2007

Reassembling Scholarly Publishing: Institutional Repositories, Open Access, and the Process of Change

Mary Anne Kennan
University of New South Wales, maryanne.kennan@unsw.edu.au

Dubravka Cecez-Kecmanovic
University of New South Wales, dubravka@unsw.edu.au

Reassembling Scholarly Publishing: Institutional Repositories, Open Access, and the Process of Change

Mary Anne Kennan, Dubravka Cecez-Kecmanovic
Information Systems Technology and Management, Australian School of Business
University of New South Wales
Sydney, Australia
Email: {maryanne.kennan, dubravka}@unsw.edu.au

Abstract

The domain of scholarly publishing is undergoing rapid change. Change has been instigated and produced by the Internet and open access systems – such as disciplinary and institutional repositories and open access journals. However traditional scholarly publishing is strengthening its hold over prestigious journals thus resisting change. How then does the change come about? An attempt at answering this question led us to examine an institutional repository initiative in a University. As we identified and followed the actors (researchers, research papers, reward systems, institutional repository technology, library staff, RQF, etc.) we saw the emergence of new publishing practices and the forces preserving the old ones. By adopting Actor Network Theory (ANT) we came to understand the materiality, relationality and ambiguity of processes of reassembling scholarly publishing. This paper presents preliminary results and thereby informs a wider debate and shaping of open access and scholarly publishing.

Keywords: Open Access; Institutional repositories; Actor-Network Theory; Scholarly Publishing

Introduction

Scholarly peer-reviewed articles and conference papers are crucial in the work of academics, scholars and other researchers. Scholarly publishing is concerned with the distribution of those peer-reviewed articles through journals and conferences and other information media within scholarly communities around the world. Scholarly publishing currently relies on information technology, for its information management, storage and dissemination, as well as basic business functions (e.g. financial control, peer-review management etc.). As such scholarly publishing can be understood as a complex world wide network of loosely-coupled information systems.

The number of journals available and their costs have been steadily rising and it is increasingly difficult for any institution or organisation even in the developed world to provide access to all, or even most of them. On the other hand technology has advanced so that the information within scholarly peer reviewed journals is available over the Internet at the individual researcher's desk top. Thus, economic conditions appear to be limiting access to the scholarly corpus while technological advancements appear to be enabling access (Dewatripoint et al. 2006). The latter has become particularly evident with individual researchers making their work "open access" on disciplinary and institutional repositories or open access journals.[1]

Numerous benefits of open access (OA) have been reported (Dewatripoint 2006). OA articles have a greater research impact than articles not freely available (Antelman 2004; Harnad and Brody 2004). Free and fast communication of research results can be of high value to end users (think of medical research); furthermore they can prevent duplication of research and waste of resources especially in basic sciences. In addition OA increases publication accountability, makes meta-analysis easier and ultimately assists literature de-fragmentation in different disciplines. However, OA is perceived as undermining the traditional scholarly publishing and eroding the prestige mechanisms guarded by powerful publishing houses and reinforced by reward systems in universities: the higher the rank of a journal (for example the journal impact factor) the more valued the article published in the journal (Velterop 2003).

However, Seglen (1997) provides examples that indicate that journal impact factors as a measure of quality poorly correlate with actual citations of individual articles. In fact OA enables "new citation measures, such as CiteSeer or ParaCite, which assess the impact of individual articles" (Antelman 2004, p. 372). Based on a recent

---

[1] For the purposes of this paper, we adopt a widely accepted definition of "Open Access" (OA) (Drott 2006) that refers to work that is freely available via the Internet without financial cost or legal or technical barriers. Users can "read, download, copy, distribute, print, search or link" (Budapest Open Access Initiative, 2002.) to the full text of open access works, although it is expected that they respect the integrity of authors work and authors rights to be correctly acknowledged and cited.

survey of 5,513 senior journal authors world wide, Rowlands & Nicholas (2006) report that 50% of participants consider that OA is likely to disrupt traditional scholarly publishing and that this is a "good thing" (that is that the respondents to the survey identify that that there are aspects of scholarly publishing that would benefit from change); 61.5% consider author citations and reader downloads (from OA repositories) equally credible indicators of research usefulness. Research so far has produced ample evidence of OA adoption and emerging changes in scholarly publishing as well as economic and other implications for researchers, libraries, publishing houses, end users and many others (Antelman 2004; Harnad & Brody 2004; Rowlands & Nicholas 2006). We focus on institutional repositories, one method of providing OA, created to store, preserve and disseminate the research results (known as self-archiving) in a University setting.

There are multiple and diverse actors in OA institutional repository (IR) initiatives. They include researchers, their research outputs, disciplines and academic units, scholarly communities around the world, library and IR technology, university policies, research funding organisations and their policies. Some of them are individual or collective human actors while others are non-human actors. They are all actively involved in, and dependent on the web of relations in scholarly publishing. The agency of both humans and non-humans has a relational effect; the behaviour of one can modify the state of affairs and behaviour of other. To understand how the change in scholarly publishing is happening we propose to study how heterogeneous actors align their interest and interact to form actor networks that both enable and constrain their agency (Howcroft, Mitev & Wilson 2004; Latour 2005). Following the actors and their 'work' we produce 'mappings' of various discursive and technical practices that trace changes in scholarly publishing. In such a way we are able to study the IR initiative in the University as a socio-material network without implying any essence (social or technological). We address the research question by providing an ANT account of the emergence and reassembling of new practices of OA publishing via the IR (Callon 1986; Latour 2005; Law 2004).

