
51–55 (90)	3.92 (1.014)	4.10 (.867)	3.19 (1.235)	3.51 (1.030)	4.01 (.895)
56–60 (102)	3.95 (.921)	4.10 (.878)	3.37 (1.202)	3.63 (1.116)	4.01 (.895)
61–65 (53)	3.96 (.862)	4.13 (.841)	3.17 (1.200)	3.47 (1.085)	3.94 (.732)
65+ (22)	4.00 (.873)	4.27 (.812)	3.41 (1.008)	3.59 (.769)	3.95 (.899)
Total (523)	3.93 (.921)	4.10 (.812)	3.29 (1.181)	3.52 (1.050)	3.94 (.859)

Table 10

Barriers, by age, showing means (based on Likert scale of 1–5), showing (StdDevs)

Age (number)	Depositing in an IR adds extra workload	IRs will expose more research to plagiarism	When everyone deposits there is no competitive advantage	IRs are not as easy to use as journal indexes	IRs risk reducing the value of peer review process	IRs may breach confidentiality of some data
26–30 (15)	3.33 (.900)	3.07 (.961)	3.14 (.663)	3.07 (.730)	3.14 (.864)	3.14 (.949)
31–35 (51)	3.29 (1.045)	2.96 (1.166)	2.61 (.961)	3.16 (.934)	2.90(1.165)	3.14 (1.114)
36–40 (61)	3.47 (.965)	2.77 (.938)	2.57 (.718)	3.18 (.813)	3.08 (1.046)	3.24 (.858)
41–45 (60)	3.55 (.964)	2.83 (1.011)	2.51 (.889)	3.22 (.948)	2.83 (.968)	3.17 (.888)
46–50 (74)	3.41 (1.109)	2.86 (1.038)	2.73 (.941)	3.08 (.948)	2.77 (1.048)	3.08 (.888)
51–55 (91)	3.65 (1.047)	3.04 (1.027)	2.55 (.989)	3.26 (1.017)	2.83 (.980)	3.09 (.949)
56–60 (102)	3.38 (.999)	2.86 (.985)	2.80 (1.020)	3.05 (.936)	3.06 (.978)	3.21 (.913)
61–65 (53)	3.32 (1.070)	3.08 (1.045)	2.94 (.895)	3.35 (.955)	3.13 (1.205)	3.18 (1.108)
65+ (22)	3.68 (.780)	2.92 (.990)	2.69 (.790)	3.18 (.813)	2.94 (1.065)	3.18 (1.097)
Total (527)	3.46 (1.018)	2.92 (1.019)	2.69 (.928)	3.18 (.935)	2.94 (1.040)	3.16 (.963)

Concerns about copyright remain high for both groups, but not excessively high, and concerns about plagiarism are less than concerns about time. Technology is not perceived to be a major threat by either group. However, there is certainly not as great a difference between depositors, and non-depositors as might be expected, although standard deviations on all responses are high, ranging from 1.024 to 1.486, showing the great range of responses to this set of questions. The lack of difference between depositors and non-depositors may also be due to the fact that the majority of depositors were not regular users of the system, and had deposited only a few items (40% had deposited only one item).

Variance in attitudes according to age and academic rank

Given findings in the literature suggesting that attitudes to institutional repositories may vary according to age and academic rank, we explored this in the data for our representative sample of academics in New Zealand. Rates of deposit were higher in older age groups. No respondent below 30 years of age (15 people) had deposited an item in an institutional repository. Between 30 and 40 years of age, less than 20% of respondents report having made a deposit; from 41 to 55 rates are around 30%; between 56 and 60 they dropped (to 20%) but respondents aged 61 and over (including over 65) rates were around 40%. Rank was also a factor in rates of deposit (see Table 8). The high rates for Associate Professor reflect the fact that this is normally the top career grade in New Zealand tertiary institutions, but also an aspirational grade for those seeking to be appointed as full professors. It therefore correlates with the high rates of deposit in older age groups.

The same impact of age appears when age is correlated with positive responses concerning the benefits of institutional repositories (Table 9). Here, although the youngest respondents (who have not deposited) are enthusiastic about the benefits, support drops in the 30–40 year age bracket and then picks up as respondents approach the end of their careers. This may reflect the pressure on early-career academics to publish in highly ranked journals in order to establish a strong research profile. Associate Professors can be assumed to have done so already, which may mean that they feel more comfortable depositing their research in a repository (Tables 10, 11 and 12).

