# Institutional repositories as portents of change: Disruption or reassembly? Conjectures and reconfigurations

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## Abstract

**This paper reviews how Open Access policies (OA) and Institutional Repositories (IR) might be portrayed as agents of change within the realm of scholarly publishing. Using commentary on academic publishing as background, commentary that sees OA and IR as optimal and inevitable, and beneficially disruptive of the existing system, two theoretical approaches are presented as ways of providing a more detailed and explicit analysis of OA/IR dynamics. Both theories to varying degrees derive their inspiration from an exploration of the nature of change. The first "disruptive technology/disruptive innovation" approach (Christensen) specifies change in market theory terms, a re-structuring "driven" by innovation within, and possibly disruptive of, existing market arrangements. The second approach views change as a process of "reassembling" and reconfiguring of relationships between elements of a network (Actor-Network Theory). The application of both approaches to OA/IR is explored, including reference to a case study on a university institutional repository implementation. While "disruption" and similar terms might be in common and casual use, the basic idea gains greater clarity in these theories, and in doing so promotes greater awareness of the assumptions being made, and the aspirations being pursued.**

## Introduction

Whenever there is something that is envisaged as "new", speculation is rife as to the changes that will follow. The arrival on the scholarly publishing scene of the Internet-inspired Open Access movement and proliferating institutional repository systems are no exception. Many view these as agents or portents of new modes of academic communication and the locus of change in the traditional scholarly publishing system. How these changes might be understood is the subject of this paper.

Traditional scholarly publishing is typically represented as the formal communication of research within a research community. Book publishing is important for some disciplines, but because of major differences between book and paper publishing we focus on papers. Papers are most often made available in journals and conference proceedings published by commercial or learned society publishers via individual or organisational subscription within research communities. Scholarly publishing is seen to fill several purposes within a scholarly community; including publicity, access and trustworthiness, and its role in each of these is currently being contested (Drott 2006; Kling and Callahan 2003; Kling and McKim 1999). Change is seen to be occurring for many reasons, among them:

- The increasing demand for research to be easily accessible in order to be useful;

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- The development of remotely accessible information systems such as digital repositories and enabling protocols such as the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) which contribute towards making accessibility relatively simple;

- An increase in inter-, trans- and multi-disciplinary research where the definition of a research community is quickly evolving;

- The rising costs of traditional subscriptions;

- A growing awareness of the difficulties posed by these rising costs to researchers in poorer institutions, organisations and countries.

In response an "Open Access" (OA) movement has formed to promote the ideal of being able to "read, download, copy, distribute, print, search or link" (Budapest Open Access Initiative n.d.; Drott 2006) to the full text of open access works, without financial cost or legal or technical barriers. OA can be achieved in a number of ways, the most common of which are to post work to a web site or place in an institutional or disciplinary digital repository (self-archiving); or to publish in an OA journal. This work concentrates on institutional repositories (IR) which rely on institutions managing (or encouraging authors to manage) self- archiving of work. This can occur at the pre-print (an unrevised, un-refereed draft) or post-print (all post-publication works, including published versions).

While OA/IR are increasing in numbers, OA content in the repositories does not appear to be increasing at the same rate (McDowell, 2007; Thomas & McDonald, 2007). This may change as institutional and funder OA deposit mandates take effect.  The first institutional mandate recorded is the Queensland University of Technology in Australia effective from January 2004. Other institutional deposit mandates are increasing, most notably the Harvard University Faculty of Arts and Sciences on February 12th 2008. Perhaps even more powerful are funder mandates for OA,  for example, the Wellcome Trust (October 2005), four of the eight research councils in the UK (October 2006), the Australian Research Council (ARC) (which requires grantees to deposit their ARC-funded work in an OA repository or explain why not) and on December 26 2007 the US National Institutes of Health (NIH) (Nguyen 2008; Suber, 2007; Van Orsdel and Born 2008).

While IR are generally viewed as being an adjunct to the traditional scholarly publishing system, OA IR are perceived by some as undermining that very system, and the interests of commercial journal publishers and scientific societies for whom sale of publications form a significant part of income which is used to subsidise their other activities (Goodman 2004; Look 2004; Poynder 2004). Too wide a use of free and easy access may cause the cancellation of subscriptions, the reduction of publisher profits, and the withdrawal of publishers from the market. According to Oppenheim (2005) "it seems 'obvious' to many that the increased use of open access will lead to journal cancellations… An alternative view is that there is no cause and effect relationship between open access and cancellations".

More profound changes are anticipated, to the whole scholarly publishing paradigm, not just in the ways that people access information. This perception is not just one of publishers; but seems to be shared by many academics. Based on a 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 seen as a "good thing", in that there are aspects of scholarly publishing that would benefit from change. However, publishers currently play a key role in being largely responsible for organising the refereeing and review process, copy-editing, and distributing the journal in paper or electronic form. If Open Access policies in institutional repositories become standard, i.e. practiced by a significant section of the research community, it could be seen to undermine independent peer-review, and the quality assurance processes currently built into the traditional scholarly publishing "system".

