



## ***eScholarship as socio-technical change: theory, practice and praxis***

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### **Abstract**

Developments in electronic publishing in higher education are leading to significant changes in the information supply chain and institutional arrangements for the creation, organisation, dissemination and preservation of scholarly communications such as journal papers, conference papers, working papers and other scholarly information products. Despite the rich and growing literatures about eScholarship and scholarly ePublishing there is still much uncertainty about its impact on universities and the producers, managers and consumers of scholarly publications. In this paper we present a program of critical and evaluative research to investigate scholarly ePublishing systems in use and over time. We use theories of socio-technical change to investigate the interwoven social and technical dimensions of scholarly ePublishing. The aim of the research is to make the impact of scholarly ePublishing visible; to support the development of evidence-based policies and practices; and to improve our understanding of scholarly ePublishing praxis.

### **Introduction**

Advances in ePublishing such as the development of University ePresses, institutional repositories and the publication of open access journals have the potential to transform scholarly communication in as profound a manner as eLearning has transformed teaching and learning in higher education. The implementation and subsequent use of scholarly ePublishing systems represent complex change and the implications of such change for individuals, communities of practice and institutions are not yet clear.

Much of the current literature focuses on the benefits of scholarly ePublishing. Such benefits include: solving the serials crisis by reducing the costs of producing and acquiring scholarly publications (Harnad, 1995a); wresting control of the scholarly communication process from commercial publishers (Harnad, 1995b); widening readership by offering open (often free) access to electronic journals (Odlyzko, 2002); and improving impact and citation opportunities for authors (Lawrence, 2001; Antelman, 2004). Much of this literature presents the perceived benefits of scholarly ePublishing with much less emphasis on how these benefits may be achieved in practice while others (Quandt, 2003) question the impact on productivity of innovations in scholarly communication.

There are also extensive literatures on technical issues such as: the design of software systems for storage and retrieval (Smith et al, 2003); the development of tools for resource discovery, the development and selection of standards for resource description, encoding and interoperability (Van de Sompel & Lagoze, 2002; Liu et al, 2001) and digital preservation (Lavoie & Dempsey, 2004) as well as publishing issues such

as the changes to the peer review process (Rowland, 2002) and copyright and intellectual property (Gadd et al, 2003; Maxwell, 2004).

Whilst this literature provides important guidance to the designers of scholarly ePublishing systems it is less helpful to practitioners responsible for implementing and managing such systems. Further, there are few longitudinal studies to provide insights into ePublishing systems as they evolve over time. In this paper we present a program of critical and evaluative research to investigate scholarly ePublishing systems in use and over time. The aim of the research is to investigate the impact of scholarly ePublishing on the work practices of individuals, the responsibilities of professional groups and institutional structures, policies and practices.

We argue for theoretical perspectives that make visible the complex socio-technical change that occurs when scholarly ePublishing initiatives are planned and implemented. We begin with a brief overview of the challenges associated with implementing scholarly ePublishing systems and provide an overview of the UTSePress project as an illustration of these challenges. We use this illustration to draw out some of the issues arising for practice and propose a long-term research agenda. We then argue for socio-technical theoretical perspectives that make the work of scholarly ePublishing visible through theories of the social construction of technology and actor-network theory. Finally, we discuss the need for participatory research designs involving academic and practitioner researchers to support the development of evidence-based policies and practices and to improve our understanding of scholarly ePublishing praxis.

### **Challenges for implementation: multiple stakeholders, designs and motivations**

Scholarly ePublishing involves and affects a wide range of stakeholders. These include inter alia, producers, publishers, readers, users, designers, managers, policymakers and research funding bodies. The motives, intentions and constraints of these differing professional and user groups contribute to the way strategies and designs for scholarly ePublishing are mobilised and sedimented in practice. Further, strategies and designs for scholarly ePublishing impact the work and professional practice of stakeholders. Existing research has begun to explore the impact of scholarly ePublishing on the producers, consumers and managers of scholarly ePublishing systems. However little attention has been paid to the way such change is negotiated or on how the (often competing) interests of stakeholder groups shift and are aligned over time.

There is no unified design for scholarly ePublishing. Individuals, organisations and institutions have varying motivations and available resources to hand and seek different outcomes and benefits from their initiatives. Designs are also shaped by professional and national policies regarding the need for, value of and rewards (real and perceived) for participating in eScholarship. Different scholarly ePublishing initiatives produce different designs. For example, institutions adopting an Open Access publishing model may implement very different designs; ranging from completely open access to authenticated access to open access after a period of toll access, to fully toll-based access. The reasons and rationalisations behind the resulting models will differ considerably. A challenge for practitioners is to make sense of why and how these designs came to be as they are, and to use this understanding to inform their own practice. As Stephen and Harrison (2001)

argue “electronic services need to be designed differentially and should deploy technologies selectively in service of the varying practices that define different fields.”

### **The research context: UTSePress**

As early as 2002, key members of the Library staff had been considering strategies for capturing and facilitating access to the scholarly output of the academic and research staff of the University of Technology, Sydney. This was prompted by the increasing awareness of, coupled with concerns about, the disparate strategies then in place for disseminating and providing access to this valuable information. Some of this material was on the University website, others in individual websites, others in individual machines waiting to be “published” thereby inaccessible to other researchers, while others in print form provided only limited access. There were further concerns about the surrender of copyright by university staff to commercial publishers who publish their intellectual output. These concerns were aggravated by the funding constraints on university libraries which effectively buy back these resources in significant subscription fees for electronic databases and journals.