For all ages and ranks, (recognizing that these do not correlate exactly), the benefits of exposure (primarily for the institution, but also for the individual) and preservation remain the strongest motivators. For all ages and ranks, workload continues to be the biggest barrier.

Differences by discipline

Given findings in the literature highlighting the impact of discipline on scholarly communication, the data was broken down by discipline, using similar categories as Kim (2010),[26] with the addition of Health sciences, Education, and Professional (Law, Accounting, Business), since New Zealand institutions are less specialized. Numbers in each discipline are relatively evenly spread

Table 11

Benefits, by rank showing means (based on Likert scale of 1–5), showing (StdDevs)

Rank (number)	IRs give the work of the researcher more exposure	IRs give the research output of the institution more exposure	IRs reduce dependence on expensive modes of scholarly publishing	IRs are an exciting new mode of scholarly communication	IRs help institutions organize and preserve their research output
Tutor (24)	3.96 (.806)	4.12 (.797)	3.79 (.658)	3.96 (1.175)	4.13 (.680)
Lecturer (137)	4.12 (.780)	4.23 (.710)	3.50 (1.175)	3.79 (.993)	4.07(.788)
Senior lecturer (213)	3.95 (.932)	4.09 (.820)	3.31 (1.176)	3.52 (1.044)	3.93 (.870)
Associate professor (80)	3.68 (1.028)	3.91 (.963)	2.95 (1.142)	3.12 (1.036)	3.82 (.902)
Professor (71)	3.69 (1.022)	4.06 (.843)	2.96 (1.247)	3.28 (1.098)	3.75 (.982)
Total (524)	3.92 (.929)	4.10 (.821)	3.28 (1.183)	3.52 (1.054)	3.94 (.867)

Table 12

Barriers, by rank showing means (based on Likert scale of 1–5), showing (StdDevs)

Rank (number)	Depositing in an IR adds extra workload	IRs will expose more research to plagiarism	When everyone deposits there is no competitive advantage	IRs are not as easy to use as journal indexes	IRs risk reducing the value of peer review process	IRs may breach confidentiality of some data
Tutor	3.13 (.968)	3.14 (.774)	2.83 (.576)	2.86 (.640)	2.96 (.638)	3.35 (.573)
Lecturer (137)	3.37 (1.010)	3.03 (1.003)	2.78 (.906)	3.05 (.885)	3.01 (.984)	3.21 (.966)
Senior lecturer (213)	3.47 (1.035)	2.81 (1.044)	2.60 (.949)	3.20 (.952)	2.88 (1.039)	3.07 (.964)
Associate professor (80)	3.45 (.980)	2.89 (1.043)	2.68 (.927)	3.24 (.996)	2.84 (1.073)	3.05 (.958)
Professor (71)	3.65 (.995)	2.99 (1.014)	2.78 (.982)	3.37 (.966)	3.14 (1.073)	3.35 (.958)
Total (524)	3.45 (1.013)	2.92 (1.021)	2.69 (.929)	3.18 (.936)	2.94 (1.041)	3.16 (.963)

in the sample, allowing for their numbers in the institutions themselves. Table 13 shows that the sciences are clearly more highly represented among those who had deposited, but that humanities scholars are equivalent to both social scientists and the professional groups in their rates of deposit. Health sciences are considerably lower than the other disciplines, which may reflect a sense that their research is most relevant to other health professionals, rather than people outside the discipline.

Discussion

The findings of this study are both similar and dissimilar to those of research conducted elsewhere. Despite a relatively high level of awareness of the concept of institutional repositories (at 75%), which is higher than in many earlier studies, the proportion of respondents (over 55%) unaware that their own institution had a repository, and the proportion who had deposited at least one or more items in their repository (24%) is similar to figures reported by Creaser in the most recent UK study,[19] although lower than the most recent US study.[18] These recent studies suggest that these figures are slowly climbing from the levels (around 15%) reported in a number of the earlier studies summarized by Gargouri.[17] However, these rising figures must be balanced against the fact that for most authors their deposit is of between one and five items, and does not, in any way, represent their actual output. The impact of the fact that many of the depositors gave "I was asked by my institution" as one of their main reasons for depositing (Table 3), and the weight given to not having been asked by non-depositors (Table 7) is offset by the fact that this appears to be a one-off activity. The number of respondents who share the philosophy that underpins the Open Access movement, and make a commitment to deposit *all* their research in a repository, appears to be small. The results reported here suggest that depositing a single item of research does not in itself lead to other deposits.