OA & IR are widely presumed to be portents of significant change occurring in academic publishing. Various terms to describe the effect have been deployed, indicating the varying degrees to which this might occur: "disruption", "adaptation and transformation", "bad injury", "fundamental, albeit long term change", "dramatic, profound shift", "death". While the presumption is that change will occur, an explication of the process on which predictions are based is more difficult to come by. Often the only indication is that certain changes are inevitable, "Revolutionary" even, an outcome of the very characteristics of the innovation (National Research Council 2002). Or under the banner of a different sort of Revolution, certain innovative policies, such as OA, should be actively promoted, in order to lead to liberating reforms of the publishing system. IR & OA might be nominated as agents of change, but precisely how they will affect change is unclear.

A more systematic, detailed and explicit analysis of the dynamics of the academic publishing system is needed. In the rest of this paper two possibilities are presented, the portrayal of change being different in each. The first specifies disruption as a re-structuring of established markets; the second specifies it as a process of reassembling and reconfiguring relationships between elements of a network. Their application in relation to Open Access and institutional repositories is then explored. While "disruption" and similar terms might be in common and casual use, they gain greater clarity in these theories, and in doing so promote greater awareness of the assumptions being made, and the aspirations being pursued.

## Disruptive technology/Disruptive innovation

The first theoretical approach being considered in this paper originated with Bower and Christensen (1995). They introduced the distinction between "disruptive technologies" (which in earlier papers seems to refer mainly to "disruptive products") and "sustaining technologies", in order to describe significant market reconfigurations in the history of disk-drive manufacturing industries. Since then the terminology and concepts have been taken up by a number of researchers, including in relation to the potential developments in publishing.

The basic thesis was that "different types of technological innovations affect performance trajectories in different ways" (Bower and Christensen, 1995: 45) where performance is measured according to market indicators. Market performance is seen to be linked with certain product attributes which are used to indicate engineering performance (in the original case, disk "density" of "information", i.e. signal inscription).

Manufacturers and service providers fall into two camps. The first rely on "sustaining technologies"; those that give an established community of their customers the products which have "something more or better in the attributes they already value" (Bower and Christensen: 45). Manufacturers that "maintain a rate of improvement" relative to other manufacturers survive; those that do not, don't survive. However, some companies are seen to fail neither through mismanagement nor failure to make technological progress, but by being displaced by smaller, newer companies touting "disruptive technologies" (the second camp).

These new companies establish new markets for themselves, with products that offer different value propositions from existing products (e.g. "portability" instead of "quality") but which, from the view of the established market, are viewed as "inferior". However, the danger for established manufacturers is that as these products improve according to the established performance criteria, they become quite "good enough" for many purposes so as to replace current product offerings in existing markets. The effect on market organization created by the disrupting manufacturers of computer disk-drives was seen as "breathtaking", and in the order of a "technological mudslide". The underlying cause of this market disruption was clear, for "technological change, of course, drove these breathtaking achievements" (Bower and Christensen: 45).

From the original focus on "product innovation", Christensen and his colleagues have consolidated their argument and extended and applied these notions to a number of other areas. These tend to be more diffusely defined as disruptive or sustaining "innovations" rather than "technologies" (Christensen and Raynor 2003). According to Markides (2006: 19) these now include:

> "such disparate things as discount department stores; low-price, point-to-point airlines; cheap, mass-market products such as power tools, copiers, and motorcycles; and online businesses such as bookselling, education, brokerage, and travel agents."

These extensions make the idea more difficult to manage conceptually; not least because of the difficulty of locating empirical equivalents of disk-drives, their manufacturers and their markets (i.e. "operationalising" the constructs consistently across different domains).

Some commentators now feel that the basic idea needs further differentiation. Writing in the product innovation literature, Markides claims that Christensen has confusingly extended the area of application of his original idea (focusing on products in a market) to all "disruptive innovations" (Markides, 2006: 19). He wishes to distinguish different types of "disruption" according to the source of "disruption": business-model innovation, industry-wide technological innovation, and radical new-to-the-world product innovation. Innovation in business models is seen to be "much more than the discovery of a radical new strategy on the part of a firm". Rather they "redefine what an existing product or service is and how it is provided to the customer", as well as having the (unsurprising) requirement that they enlarge "the existing economic pie" by attracting new customers or enticing

exisiting ones to buy more (Markides, 2006: 20). Christensen seems to agree that much innovation resides in the business-model, and now prefers the term disruptive "innovation" to that of "technology", setting this within an even more general theory of disruption (Christensen 2006: 48-49; Christensen & Raynor 2003).

One consequence of the elaboration this theory has undergone is the extent to which disruption is believed to be simply the result of technological change. This is now less certain. Other social and organizational elements in characterising innovative change are recognised as equally influential in any business marketing context. The highly simplified causal dynamic assumed and portrayed by the original Bower and Christensen (1995) article has become problematic, even for seemingly straightforward cases of product innovation. This suggests that alternative ways of representing the dynamics of disruptive change may be needed. It also somewhat dampens instrumentalist aspirations for the theory, for now the machinery of innovation management and strategic planning has become more complicated and the linkages less secure, and perhaps therefore rather less appealing to the busy manager.