This paper will first situate the research in background literature on scholarly publishing and briefly report the literature on IR and OA. This is followed by a discussion of major ideas of ANT and its adoption for studying scholarly publishing. We then begin to examine the implementation of an IR and begin to illustrate that the process of translation is not a smooth one. In the process of following the actors we begin to see the emergence of new publishing practices and the forces preserving the old ones. Finally it is explained that the study which is underway will continue to analyse more of the collected data to report more fully on scholarly publishing and the influences of open access and institutional repositories as information systems operating in a changing environment. The continuing study will draw on ANT techniques and epistemology to provide narratives that increase understanding and thus be relevant to a wide variety of stakeholder.

Literature

Scholarly Publishing Under Siege

Scholarly publishing is a formal means of communicating within a scholarly community (Tenopir & King 2000). Scholarly publishing fills at least three purposes within a scholarly community; publicity, access and trustworthiness. Publicity is where the work is announced to audiences via a continuum of activities, from subscriptions to abstracting and indexing through to advertising and citation. Accessibility refers to ways in which potential readers can access the work in a stable way. Trustworthiness refers to the level of trust a reader can place in a work and is aligned with the concept of "quality". Trust and quality come from the knowledge that a scholarly article has been reviewed by knowledgeable peers who carefully read and judge the work (Drott 2006). Others (e.g. Prosser, 2005) posit other functions: for example registration or acknowledgement of who carried out the research, termed "scientific paternity" by Guédon (2001); certification or peer review which may be mapped to the concept of "trustworthiness"; awareness which may be mapped to "publicity"; archiving, which ensures the article will be obtained for posterity and constitutes the future part of "accessibility". Accessibility is important for scholars in their research, teaching and to keep track of their specialties. Tenopir & King (2000) report on the high correlation between academic achievement with the amount of journal reading. In addition scholarly publications have become an entrenched part of the academic reward system (Prosser 2005). The academic reward structure either operates on simple counts of the number of papers published by various authors, or counts of citations of individual papers, or assessment of the Impact Factors of particular journals in which an author publishes.

Different actors have different roles within the scholarly publishing environment. For example, academics and scholars write the articles in the first place and paradoxically they are also the main targets as readers of those same articles. They also provide the certification, through peer review, whereas journals provide the registration of a work. Multiple organisations and technological platforms provide awareness and accessibility, from the journal publishers themselves through their marketing departments and subscriber lists, to commercial indexing and abstracting organisations and libraries. Archiving is provided by publishers to some extent (depending on

their storage facilities and continuing existence) but also by libraries. Libraries also provide access to wider readerships, through walk-in access to the public and inter-library loan and document delivery. Profits are invariably made only by the publishers directly, although one may argue that academics and scholars profit indirectly, through increased reputation, grants, tenure, promotion and so on (Bjork 2005; Kling & Callahan 2003; Kling & McKim 1999; Prosser 2005).

The Internet and web-based technologies have been adopted to such an extent that scholarly publishing is now mostly available online at the scholars desktop. However, the costs of access to scholarly works have not declined. If anything the costs to universities have been growing, partially due to increasing coverage and partially due to increasing number and cost of journals. Hence, despite technological advancements that encourage access, traditional scholarly publishing models still succeed to limit it (Dewatripoint et al. 2006). One response to these changes has been that individual researchers are making their work "OA" which refers to work that is freely available via the Internet without financial cost or legal or technical barriers (Budapest Open Access Initiative 2002). To reiterate, authors can make their work OA in several ways, the most common of which are either; to post their work to their own web sites or to an institutional or disciplinary repository created to store, preserve and disseminate their research (known as self-archiving); or to publish in an OA journal. Works that are self-archived are generally works that scholars give away without expectation of payment, for example works published in traditional peer-reviewed journals or conference proceedings. Self- archiving of this work can occur at the pre-print (an unrevised, un-refereed draft, unaccepted by a journal) or post-print (all post publication works including the official published draft) stage (Suber 2003; Budapest Open Access Initiative 2002). Works are self archived on individual web pages or in repositories. Institutional repositories (IR) are Web-based systems designed to support researchers in providing access to and enabling unrestricted communication of their research outputs to both scholarly and wider community. Repositories then rely on information technology (IT) infrastructure, the Internet and web based software and services to enable them perform their functions and achieve their stated objectives of providing OA to scholarly research output.

Harnad (1995; 1999) has been a leader of what has become the OA movement, promoting OA through encouraging authors of scholarly publications to electronically archive their work in these repositories utilising what he and colleagues (Harnad, et al. 2004) have dubbed the "green" road to OA, as opposed to what they termed the "gold" road, which would involve converting all journals to OA. However, IR and other forms of OA are perceived to undermine the interests of commercial journal publishers and scientific societies for whom sale of publications form a significant part of income and subsidise their other activities (Goodman 2004; Poynder 2004).   While commercial and scholarly society publishers play a key role in traditional scholarly communication, being largely responsible for organising the refereeing and review process among other things, OA is seen to also undermine the peer-review process and ultimately quality. Despite the evidence to the contrary and demonstrable advantages of OA, and specifically IR, these views seem to persist and impact on the adoption of OA. Being concerned with the views of scholars and other stakeholders in relation to the adoption of an IR in the University, the question we seek to address in this study is:

> *What are the views of scholars and other stakeholders about open access IR, and how do their views and behaviour regarding scholarly publishing change during the implementation of an IR in a University?*

This paper reports preliminary findings from a larger project which will contribute to describing and understanding the changes to the scholarly publishing system emerging through the adoption of an institutional repository. It will add to our knowledge of the scholarly publishing behaviour of academic researchers and writers. It may also have practical implications for the development of digital collections, institutional repository applications and implementations, and other potential adjuncts to the scholarly publishing system.