Table 13

Number and percentage within disciplines who had deposited

Discipline	Number (and %age of discipline) who have deposited	Number in discipline and %age of total sample
Science	24 (34.3%)	70 (14.3%)
Engineering and applied sciences	27 (32.5%)	83 (16.9%)
Social sciences	17 (27.9%)	61 (12.4%)
Arts and humanities	17 (26.2%)	65(13.3%)
Professional	22 (25.6%)	86 (17.6%)
Education	11 (21.6%)	51 (10.4%)
Health sciences	12 (16.2%)	74 (15.1%)
Total	130 (26.5% of all disciplines)	490 (100%)

Among respondents to this national survey, therefore, cooperating with a request from the repository, making their research available to their colleagues and students, and increasing the exposure of their research, appear to be the leading motivations for depositing. The benefits rated most highly by this group reinforce the value of exposure of their research to the individual and the institution, while management and preservation of their outputs is the third most highly rated reason for depositing. Thus, it seems, New Zealand academics who *do* deposit their research outputs in repositories are motivated by both extrinsic and intrinsic motivations, but not very obviously by any sense of personal reward, nor by any great concern about the future of the scholarly communication system (see Tables 4 and 6). The fact that the fifth rated potential benefit in Table 6 (reducing the dependence on traditional forms of scholarly communication), influenced depositors less than it influenced those who had not deposited, perhaps reflects a trend in this group to deposit after publication in a peer-reviewed journal. This suggests that the two methods were likely to be seen as complementary rather than in opposition. As in the pilot study reported in the literature review,[31] altruism, and a desire to share information and knowledge, appears to be a fairly powerful motivator, while the reward systems which are part of academic life (promotion, tenure and recognition) remain tied to traditional scholarly communication models, particularly for early-career researchers.

"New Zealand academics who do deposit their research outputs in repositories are motivated by both extrinsic and intrinsic motivations, but not very obviously by any sense of personal reward, nor by any great concern about the future of the scholarly communication system."

Barriers and demotivators to deposit are clearly centered around workload as Devakos, and Davis and Connolly found,[28,29] along with lesser concerns about ease of use for retrieval and confidentiality of data (Table 5). Lack of awareness, and lack of time, (and lack of encouragement), remain major constraints for non-depositors, and

concerns over Intellectual Property issues (largely permission from publishers) remain an issue, although concerns about plagiarism seem to be waning. These trends are all noted in the literature.

The issue of a shift to mandatory deposit does not seem to be a likely option in New Zealand, given the evident resistance to this in the academic community. The one aspect of repositories that did receive strong support from respondents in this research was their use to make student research, in the form of theses or dissertations, more widely available. In New Zealand, apart from limited use in recent years of the Australasian Digital Theses repository, which now acts as a metadata service linking back to individual institutional repositories, these documents have traditionally only been available in hard copy through the institution's library, which limits their dissemination. Over three-quarters of respondents (416) indicated that they would be happy to deposit their PhD or Master's thesis in a repository, and nearly 80% (422 respondents) said that they would encourage their students to do so. This suggests that respondents had the greatest support for the aspect of research dissemination they considered to be the most problematic. However, while mandatory deposit of theses has been adopted at all New Zealand universities, mandatory deposit of all peer-reviewed publications is likely to be strongly resisted, and there is no evidence that a) libraries could sustain the additional workload this would entail, since experience suggests that author deposit is unworkable,[13] and b) there is no evidence that compliance is very high in institutions where deposit is mandated.