## OA/IR as disruptive innovations

As already mentioned, a number of commentators conjecture about the potential for Open Access and Institutional Repositories to "change" or "disrupt" traditional scholarly publishing, without specific referral to Christensen's theory (Goodman 2004; Poynder 2004; Rowlands and Nicholas 2006). Bachrach (2001) does not use the term "disruption" as such, but envisages a "dramatic, profound shift in how scientists should (and will) communicate in the future" (quoted McKiernan 2002: 317). Crow writing as senior consultant to the SPARC OA lobbying group foresees "fundamental, albeit long term change in the structure of scholarly publishing" initiated by OA and IR (Crow 2002: 5). Any number of other examples can be found listed in Bailey (2008).

Some authors on OA and IR do refer explicitly to Christensen's theory (Lewis 2004; Look 2004; Madison 2006). Well-established publishers and library customers focus on refining the current options: for example, by turning paper journals into electronic journals, by creating new economic models for access such as bundling, and by making improvements to products, such as improving user interfaces and ease of use. In the meantime new options, such as institutional and disciplinary repositories are ignored, or relegated to the margins. Look (2004) suggests that publishers who underestimate or actively oppose the Open Access movement may end up mortally injured. The most detailed and familiar analysis of scholarly publishing using disruption theory, including the role of academic libraries, is offered by Lafferty & Edwards (2004). They stay with Bower and Christensen's original terminology, and provide lists of "sustaining" and "disruptive" components and functionalities (in electronic journal publication), mostly drawing on McKiernan (2002) for these, although the "disruptive technology" terminology is not used by McKiernan. Given the short history available, these lists are necessarily conjectures. The criteria for membership of the two categories are not discussed, and somewhat puzzling. Reader "discussion forums and lists linked to individual journals or articles" (p.45) are seen to sustain, whereas the inclusion of "output files from programs, and data sets" is seen as disruptive. An argument could easily be mounted for the opposite, especially with regard to the impact on the reviewing process.

In the same spirit as Christensen's work, Lafferty & Edwards offer management advice to librarians and university and research administrators by recommending ways of managing potential disruption, such as isolating development in separate organizational units, or avoiding performance oversupply in existing products (Lafferty & Edwards 2004: 257). They do not explore the disruptive nature of this change much further, only identifying some possible components (future cooperatives of repositories) and other indicators, such as examples of the early stages of growth of OA projects.

The identification of particular components of publishing as technologies, as Lafferty & Edwards do, is a more specific product-oriented view of publishing than that of other commentators, for whom disruption would be to the business model, or commentators who envisage publishing in more holistic terms, as constituting some sort of system. More fundamentally, Christensen's analysis of disruption functions at the gross scale of markets. The concept hides (and needs to hide) the intricacies of the scholarly publishing system which might be necessary to understand in order to place OA and IR within it. The key question remains: "What is this disruption? Disruption of what? Disruption of the established system of scholarly publishing? Of the role of commercial and society publishers, the role of libraries, all or none of these, other elements we have not yet imagined?" Addressing these

questions at the level of detail necessary to come to some detailed understanding of dynamics of the system may be better achieved using other modes of analysis.

For most commentators the forecast is unclear. Scholarly publishing will not go away but it will change; but to what extent disruption will be experienced, and where, and for what reasons, remain to be seen. There is insufficient evidence to predict a disruptive role for OA and IR – it is too early in the story. However, we might, like Johnson, see both "adaptation and transformation" rather than "disruption" being the future of scholarly publication (Johnson 2004). This view might be accommodated more appropriately by a theory that does not have its basis in an opposition between disruptive and sustaining change. Our initial suggestion, offered in the spirit of conjecture, is to use Actor-Network Theory (ANT), with its idea of translational change of participant networks, and to this we now turn.

## Actor-Network Theory

Actor-Network Theory (ANT) originates in the studies of science, technology and society (Callon 1986; Latour and Woolgar 1986; Latour 1999; Latour 2005; Law 2004). ANT sees the world in terms of networks made up of heterogeneous elements or actants and constituted by alliances, allegiances and oppositions. Anything that modifies a state of affairs by making a difference is an actant. Social actors cannot simply press their wills on inert passive "things"; similarly artifacts cannot force human actors to perform in a specific way (Howcroft, Mitev and Wilson 2004; Latour 2005; Law 2003; Tatnall and Gilding 1999). This allows us to avoid the technological deterministic tendencies detected in our analysis of disruptive technology theory. ANT encourages us to look for all the actants and the effects they may have on the network and therefore enables examination of OA and IR at a greater level of detail than a theory such as that of disruption. 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 on "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".