Actor-Network Theory

Actor-network theory (ANT) originated in the studies of science, technology and society (Callon 1986; Latour 1999; Latour 2005; Law 2004). It is defined as a socio-philosophical approach "to socio-technical analysis that treats entities and materials as enacted and relational effects, and explores the configuration and reconfiguration of those relations. Its relationality means that major ontological categories (for instance 'technology' and 'society', and 'human' and 'non-human') are treated as effects or outcomes, rather than explanatory resources" (Law 2004, p. 157). It means the rejection of essential differences among the social and the physical world. It also means that any *a priori* separation among the human and the non-human actants is unwarranted and therefore needs to be prohibited (Callon 1986).

Our earlier discussion of scholarly publishing could be seen as describing an heterogeneous actor-network, comprising as it does of a wide variety of actors who work together to comprise the whole – the scholarly publishing system. The literature review thus far has demonstrated that scholarly publishing is undergoing

change and thus could be said to be in the process of being reassembled (Howcroft, Mitev & Wilson 2004; Latour 2005). Central to ANT is the questioning of how networks are formed and how they change; how the actors in a network bring together other actors to hold the network together, or to change the network or create another one. This activity is known as "translation" (Law 2003). The accomplishment of translation is understood to occur through "moments": problematisation (defining the "problem", presenting a proposed solution); interessement (arousing other actors' interest in the proposed solution); enrolment (to consolidate alliances around the proposed solution); and finally, mobilization (implementing the proposed solution) (Callon 1986; McGrath 2002; Underwood 2001). Sometimes an actor-network is converted into an entity, an inscription or a device, sometimes termed "immutable mobiles" and sometimes "black boxed" when composed of a number of networks where the complex parts are hidden or take on the appearance of a durable whole (Vidgen & McMaster 1996). The "entry of new actors, desertion of existing actors, or changes in alliances" can cause these to "be opened" or re-considered (Tatnall and Gilding, 1999) and this appears to be what IR and OA are doing to the scholarly publishing system.

Latour (2005) suggests that the use of ANT is appropriate in situations "where innovations proliferate, where boundaries are uncertain, when the range of entities to be taken into account fluctuates". Our brief literature review indicates that this statement could be seen to apply to scholarly publishing. He also suggests three tests for ANT membership: non-humans have to be actors with a type of agency; the explanation is unlikely to be "social", no hidden social force is offered in explanation; and, that the study aims at reassembling the social (Latour 2005: 10-11). The reviewed literature, the existing texts on the subject (discussed above), suggest that non-humans have agency. The Internet and associated technologies appear to have wrought vast changes in scholarly publishing. Scholarly publishing relationships and alliances are in the process of being reassembled yet there is no obvious social force to offer in explanation of the changes taking place, and there is no obvious outcome or new system that will replace the current system. ANT potentially provides a conceptual apparatus which may allow us to fathom the controversies of scholarly publishing by tracing the range of heterogeneous actors as they interact, form coalitions and negotiate changes in the course of adoption of open access IR.

ANT stimulates the researcher to avoid both social and technological determinism by transcending distinctions between the natural (non-human) and the social (human) actors and regarding social and technological processes as a process of network building. Social actors cannot simply press their wills on inert passive "things"; similarly artefacts cannot force human actors to perform in a specific way (Latour 2005; Law 2003; Tatnall & Gilding 1999). Instead there is "symmetry" between the social and the technical as they are inseparable. This symmetry allows us to avoid hierarchies (Underwood 2001), we can follow the local to the global, or to another locality. Following the actors of interest in a network and describing what we see aids in revealing the situation of interest (Underwood 1998). Actors are treated as mediators who render the movement of the social visible. Latour (2005) describes this as the reassembling of the social.

ANT has been criticised for many reasons. Chief among them is that it ignores the wider social environment and that it is amoral by considering humans and non-humans "equally". Similarly, there are methodological difficulties in identifying and tracing actors and actants (Underwood, 1998). However, ANT is not prescriptive. Rather it asks us to consider human and non-human actors without any biases and preconceptions and let them express themselves. While ANT has been criticised as not being about actors, networks, and indeed, not being a theory (Jacobs 2001) as we shall see, actors and networks are key and the theory may refer not to ANT as a social theory, but to ANT as a theory about ways of "doing" or "seeing" social research, "people, machines, ideas" (Law 2003), or a theory of method or as Latour (2005;142) suggests "a theory about how to study things…how to let the actors have room to express themselves". The aim, after all, is to deepen our understanding.