A number of prior studies have suggested that academics continue to be strongly influenced by their disciplinary community, and that this is influencing their behavior in relation to institutional repositories. [22,30] In our data this shows up in two ways. Firstly, in the fact that there are minimal differences in attitudes to institutional repositories across the various disciplinary groups, suggesting a common and strong allegiance to their own invisible college across all disciplines. Secondly, it is shown in where respondents state that they looked for information, preferring subject-based repositories (over 75%) and the websites of colleagues or departments known to them (Table 2). These findings, combined with low rates of deposit, the trend to deposit only one or a few items, as well as the overall focus of responses about barriers and benefits of institutional repositories, (which coincides with anecdotal evidence gathered throughout this study) strongly suggest that the invisible college is still a very powerful phenomenon in the online environment, possibly even reinforced by the ease and speed of communication online. The New Zealand academic communities studied appear to share an international set of values about scholarly communication, and to be as committed as their international peers to a reward system based on the invisible college, (i.e. publication in the journals used by that community and eventual citation and recognition by it). The message that depositing peer-reviewed publications in Open Access forums, (in institutional repositories as well as in subject-based repositories), leads to higher awareness by one's peers, and potentially higher citation rates has clearly not been taken on board by the academic community being studied here. The higher level of support respondents indicated for subject or disciplinary repositories suggests that managers of institutional repositories need to seek ways of linking their content to existing subject repositories, or presenting the documents by discipline, rather than by organizational unit.

Conclusions

This study, reporting on a national survey of academics primarily based in New Zealand's eight universities, reinforces and adds to an emerging picture of institutional repositories worldwide. The findings, along with those of many earlier studies bring into question whether the crisis in scholarly communication is as acute as some have suggested, and whether institutional repositories are a solution that the academic community is looking for. Most academics are clearly operating productively within the existing methods of scholarly communication, while making use of subject repositories, and other channels to connect with their disciplinary community in ways that appear to satisfy their needs. These needs, for communication with their peers, and those related to reward systems (promotion and tenure) appear to be being met. The four key functions of the scholarly communication system, registration, certification, awareness and archiving, as identified by Roosendaal and Geurts,[4] focus on the primary tasks that the traditional form of scholarly communication has evolved to meet. In its current form, with almost universal adoption of electronic availability of journals, increasingly free access to earlier volumes of journals online, and better agreement with libraries and authors about rights of access and IP, the paradigm appears to be strengthened rather than weakened. The rapidity and volume of online communication through peer-reviewed journals shows no sign of abating, and indeed shows renewed energy and activity in recent years. Institutional repositories, on the other hand, with their lack of an internal peer review system, and without adequate and informed supervision from the institution as to what is collected and made available, fall short on the most important of these functions, registration and certification. The findings of this study and of many others now tell us that these are more important to academics than awareness and archiving. Furthermore, these two principles are currently being reinforced by the widespread adoption of research assessment exercises which focus on publication in highly rated journals.

However, the conclusions for libraries, which have invested considerably in their institutional repositories need not be dire. Although the low rates of deposit in institutional repositories globally suggest that the notion of “capturing the intellectual capital of the institution” as mooted by Rieh et al.[15] is far from an achievable reality, there may be other valuable roles that repositories can fulfill. Firstly, by their very existence they continue to put pressure on journal publishers to allow as much free online access to their products as is economically possible. The business model underpinning the scholarly communication system is changing, and changing for the better. Secondly, they have a major role to play in making the valuable research content of PhD and Master's theses far more widely available, and have been key players in the development of effective metadata systems to provide access to these. Thirdly, by promoting the ability of a repository to “give back” research findings to the community that funded it, they may well identify a unique role that will make it easier to bring their academic community on board. Fourthly, they have a major role to play in extending the metadata systems, and technical interoperability that will support regional and global subject access to repositories, that will bring them more into line with the needs of their academic communities. And finally, learning from the findings of Gargouri et al.[17] by adopting their own quality assurance measures, and distinguishing more carefully between types of content, they can focus on gaining the leverage for their institutions' research output by maximizing the “quality advantage” that Open Access enhances by maximizing the accessibility, and the citability of the very best output of their institutions, thereby also inserting themselves into the institutional rewards system.

Thus, these two apparently opposing paradigms may yet be able to be aligned to avoid offering conflicting values to the academic and scholarly communities they both seek to serve. While institutional repositories cannot meet all the needs of their institutions' academics, by a more informed and proactive approach it may be possible to define for them a more central role in the future of scholarly communication.

Appendix A. Supplementary data

Supplementary data to this article can be found online at doi:10.1016/j.acalib.2011.07.002.

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