Actants in the network enrol allies into the network by negotiations, known in ANT parlance as "translation". "Moments of translation" are those in which actants recruit allies to their network. New actants can be recruited in many ways. Law claims that translation strategies depend on the empirical environment and identifies examples from his own work, such as ""enterprise", "administration", "vocation" and "vision" -- which collectively operate to generate multi-strategic agents, organisational arrangements and inter-organisational transactions" (Law 1992, updated 2001). The stages or "moments" where actants attempt to enrol other actants in their networks are known as *problematisation* (defining the network as useful), *interessement* (attracting others to the network), *enrolment*, and *mobilization (*appropriating others' interests to one's own, making the translation durable, for a time at least, against the competing interests of other actants and networks) (Callon 1986; McGrath 2002; Underwood 2001b; Underwood 2001a).

The network can be traced by the connections, inscriptions, artifacts and other entities created by actants. ANT is not concerned with the distance between macro and micro, or local and global, instead it considers all actants in a network as a single continuous trail or structure that within itself is related, connected, associated, assembled (Law, 2003; Latour, 2005). Following the connection between actants of interest, and describing what we see, helps highlight what is important in the network (Underwood 1998). Unlike disruption theory (being a management theory of instrumentalist intent) which wants to provide prediction and advice, ANT (being a theory about how to approach research) is more concerned with describing and explaining -- letting the actants speak for themselves. The process of change or reconfiguration in the network is described by Latour as reassembly (Latour, 2005). This is expressed by others in terms of changes in the dynamic, "shifting alliances" which make up the network (Tatnall and Gilding, 1999). These new alliances can become entity-like, or form as new actants, as inscriptions or devices, "immutable mobiles" or "black boxes", this especially when composed of a number of simpler networks which are being taken for granted (Underwood, 2001). The "entry of new actants, desertion of existing actants, or changes in alliances" can cause these supposedly stable entities to be "opened" and re-considered (Tatnall and Gilding, 1999), that is, reassembled.

One value of this approach is that an analysis can be conducted at any level of detail. It allows the analysis to further proceed by unpacking the black box of an actant to examine it in more detail, maybe portraying it as comprising a network or assemblage of its own. Relationships may divulge

more detail also, and be subject to closer scrutiny (e.g. to detail the interactions through which they might be formed and maintained.) The opposite process might happen also, with the formation of sub-networks into actants, for deployment in representations involving larger categories (e.g. to describe maintenance or disruption of "markets"). Therefore ANT, even if not regarded as a sufficiently theoretical approach by some, is at least a useful mapping procedure. Unlike more normative theories, such as the theory of disruption, which aim for predictive power, ANT enables the researcher and interested people to follow the actants from one to another, to identify actants which may have agency but which may not be evident at the macro-level analysis of markets and business models favoured by researchers using disruption theory. Finding and analysing these actants and their role in assembly and reassembly of a network aids in our understanding of the changes occurring in scholarly publishing, and potentially in other systems or networks.

## The reassembly of scholarly publishing

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 reviews of OA and IR in our introduction indicate that this statement could be seen to apply to scholarly publishing. He also suggests three tests for ANT membership: non-humans have to be actants 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). In his early work, Latour (1987) represents formal scholarly communication (aka scholarly publishing) as an actor-network. His work reveals how actants such as writers, articles, journals etc. attempt to enrol the authority of citations to reinforce the legitimacy of a piece of writing. Our work aims to look at how existing actors (authors, readers, open access lobbyists) enrol new technologies (Internet, repositories, OAI-PMH), and policies (Open Access) as actants to the existing system and what changes this may bring about. The Internet and associated technologies are claimed to have wrought vast changes in scholarly publishing. Scholarly publishing relationships and alliances are in the process of being reassembled. While new actants are joining 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 actants as they interact, form coalitions and negotiate changes in the course of adoption of open access IR.

Scholarly publishing can be seen as an heterogeneous actor-network, comprising as it does of a wide variety of actants who work together to comprise the whole. Scholarly publishing is undergoing change and thus could be said to be in the process of being reassembled (Howcroft, Mitev and Wilson 2004; Latour 2005). Open access and institutional repositories are more than a technological information system. For them to work, they have to become connected into a far bigger and more heterogeneous information system, the scholarly publishing system. We use ANT to re-specify the term "system" as "network". Such a scholarly publishing network can be investigated in terms of not only researchers and writers, university managers and publishers, but also Internet, browsers and repositories, copyright and intellectual property, even Internet protocols, as actants. We need to pay attention to processes, actants and events beyond the organization as well as within the organisation because all appear to play pivotal roles. As such, analyses can neither focus on the individual, the organization, or the world, but in all parts. There is no incontrovertible starting point for the study, it could be the implementation of the institutional repository, but it could be anywhere else within a pre-existing network. Indeed, from our reviews of scholarly publishing we see that the phenomenon appears to be created and maintained by a network of aligned but separate individual, disciplinary, organizational and other actants.