Research Method: Following the Actors and Tracing the Pathways

ANT uses multiple techniques to follow the actors, trace connections, and make the deployment of the actors visible, for example, by writing accounts. Multiple techniques and a range of information and data sources are used to gather information from actors. For this research the starting point was the decision by a university in Australia, University A, to implement an IR. Information was collected in a number of ways, including contextual information from various sources, system planning and implementation documentation, emails and minutes of meeting, semi-structured interviews with both implementers and scholars, and observation of distribution of information regarding the implementation to potential users and managers. Information about technological and other non-human actors came from the researchers' observation and analysis of the role of these actors. This paper presents early findings, six months into the empirical study. Texts (in ANT parlance, scripts) relating to scholarly publishing in general and the implementation in particular are studied. Interviews targeting actors in different stakeholder groups, academics (from different disciplines), management and the implementation team have been conducted. Initially we started with texts by proponents of the OA and IR

movement and their opponents to develop some understanding of the issues. Fieldwork included interviewing the University Librarian, and the implementation project managers (two people as these changed during the period of study). From there we followed the actors, by referral, by seeking out users and proponents and opponents, and by keeping track of institutional and other policies and documentation and following the technology development during the period October 2006 and continuing.

ARROW at University A: Introducing the Case

The Australian Government represented by the Department of Education, Science and Training (DEST)[2] funded projects through the Australian Research Information Infrastructure Committee (ARIIC), under the Systemic Infrastructure Initiative (SII) Accessibility Framework. ARIIC's goals are to build a technical information infrastructure to support the creation and dissemination of, and access to, knowledge and the use and management of digital assets (digital representations of research, for example research articles and papers), in other words, to aid the communication process. The stated aim is to improve Australia's ability to take part and lead in national and international research (Australian Government Department of Education Science and Training n.d.-a)

University A is in the early stages of implementing an IR. University A is part of the Australian Research Repositories Online to the World (ARROW[3]) consortium, which is one of four initial projects funded by ARIIC. ARROW originally consisted of three university consortium partners, managed by their respective university libraries. The National Library of Australia was the fourth original partner, whose specific role was to trial a federated resource discovery (search) system for Australian IR.

The ARROW project's initial objectives were to:
- 'identify and test software to support best-practice institutional digital repositories at the ARROW Consortium member sites to manage e-prints, digital theses and electronic publishing.
- develop and test a national resource discovery service using metadata harvested from the IR by the National Library of Australia.'(ARROW Australian Repositories Online to the World n.d.).

While the repository software itself is relatively mature, the deposit and user interface development has been outsourced to a commercial software vendor. The University A Library is managing the implementation of an ARROW repository using ARROW repository technology. It planned to focus however on expanding,

> understanding of the issues involved in developing institutional repositories, the cultural issues, the technical issues rather than filling the repository or get[ting] policies or so on hung from it [University Librarian],

and to incrementally adapt the technology to suit users and organisational needs. The Library appointed a Project Manager to oversee the project and run trials. Academics—researchers from several different backgrounds were recruited to run trials providing material in open access versions using ARROW.

At the same time, the Australian Government has been developing a Research Quality Framework (RQF) with the objective to improve the evaluation of the quality and impact of publicly funded research and to design an effective process to achieve this (Australian Government Department of Education Science and Training n.d.-b). Currently DEST collects data each year on research publications from universities, which is used, together with data on the number of research students and completed research degrees, and grants won, to help determine how money will be allocated to universities. For research publications to be counted they must meet several criteria, including having been peer reviewed (Australian Department of Education Science and Training (DEST) [2006]). There are university policies and procedures regarding the collection of data on research publications and these are reinforced by their potential to add weight to claims for institutional funding rewards and personal recognition rewards. In October 2006 a paper titled the *Recommended RQF* was released (Australian Department of Education Science and Training. Development Advisory Group of the RQF 2006) which, as well as outlining the implementation methodology for a new research evaluation regime, the future RQF, also drew attention to the fact that the RQF was developed in conjunction with the Accessibility Framework, and that repository and other projects supported through the Accessibility Framework would therefore have a role to play as RQF Information Management Systems (pp.26-27).

To summarise, data collected to this point includes: interviews with fourteen research active academics at various levels from a variety of disciplines, the University Librarian, an ARROW central staff member, two interviews with the current ARROW project manager, one interview with the initial ARROW Project Manager and interviews with two representatives from the University research office over the period November 2006 to

---

[2] http://www.dest.gov.au/sectors/research_sector/default.htm
[3] http://arrow.edu.au

February 2007. Documents include the ARROW documentation made available by the University Librarian and those from the ARROW web site, the DEST web site, the University Research Office web site, information from a DEST RQF awareness day and other RQF documents, a seminar on repositories. The interviewees and documents were selected by following the activities of actors – the librarian; ARROW documents, technology and staff; researchers and their publications; RQF policy development, etc. – that enabled us to trace the formation of IR actor-networks. Preliminary analysis, presented in this paper draws from the interviews, researcher's notes and the documents relating to the RQF.

ARROW and ANT: Preliminary Analysis of the Case

More broadly the problem is perceived as being the means of accessing research outputs after the research is complete. Members of scholarly community report difficulties in accessing ALL the scholarly publications they require in a timely fashion. A major funder of research, the Australian government through DEST recognises the difficulties associated with research accessibility and allocates funds on a competitive basis under its Accessibility Framework for the development of IR. The University Librarian sees a connection between providing a potential solution for accessibility and the availability of these funds and as a part of a consortium applies for the funding, and establishes an implementation program for an IR. Looking at this from an ANT perspective we see DEST as a macro-actor who defines the problem as well as the solution – the implementation of the IR initiative as a way of solving problems of accessibility to research and the management of research outputs. Furthermore, DEST defines the roles of other actors (both macro and micro) in the emerging IR actor-network: those of researchers, the University and its Library, ARROW Consortium and ARROW technology, research funding policy, etc. The implementation of the IR actor-network can thus be seen as emerging through influences, relationships, and negotiations among various macro and micro actors as presented in Figure 1.
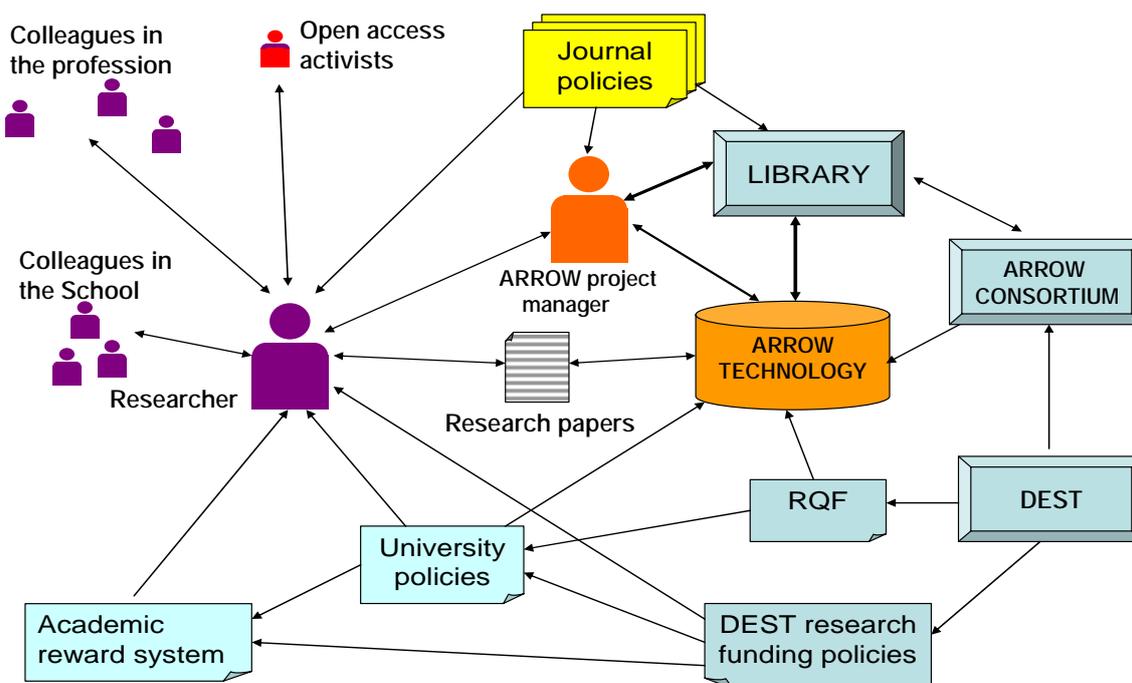

Figure 1: The emerging actor-network of scholarly publishing within University A

The IR actor-network in currently in the interessement stage: the growing RQF documents (acting on behalf of DEST) present specific mechanisms for enrolling the University and its researchers in the ARROW project. On the other hand the University Librarian and the ARROW project manager (acting on behalf of the Library and ultimately DEST) made an initial attempt to exert their influence by defining the role the ARROW technology as providing a home for, and open access to, research not published in the "usual way", such a working papers, technical reports, honours theses and so on – research outputs that were not in journals or books. Initially they:

> *never went looking for preprints and post-prints of already published articles as a way to build the repository...if the published version wasn't freely available on the web, it was still accessible to our community, and if they had published it then it was more than likely in a journal which we took. So we took the line that why would we spend a lot of time and effort in a sense republishing things that have already been published.[University Librarian].*

> *There's no point in us keeping things for ten years if nobody's allowed to look at them except the person who put them in...so the point of the repository is not as a dark archive... [Project Manager 2]*

Objectives were to provide information management and stewardship for these outputs in an enduring way. And indeed initially those academics that were approached to trial the repository were interested in this approach. Researchers interviewed in engineering and earth sciences, have readers outside of academia; engineers, and scientists in industry, consultants, government. One academic, manager of a research laboratory which produces a well known series of technical and research reports, often on well funded grants or for paying clients, which have a much broader, indeed international applicability, says:

> *I don't care about the publication stuff* [writing up articles from technical reports] *because the impact from the dollars coming in is already enough...but one of the things I wanted in return for putting our reports in the ARROW database was lists of everyone downloading, or at least numbers of downloads, ... I actually felt that by taking the technical report series and making it available so that people could download it and use it and reference it would substantially increase our number of citations and therefore our impact.... But there's no point in just putting them up there. You've actually got to get the key words and stuff correct so that people can actually find them.*[Research Laboratory Manager]

This interviewee also suggested that additional functionality of the ARROW technology would be required. For example some reports and publications are ready for immediate release. Sometime contracts require confidentiality for a period and delayed release. Repository software could assist in managing that.