## OA/IR in reassembly

While we do not have access to empirical data that will allow us to further explore scholarly publishing through the lens of disruption theory we have access to some that allow us to explore scholarly publishing through the lens of ANT. This data does reveal the changes wrought by OA/IR as encouraging change as a process or reassembling and reconfiguring influenced by a number of actants, rather than as a disruption in terms of Christensen's theory brought about by a particular technology or innovation. In an earlier work (Kennan and Cecez-Kecmanovic 2007) we reported on early findings of an ANT-informed study of an OA/IR. The study reported the case of the implementation of an institutional repository within a university in Australia. We followed the actors, traced connections, and made the deployment of the actors visible, for example, by writing accounts

such as this. Multiple techniques and a range of information and data sources were used to gather information from actors. For this research the starting point was the decision by a university in Australia 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 meetings, semi-structured interviews with both implementers (9) and scholars (15), 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.

However, following the actors led us beyond the scope of just performing an implementation study, by revealing how actants beyond the organisation have agency, influencing the acceptance and take-up of the repository system within the organisation and other actants within the organisation possibly even creating effects beyond the organisation. While this research follows one case in particular, it does throw light on the "network" in general, and many of the actants in this case, are also actants in other scholarly publishing networks.

One of the central tenets of ANT is that the actants make everything, including frames, theories, contexts etc. The assumption is that following the actants involved in scholarly publishing will "render the social connections traceable" (Latour 2005:31) and that some actants in scholarly publishing "make" other actants do things by "generating transformations" (Latour 2005: 122). The work presented in this earlier paper followed the actants thereby rendering their traces visible. The OA/IR actor-network was revealed as actants were followed, influenced each other and established connections. What following the actors revealed, through analysis of interviews and documentation and conversations, through reading research articles and books, was 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". Actants had stable and clear roles and mutual relationships (even though these were sometimes different in different research communities or disciplines), processes were well defined, and in place for a long time. The entry of new "technological" actants such as the Internet encouraged the opening of this black box, as scholars and associated actants in the network experimented with different ways of making research accessible using new publishing practices that may have little or great impact on the whole system. OA activists agitate for all work to be OA. Some posit that any effect this may have on other actants, such as publishers and their markets, is mere speculation and no reason to halt promotion of OA. Others propose that publishers will have to change and speculate about the ways in which this might happen (EPrints, undated).

In our research we are beginning to see actants that are attempting preserve the strength of the existing traditional scholarly publishing actor-network – and those who are encouraging change. The actants that emerged from our research who work to preserve the existing network, as well as including individuals with attachments to it, include publishers, journal publishing policies (to self-archive or not), copyright law (or at least perceptions about copyright law), the academic reward structure, scripts such as journal impact factors, and funding rules (in the words of one interviewee "the game").

Those actants playing a role in opening the black box to include open access and institutional repositories, in addition to open access activists from within and beyond the university under study, include a major funder of research, the Australian government through the Department of Education, Science and Technology (DEST). DEST recognised the difficulties associated with research output accessibility and allocated funds on a competitive basis under an Accessibility Framework for the development of IR in universities. Looking at this from an ANT perspective we see DEST as an actor who attempts to define the problem as well as to impose the solution – the implementation of the IR initiative as a way of solving problems of accessibility to research and the management of research outputs. In our case, the University Librarian perceives the same problem of accessibility of research papers and seizes the opportunity to provide a potential solution in the University by applying for DEST funds as a part of a Consortium. Acting on behalf of DEST, the Librarian can thus be seen as an initiator of the University IR as the solution for the problem of accessibility of University research output. The Librarian also defines the problem for other actants in the University and positions himself as indispensable or an "obligatory passage point" for the solution (IR) (Callon 1986).

Furthermore, through its IR initiative DEST also defines some of the roles of other actants (both macro and micro) – those of researchers, their research papers, the University and its Library, the Consortium and repository technology, research funding policy and so on in what we are now