> *I want to be able to have from our web pages a series of short cuts into the ARROW database so that ...I don't have to keep an up-to-date list of what we have done. All we should have to do when we have finished something is put it on the ARROW database and then in turn it is uploaded to our web pages too,...Well, just print me the DEST reports. If it can be done through the ARROW system that makes a lot more sense...We're trying to present the university doing all these things...*[Research Laboratory Manager]

When asked whether the lab would be prepared to put pre- or post-prints of journal articles or conference papers into the ARROW database in accordance with the proposals put forward by the OA movement the response was like many others interviewed:

> *We would like to use the ARROW database for those, but the problem being many ... refereed conference papers and the journal papers... have copyright on them and you shouldn't really be putting them up* [Research Laboratory Manager]

> *...in publicly funded research areas there is a requirement that publicly funded research is publicly accessible ...that's of course a very important issue for us* [Researcher - Social Science of Medicine]

Copyright issues have long been identified as a key barrier for OA publishing. On the other hand the current academic reward system in University and DEST policies encourage researchers to publish in peer reviewed, high impact journals. Most of these journals however have polices specifically forbidding authors making these works available in the open access repositories in any way:

> *So there is a political game we are forced to play by the nature of the funding that prevents us from making some of our work open access* [Senior Lecturer, Science]

We can see here the 'program' by funding agencies (macro agents) to make all publicly funded research publicly accessible and the 'anti-program' by journals and conference publishers to prevent it, each impacting on the IR actor-network emergence. The actors such as academic reward system, RQF policies and research funding policies are currently exerting inconsistent, even contradictory influence on researchers and the technology thus weakening the IR actor-network.

In addition, the RQF with its focus on high impact, international journals is causing difficulties for people who have an Australian focus and publish research in domestic outlets:

> *What I do relates to Australian [subject domain]. Insofar as I think there is a message to get across to the broader public and particularly planners and decision makers and so on, I have tended to put that in local journals. This gets me into conflict with their corporate objectives these days* [Professor, Science]

> *The Australian Institute of [subject] has got a, a kind of a series of short articles. Something that is quite valued by practitioners and research students...they don't count for DEST though they are very useful and valued in my discipline* [Professor, Arts and Social Sciences]

This is yet another example of 'program' and 'anti-program' that confuse micro actors (researchers) and weaken their enrolment in the IR actor-network.

Another academic who participated in the trial had set up something similar to ARROW within their own School rather than wait for ARROW's full implementation. Already indexed by Google and Google Scholar they are getting requests "*for further information from around the world*". They view "*communication with the external environment*" so important that they have put up their thesis work (undergraduate and post graduate), conference papers, technical papers and reports despite knowing that the work will be come redundant if ARROW becomes fully implemented. Their interests are already strongly aligned with the ARROW project but the question for them is influence the technology to enable their tracking who is downloading the work, or at least where they come from.

This is not however the case with many other researchers. The value of OA and specifically IR is not always clearly seen. Some researcher indicated there would need to be a "carrot" to encourage them or some of their colleagues to use a repository for example:

> *At the moment there's no reward for it. There are rewards for the documentation system at the moment, but there isn't for this, so because there's no reward, it's not valued; if it's not valued, then why do it? I think that's the perception* [Senior Lecturer, Engineering].

Most mentioned that ARROW technology must be easy to use and provide useful functionality to be attractive for them; many mentioned that they have to do so much reporting about their research, that only having to upload the details once would be an incentive.

Since its initial problematization stage, the IR actor-network has been emerging through the translation "moments" with interessement and enrolment overlapping and happening in parallel. Some researchers with clearly aligned interest are enrolled and have taken steps to mobilise other actors to utilise the proposed solution. Others, on the other hand, while seeing their potential interests are still influenced by anti-programs and cannot clearly see how opposing interests can be reconciled and alignment negotiated. Like many, indeed most other researchers interviewed, they are interested in areas beyond the University library's proposed area and wish to put their published papers into the repository and see the copyright restrictions of publishers and conference organisers, and the policies of the government department and the very university providing the repository as barriers.

The IR appeared to have an ally in the RQF, as reported earlier, but as the proposed implementation of the RQF came closer it became clear that accessibility in the form of OA had taken a back seat to the pragmatics of managing a research evaluation exercise. On the 13ᵗʰ February 2007 at a colloquium entitled "The RQF Explained: Information Management and Repository Needs for the RQF"[4] DEST announced that while DEST required that universities place their assessable research outputs in repositories, it would prescribe the submission of the published version of the paper, instead of the preprints and post-prints more likely to be available OA. Kingsley (2007) has termed this possible outcome the "OA mirage" of the RQF. This means that repositories will need to be configured to provide both open and closed access, which muddies the message for IRs required for translation.

> *so what is likely to happen is there is likely to be a separate instance of the repository for the RQF, because of the requirements of the RQF for only four outputs for each researcher and the formal published copy, so it will have to be a dark archive* [Project Manager 2].

In addition, the ARROW technology is still under development, holding up implementation. New requirements and expectations are revealed through on-going discussions and trials with academics. The University Librarian reported that he did not want to officially launch the repository until it was *shiny*. The Project Manager in October 2006 indicated he was expecting upgrades in December that would enable more complete trials to be launched. In March 2007, they were still waiting for testing on the upgrades to be complete and for some additional enhancement. We see then the process of translation is not a smooth one. In the process of following the actors we begin to see the emergence of new publishing practices and the forces preserving the old ones.

Conclusions: Scholarly Publishing and Institutional Repository as an Actor-Network

One of the central tenets of ANT is that the actors make everything, including frames, theories, contexts etc. The assumption is that following the actors involved in scholarly publishing will "render the social connections traceable" (Latour 2005:31) and that some actors in scholarly publishing make other actors do things by "generating transformations" (Latour 2005: 122). The work presented in this paper followed the actors thereby rendering some of their traces visible. The IR actor-network has been revealed as the trace left behind by actors,

---

[4] http://www.apsr.edu.au/rqf/colloquium.htm

as they influence each other and establish connections. What following the actors shows is that scholarly publishing as we used to know it (before the Internet and the possibilities the Internet created for OA) had some of the characteristics of a "black box". Actors all had stable and clear roles and mutual relationships; processes had been well defined, in place for a long time. The entry of new technological actors such as the Internet has encouraged the opening of this black box, as scholars and associated actors in the network experiment with different ways of making research accessible utilising new publishing practices that may have little or great impact on the whole system. In our research we are beginning to see the actors that are attempting preserve the strength of the existing actor-network – copyright, scripts such as journal impact factors, funding rules and reward mechanisms (in the words of one interviewee "the game"). We also see actors playing a role in opening the black box. The Internet and other technologies such as institutional repository software, metadata harvesting tools that enable searching of scholarly material only, have created opportunities for changing scholarly publishing practices, as have individuals as advocates and individuals as parts of organisation such as libraries making repository technologies available, and supporting their implementation and use.

The analysis of IR actor-network in the University A shows how the agendas for changing scholarly publishing are enacted through the initial problematization and subsequent interessement and enrolment of various actors, that however reveal some contradicting programs and enrolment efforts. At present we can see how IR actor-network emerges as a shifting alliance between macro-actors (RQF acting on behalf of DEST; University A aiming to achieve its goals and optimize its RQF score); micro-actors such as academics and researchers as they are being enrolled into the actor network; and IR technology that is being re-designed to act as an interessement device to enrol academics and other researchers to achieve the University goals. The IR actor-network can also be seen as a way for the macro-actor University A to enrol micro-actors, academics and researchers, in the pursuit of its goals. However our analysis shows that the IR actor-network is emerging slowly and that enrolment of academics is not a natural and straightforward process as some have expected. This can be attributed partially to the IR technology development that so far has not reflected or has been too slow in expressing the interests of these micro-actors and has thus failed to act as an interessement device; and partially to the unresolved presence of programs and anti-programs (open access vs copyright protection; publishing in the high impact journals vs making research results publicly accessible; publishing in the international journals vs focusing on Australian context and content). The IR actor-network is still clearly a "shifting alliance", not yet an entity converted into an inscription or a device; an "immutable mobile" or a "black box". There is still occurring the entry of new actors (IR, OA, Internet), or changes in alliances (as scholars experiment with alternatives) within the scholarly publishing system. Whether these changes will cause the desertion of existing actors, such as some publishers, is widely discussed. Further enrolments of researchers would require "multilateral negotiations, trials of strengths and tricks that accompany the interessments and enable them to succeed" (Callon 1986, p. 211). For translation of interests to succeed and the IR actor-network to strengthen and stabilize, all key allies have to be mobilized, contradicting programs negotiated and the ARROW technology inscribing actors' interests, stabilized and institutionalized.

The changes are emerging without us fully understanding what the changes may actually mean for scholarly communication, IR and OA, even who the all current actors are, and how these changes may affect the nature of scholarly work. Broadly, this paper has reported an ANT account of the current situation and some emergent associations and contradictions. Starting with the actors involved in the implementation of the IR, using ANT we have begun to empirically follow existing actors to trace connections, locate other actors that have been enrolled, allowing them to be the mediators, while recording and describing what is happening. The study which is underway will continue to analyse the collected data to report changes on scholarly publishing and the influences of open access and institutional repositories as information systems enabling the information management of scholarly publishing and operating in a changing environment. The expected results are relevant for:

- Individual researchers seeking understanding of the contemporary publishing environment

- Organisations or institutions seeking to maximise access to their research or developing and implementing open access repositories

- Publishers and libraries in terms of understanding local and global challenges emerging from increasing use of open access.

References

Antelman, K 2004, 'Do open-access articles have a greater research impact?' *College and Research Libraries*, vol. 65, no. 5, pp. 373-82.

ARROW Australian Repositories Online to the World n.d., *About ARROW*, viewed 4 December, 2006 <http://arrow.edu.au/about/>.

Australian Department of Education Science and Training (DEST) [2006], *About the Higher Education Research Data Collection*, viewed 14 September, 2006 <http://www.dest.gov.au/sectors/research_sector/online_forms_services/higher_education_research_data _collection.htm#About_the_Higher_Education_Research_Data_Collection>.

Australian Department of Education Science and Training. Development Advisory Group of the RQF 2006, *The Recommended RQF*, Australian Department of Education, Science and Training, Canberra.

Australian Government Department of Education Science and Training n.d.-a, *Accessibility Framework*, viewed 4 December, 2006 <http://www.dest.gov.au/sectors/research_sector/policies_issues_reviews/key_issues/accessibility_frame work/>.

---- n.d.-b, *Research Quality Framework: Assessing the quality and impact of research in Australia*, viewed 4 December, 2006 <http://www.dest.gov.au/sectors/research_sector/policies_issues_reviews/key_issues/research_quality_fra mework/default.htm>.

Bjork, BC 2005, 'A lifecycle model of the scientific communication process', *Learned Publishing*, vol. 18, no. 3, pp. 165-76.

Budapest Open Access Initiative 2002, *Read the Initiative*, viewed 7 April, 2006 <http://www.soros.org/openaccess/read.shtml>.

Callon, M 1986, 'Some elements of a sociology of translation: Domestication of the scallops and fishermen of St. Brieuc Bay', in J Law (ed.), *Power, action and belief: a new sociology of knowledge?*, Routledge, London, pp. 196-233.