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identifying as the emerging IR actor-network (see Figure 1).  Apart from those, there are other actants that exert influence within the network (also identified in Figure 1), such as scholarly journals and their policies, OA sites (other institutional and disciplinary repositories), researchers - colleagues within the university and from other academic institutions, copyright laws, all of whom propel their own framing of the problem. The traditional paper-based technology has had the key role in shaping and strengthening the traditional scholarly publishing actor-network which has long been institutionalized and stabilized. What the new OA-enabling technologies are doing is to expose the interests of publishers intertwined into the traditional scholarly publishing networks.  As researchers started to act through, and align themselves with, OA repositories they opened up new possibilities for reassembling scholarly publishing and also revealed that the 'problem' lies in the robustness of the traditional scholarly publishing actor-network. The IR actor-network in the University studied has been for some time in the interessement stage: the initiator has been seeking allies and trying to enrol other actants, in particular researchers.
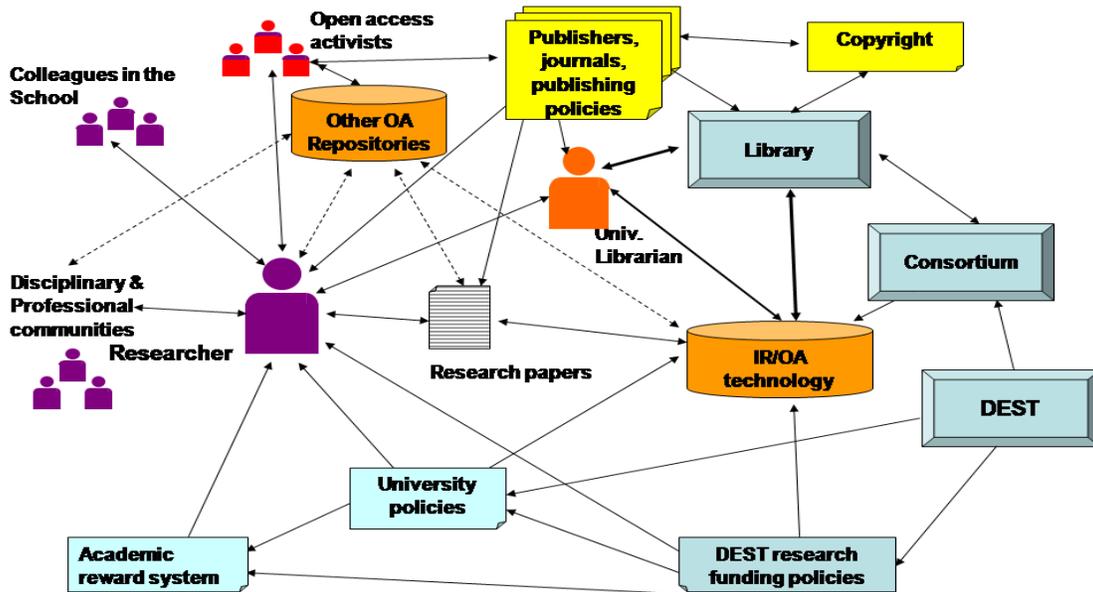


Figure 1: An emerging actor-network of scholarly publishing within a University case study (adapted from Kennan and Cecez-Kecmanovic 2007)

Some researchers concurred with the interessement strategies of the initiators and became enrolled in the OA/IR actor-network. This is not however the case with many other researchers for whom the interessement mechanisms and strategies were not sufficient. The value of OA and specifically IR is not always clearly seen. Those who are not enrolled have reasons for not becoming enrolled. One is that currently researchers may have to report their research five times in five different ways to the university (for example 1. to their School on submission of a paper, 2. to the university for the HERDC annual collection, 3. to their School or faculty webmaster for the web presence, 4. for the RQF and 5. for performance review and promotion purposes). If they also belong to a disciplinary community that supports a repository this will entail reporting a research paper a total of six times. Some researchers 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 the OA/IR 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.

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Research papers and IR technology can be seen as focal objects that different actants attempt to enrol in their own scholarly publishing actor-networks.  As researchers aim to make their works available and to maximize their readership, they are influenced by macro actants.  These include the University and DEST via University policies and the academic reward system and DEST funding policies; and peer pressures and journal policies. Researchers see both opportunities and the impediments for the University IR to be a truly OA repository. The impediments come from restrictive journal post-print policies as well as from uneasy engagement with repository technology (lack of functionality and support for academics to upload and manage their work on the IR). While initially difficult, IR posting of papers is also perceived as potentially conflicting with disciplinary OA repositories. The interessement and enrolment processes so far have been partly successful. The emerging University IR actor-network is partially overlapping and colliding with traditional publishing actor-networks and disciplinary OA publishing networks, through influences, relationships, and negotiations among various actants as presented in Figure 1. 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 micro actants such as researchers with clearly aligned interest are enrolled and have taken steps to mobilise other actants to utilise the proposed solution. Others, on the other hand, while seeing their potential interests are still influenced by anti-enrolment actants, cannot clearly see how opposing interests can be reconciled and alignment negotiated.

In teasing this out in interviews and reviews of documentation and reports, we see that, for example, while DEST and the University provision of the repository technology and staff overtly act as interessment and enrolment devices, other scripts by the same actants act as anti-interessment and anti-enrolment devices. For example DEST research funding policies for the University are not tied into OA deposits in the repository, but instead tie into peer-reviewed journals and articles published in journals with high impact factors. Accordingly, the university also overtly rewards traditionally published work, whether or not it is placed in the repository. Consequently mobilization has been haphazard. It could be called fragmented mobilization (Kennan and Cecez-Kecmanovic 2007). The "ordering effects" of translation processes on the IR technology are incoherent thus producing conflicting demands on the IR technology. As a result the 'inscription' process "through which actants embed their social agendas into technical artefacts" (Holmstrom and Robey 2005) is ambiguous and is driving the IR technology development in different directions. More consistent messages such as mandates (Harnad, 2006) may encourage less fragmented mobilization.

Our ANT analysis at this stage provides us with a starting point. To appreciate the process in more detail we need to conduct further analysis on the interviews and look more deeply into the actor networks we have presented here as black boxes, such as the academic reward system, journal publishing policies and so on. The complexity of these actants and their network relationships hide interactional processes which we are beginning to uncover. The analysis so far indicates that OA and IR are contributing to change in scholarly publishing, but from our vantage point the change looks far more like a reassembly (or adaptation and transformation) rather than a disruption of the kind reported by Christensen and colleagues.

## Conclusions

Attempts so far to identify the types of change to scholarly publishing that Open Access policies (OA) and Institutional Repositories (IR) will initiate are ambiguous and conjectural. Not only is it too early in the story – evidence is hard to come by – the figuring provided by the Revolutionary imagery on offer makes it difficult to re-assess the means by which change might take place, or where any changes or any particular sequence of events might lead. As a way of further clarifying the nature of change within scholarly publishing two theoretical approaches are offered here.

The first approach considers change in relation to innovation in particular industry markets. Innovation can be envisaged as being disruptive or sustaining of existing market arrangements. While this analysis may have value when considering change at a publishing industry level, or within an organization such as a publishing firm or a university, it does not admit precisely enough the elements and dynamics involved should a more detailed analysis be needed.

Maintaining a suitable analytical distance is also difficult when deploying figures of Disruption, which connote oppositions of "Revolutionary vs Reactionary"  and  "Radical vs Superficial". Their normative aspirations invariably assume commitments to ideas of "Progress", an allegiance which may discourage a re-examination of the assumed underlying dynamic.

Resorting to Actor-Network Theory, an alternative way of modelling or representing OA/IR within scholarly publishing is suggested. ANT generally eschews large-scale oppositions, and can be seen to provide a number of points of access to varying levels of detail. This affords a closer look at elements of the network of actants that constitute specific publishing "systems", illustrated here by material from a case study of a university institutional repository. This may need to be complemented by other forms of analysis, to more closely identify the interactions through which network relations are formed and maintained.

ANT accommodates ideas of change, but would re-specify or reconfigure "disruption" as a "one-off" in terms of a continual "reassembly" of an existing network. This approach disengages "disruption" from the Modernist infatuation with tropes of Progressive change, usefully introducing strange and distancing tropes and figures of its own. ANT provides a framework for locating oneself, as researcher and as practitioner, and for re-assessing basic assumptions about how the world of academic publishing goes about its work.

## References

Bachrach, S. M. (2001). Scientific Journals of the Future. In *The Transition from Paper: Where Are We Going and How Will We Get There*? In R. S. Berry and A. S. Moffat (Eds.). Boston, American Academy of Arts & Sciences.

Bailey, C. W. (2008). *Scholarly Electronic Publishing Bibliography* (*SEPB*)
Available at:  http://www.digital-scholarship.org/sepb/sepb.html

Bower, J. L. and Christensen, C.M. (1995). Disruptive technologies: Catching the wave. *Harvard Business Review,* 73(1), 43-53.

Budapest Open Access Initiative. (n.d.). *Read the Initiative.*  Retrieved 7 April, 2006, from 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 *Power, action and belief: a new sociology of knowledge?* J. Law (Ed.). London, Routledge**,** 196-233.

Christensen, C. M. (2006). The ongoing process of building a theory of disruption. *Journal of Product Innovation Management,* 23: 39-55.

Christensen, C. M. and Raynor, M. E.  (2003). *The Innovator's Solution: Creating and Sustaining Successful Growth.* Boston, Harvard Business School Press.

Crow, R. (2002). *The Case for Institutional Repositories: A SPARC Position Paper.* Washington, City The Scholarly Publishing & Academic Resources Coalition, from http://www.arl.org/sparc/IR/ir.html.

Drott, M. C. (2006). Open Access. *Annual Review of Information Science and Technology (ARIST),* 40, 79-109.

EPrints (undated) *Self-Archiving FAQ* retrieved 6 May 2008 from http://www.eprints.org/openaccess/self-faq/#17.Publishers

Goodman, D. (2004). The criteria for open access (preprint). *Serials Review* 30 (4), http://eprints.rclis.org/archive/00003542/02/SR30_4_Goodman.pdf

Harnad, S. (2006). *Optimizing OA Self-Archiving Mandates: What? Where? When? Why? How?* Retrieved 28 April 2008, from http://openaccess.eprints.org/index.php?/archives/136-guid.html

Holmstrom, J. and Robey, D. (2005). Understanding IT's organizational consequences: An actor network theory approach. In *Actor-Network Theory and Organizing.* Czarniawska, B. and Hernes, T. (Eds.) Actor-Network Theory and Organizing. Stockholm: Liber, 165-187.

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

Johnson, R. (2004). *The Future of Scholarly Communication in the Humanities: Adaptation or Transformation?* Washington D.C., SPARC Scholarly Publishing & Academic Resources Coalition. Retrieved 12 January, 2008, from http://www.arl.org/sparc/publications/papers.html.

Kennan, M. A. and Cecez-Kecmanovic, D. (2007) Reassembling Scholarly Publishing: Institutional Repositories, Open Access, and the Process of Change. *Australian Conference on Information Systems: The 3 Rs: Research, Relevance and Rigour - Coming of Age*, December 5-7, 2007 Available at SSRN: http://ssrn.com/abstract=1030964

Kling, R. and Callahan, E. (2003). Electronic journals, the Internet and scholarly communication. *Annual Review of Information Science and Technology (ARIST)* 37, 127-178.