Dewatripoint, M, Ginsburgh, V, Legros, P, Walckiers, A, Devroey, J-P, Dujardin, M, Vandooren, F, Dubois, P, Foncel, J, Ivaldi, M & Heusse, M-D 2006, *Study on the Economic and Technical Evolution of the Scientific Publication Markets in Europe. Final Report.* European Commission, Directorate-General for Research, Brussels.

Drott, MC 2006, 'Open Access', *Annual Review of Information Science and Technology (ARIST)*, no. 40, pp. 79-109.

Guédon, J-C 2001, 'In Oldenburg's Long Shadow: Librarians, Research Scientists, Publishers, and the Control of Scientific Publishing', paper presented to Creating the Digital Future, Association of Research Libraries. Proceedings of the 138th Annual Meeting, Toronto, Ontario May 23-25, 2001.

Harnad, S 1995, 'Universal FTP Archives for Esoteric Science and Scholarship: A Subversive Proposal. ' in A Okerson & J O'Donnell (eds), *Scholarly Journals at the Crossroads; A Subversive Proposal for Electronic Publishing*, Association of Research Libraries, Washington, DC.

---- 1999, 'Free at Last: The Future of Peer-Reviewed Journals.' *D-Lib Magazine*, vol. 5, no. 12, p. http://www.dlib.org/dlib/december99/12harnad.html.

Harnad, S & Brody, T 2004, 'Comparing the impact of open access (OA) vs. Non-OA articles in the same journals', *D-Lib Magazine*, vol. 10, no. 6.

Harnad, S, Brody, T, Vallieres, F, Carr, L, Hitchcock, S, Gingras, Y, Oppenheim, C, Stamerjohanns, H & Hilf, E 2004, 'The Access/Impact Problem and the Green and Gold Roads to Open Access. ' *Serials Review*, vol. 30, no. 4, pp. 310-4.

Howcroft, D, Mitev, N & Wilson, M 2004, 'What we may learn from the social shaping of technology approach', in J Mingers & L Willocks (eds), *Social Theory and Philosophy for Information Systems*, John Wiley & Sons, West Sussex, UK.

Kingsley, D. 2007 'The one that got away? Institutional reporting changes and open access in Australia" preprint available at http://dspace.anu.edu.au/handle/1885/45158 viewed 27 September 2007.

Kling, R & Callahan, E 2003, 'Electronic journals, the Internet and scholarly communication', *Annual Review of Information Science and Technology (ARIST)*, vol. 37, pp. 127-78.

Kling, R & McKim, G 1999, 'Scholarly communication and the continuum of electronic publishing', *Journal of the American Society for Information Science*, vol. 50, no. 10, pp. 890-907.

Latour, B 1999, 'On Recalling ANT', in J Law & J Hassard (eds), *Actor Network Theory and After*, Blackwell Publishers / The Sociological Review, Oxford, pp. 15-25.

---- 2005, *Reassembling the social: An introduction to Actor-Network-Theory*, Clarendon Lectures in Management Studies, Oxford University Press, Oxford.

Law, J 2003, *Notes on the Theory of the Actor Network: Ordering, Strategy and Heterogeneity*, Centre for Science Studies, Lancaster University, Lancaster, England, viewed 11 July 2006 <http://www.lancs.ac.uk/fss/sociology/papers/law-notes-on-ant.pdf>.

---- 2004, *After Method: Mess in Social Science research*, Routledge, London.

McGrath, K 2002, 'The Golden Circle: a way of arguing and acting about technology in the London Ambulance Service', *European Journal Of Information Systems*, vol. 11, pp. 251-66..

Prosser, DC 2005, 'Fulfilling the Promise of Scholarly Communication – a Comparison Between Old and New Access Models', in EK Nielsen, KG Saur & K Ceynowa (eds), *Die innovative Bibliothek : Elmar Mittler zum 65.Geburtstag*, K.G. Saur, pp. 95-106.

Rowlands, I & Nicholas, D 2006, 'The changing scholarly communication landscape: An international survey of senior researchers', *Learned Publishing*, vol. 19, no. 1, pp. 31-55.

Seglen, PO 1997, 'Why the impact factor of journals should not be used for evaluating research ', *British Medical Journal*, vol. 314, no. 7079, p. 497.

Tatnall, A & Gilding, A 1999, 'Actor-Network Theory and Information Systems Research', paper presented to 10th Australasian Conference on Information Systems (ACIS), , Wellington, New Zealand.

Tenopir, C & King, DW 2000, *Towards Electronic Journals: Realities for Scientists, Librarians, Publishers*, Special Libraries Association, Washington D.C.

Underwood, J 1998, 'Not another methodology: What ANT tells us about systems development', paper presented to 6th International Conference on Information Systems Methodologies, Salford, UK.

---- 2001, 'Meaning in IS Development: Understanding System Requirements and Use with Actor-Network Theory', University of Wollongong.

---- 2001, 'Translation, betrayal and ambiguity in IS development', paper presented to IFIP WG8.1 Working Conference on Organizational Semiotics, Montreal, July 2001, <http://linus.socs.uts.edu.au/~jim/publications/montreal2001.doc>.

Velterop, J 2003, 'Should scholarly societies embrace open access (or is it the kiss of death)? ' *Learned Publishing*, vol. 16, no. 3, pp. 167-9.

Vidgen, R & McMaster, T 1996, 'Black boxes, non-human stakeholders and the translation of IT through mediation', paper presented to IFIP WG8.2 Working Conference on Information Technology and Changes in Organizational Work, , Cambridge.

Copyright