Kling, R. and McKim, G. (1999). Scholarly communication and the continuum of electronic publishing. *Journal of the American Society for Information Science,* 50(10): 890-907.

Lafferty, S. and Edwards, J. (2004). Disruptive technologies: What future universities and their libraries? *Library Management* 25(6/7), 252-258.

Latour, B. (1987). *Science in Action.* Milton Keynes, Open University Press.

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

Latour, B. (2005). *Reassembling the Social: An introduction to Actor-Network-Theory.* Oxford, Oxford University Press.

Latour, B. and Woolgar, S. (1986). *Laboratory Life: The Construction of Scientific Facts.* Princeton, N.J., Princeton University Press.

Law, J. (1992, updated 2001). *Notes on the Theory of the Actor Network: Ordering, Strategy and Heterogeneity.* Lancaster, England, Centre for Science Studies, Lancaster University, Retrieved 11 July 2006, from http://web.archive.org/web/20040214135427/http%3A//www.comp.lancs.ac.uk/sociology/soc054jl.html

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

Law, J. (2004). *After Method: Mess in Social Science Research.* London, Routledge.

Lewis, D. W. (2004). The innovator's dilemma: Disruptive change and academic libraries. *Library Administration & Management* 18(2): 68-74.

Look, H. (2004). Open access: Look both ways before crossing. *Serials,* 17(3), 217-223.

Madison, M. (2006). The idea of the law review: Scholarship, prestige and open access. *Lewis & Clark Law Review* 10(4): 901-924. Retrieved 14 January, 2008 from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=899122.

Markides, C. (2006). Disruptive innovation: In need of better theory. *Journal of Product Innovation Management,* 23, 19-25.

McDowell, C. S. (2007). Evaluating institutional repository deployment in American academe since early 2005: repositories by the numbers, Part 2. *D-Lib Magazine, 13*(9/10), 1082-9873.

McGrath, K. (2002). The Golden Circle: a way of arguing and acting about technology in the London Ambulance Service. *European Journal of Information Systems,* 11, 251-266.

McKiernan, G. (2002). E Is for everything: the extra-ordinary, evolutionary [e-] journal. *The Serials Librarian* 41(3/4), 293-321.

National Research Council. (U.S.). Panel on the Impact of Information Technology on the Future of the Research University, (2002). *Preparing for the revolution: information technology and the future of the research university.* National Research Council of the National Academies. Washington, D.C.: National Academies Press.

Nguyen, T. (2008). *Open doors and open minds: What faculty authors can do to ensure open access to their work through their institutions: A SPARC / SCIENCE COMMONS WHITE PAPER.* Cambridge MA: SPARC/SCIENCE COMMONS.

Oppenheim, C. (2005). Publish OA if you can - self archive either way. *American Scientist Open Access Forum* Retrieved 18/10/05, from http://listserver.sigmaxi.org/sc/wa.exe?A1=ind05&L=american-scientist-open-access-forum&F=l#219.

Poynder, R. (2004). No gain without pain. *Information Today,* 21(10), 1-5.

Rowlands, I. and Nicholas, D.  (2006). The changing scholarly communication landscape: An international survey of senior researchers. *Learned Publishing,*  19(1), 31-55.

Suber, P. (2007). *Timeline of the Open Access Movement (Last revised, December 10, 2007).* Retrieved 28 April, 2008, from http://www.earlham.edu/~peters/fos/timeline.htm

Tatnall, A. and Gilding, A. (1999). Actor-Network Theory and information systems research. 10th *Australasian Conference on Information Systems* (ACIS), Wellington, New Zealand, Victoria University of Wellington Retrieved 11 July, 2006, from http://www2.vuw.ac.nz/acis99/Papers/PaperTatnall-069.pdf.

Thomas, C., & McDonald, R. H. (2007). Measuring and comparing participation patterns in digital repositories. *D-Lib Magazine, 13*(9/10), 1082-9873.

Underwood, J. (1998). Not another methodology: What ANT tells us about systems development. *6th International Conference on Information Systems Methodologies*, Salford, UK, British Computer Society. Retrieved 19 July, 2006 from, http://linus.socs.uts.edu.au/~jim/publications/Salford99.doc.

Underwood, J. (2001a). *Meaning in IS Development: Understanding System Requirements and Use with Actor-Network Theory*. PhD Thesis. Department of Information Systems. Wollongong, University of Wollongong.

Underwood, J. (2001b). Negotiating the chasm in system development: some advice from ANT. *Twelfth Australasian Conference on Information Systems*, Coffs Harbour 19 July, 2006, http://linus.socs.uts.edu.au/~jim/publications/ACIS2001underwood.doc.

Van Orsdel, L. C., & Born, K. (14 April 2008). *Periodicals Price Survey 2008: Embracing openness*, from http://www.libraryjournal.com/article/CA6547086.html