It was agreed that the Library would develop and manage the infrastructure in support of the goal of providing access to the university’s scholarly output. The University Librarian presented a case to the Vice-Chancellor and the Academic Board who endorsed the plan. Investigation then followed to find suitable underpinning systems to bring this to fruition. The Electronic Publishing Conference in 2003, held in Portugal brought to light related projects with similar goals from among research and academic institutions in North America and Europe. The challenge was in determining the most suitable systems for our needs. Given the relatively innovative nature of the plan, we were faced with enabling systems, standards and processes which are still in development with no best practice readily identifiable. A related development was the Open Archives Initiative which was increasingly gaining support among academics and technical groups.

The Electronic Publishing Conference provided valuable contacts with the developers of MIT’s DSpace system, the Open Journal System of the Public Knowledge Project at the University of British Columbia and the LOCKSS (Lots of Copies Keep Stuff Safe) archival system from Stanford University. These developers were keen to collaborate on the development of the UTSePress and support testbeds to increase their own understandings and further their systems development.

In an attempt to increase local and national understanding of issues and possible strategies for implementation, UTS Library staff organised a workshop in January 2004 on Scholarly publishing with speakers from the three institutions above and a UTS academic interested in undertaking research in this area. Interest in this emerging field was evidenced by the attendance of over 70 delegates from around the country.

This workshop also provided the venue for launching UTS' first online journal, *Portal: journal of international multidisciplinary studies*. With the members of the editorial team in Guadalajara, the simultaneous launch in Sydney and in Mexico provided the opportunity to demonstrate the truly international nature of the journal.

Two and a-half years later, *Portal* is in its third issue and is going well. There are plans to add to the portfolio of UTSePress' publications, with the expected release of a further two e-journals, an e-book and conference proceedings. There is increasing awareness in the University of the value of open access to scholarly information and an appreciation of the added benefit of giving greater exposure to the University's research profile. There are ongoing discussions with another Australian university for UTS Library to manage the underpinning IT infrastructure for that university's e-publishing program. The heightened interest has highlighted some issues which need addressing.

These include:

- 1 policy development for each ePress and for consortial implementations
- 2 resourcing implications in the Library; in the University
- 3 digital preservation issues
- 4 evaluation and implementation of suitable systems
- 5 monitoring and understanding emerging standards and protocols
- 6 integration issues with existing Library services and the need to prioritise within our increasingly reduced resources
- 7 training and support for an increasingly international body of authors, peer reviewers, editorial teams, etc.
- 8 collaboration with systems developers to ensure that development of largely open source solutions meet UTS' requirements
- 9 understanding user behaviour to inform the design of systems and their user interfaces
- 10 availability of user and other information in support of further service development
- 11 acquisition and retention of suitably skilled staff (e.g. Library professionals and IT staff)
- 12 structural responses to ensure the sustainability of this and the Library's other programs and services
- 13 identification of suitable metrics for the evaluation of electronic publishing programs
- 14 implementation of cost-effective marketing strategies to achieve buy-in from different stakeholder groups

### **An emerging research agenda**

Against this backdrop, key imperatives for a research agenda into the sustainable management of scholarly ePublishing emerged. Our aims are to: make sense of the socio-technical change arising from the implementation of scholarly ePublishing initiatives; to explore the implications for both research and practice; and to contribute to scholarly ePublishing praxis. We are concerned with the impact of scholarly ePublishing across the entire publishing lifecycle, at different levels of abstraction and from different professional and organisational perspectives. We place special emphasis on policy and strategy issues and the ways that

these shape, and are shaped by scholarly ePublishing. To achieve these research aims our approach must be holistic and accommodating of the perspectives of multiple stakeholders and across multiple levels of inquiry (individual, professional, organisational, institutional, cross-institutional). It must be socio-technical and sensitive to the interwoven relationship between scholarly ePublishing and organisational transformation. It must be longitudinal and reveal socio-technical change as it emerges in context and over time. It must be reflexive and experiential drawing from the lived experience of practitioners involved in scholarly ePublishing initiatives and comparative, using the experiences of others internationally to help make sense of our own findings. Miles and Huberman (2002, p.xi) suggest “all researchers need to be concerned with describing their procedures. When they spend more pages explaining why they will not deploy particular methods than on describing their own conceptual and analytic moves, they leave behind too few footprints to allow others to judge the utility of the work, and to profit from it. [...] to make the actual conduct of qualitative research transparent, to ourselves and to others”. We consider this a key imperative for evidence-based research practice. Below we present our epistemological position by briefly outlining the theoretical lens (theories of socio-technical change) and our research approach (participatory action research).

### **Researching socio-technical change**

Scholarly ePublishing is both a social and a technical phenomenon where the needs of individuals, professional groups and organisations are interwoven with the technologies, structures and practices of scholarly communication. Definitions and implementations of scholarly ePublishing are not fixed but change and are shaped over time as policy priorities; the affordances of technologies; and the needs of the producers, managers and consumer of scholarly publications emerge. We draw on theories of the social construction of technology (SCOT) (cf. Pinch & Bijker, 1987) and actor network theory (ANT) (cf. Latour, 1987; Law and Hassard, 1999) to enable us to give visibility to the social and technical contexts of scholarly ePublishing. Using constructs from ANT we seek to understand the ways that interests are aligned, designs are shaped, and meaning is inscribed in the artefacts, designs, work practices and policies for scholarly ePublishing.

### **Participatory action research**

Our team comprises academic researchers and information professionals involved in the implementing and setting policy directions for the UTSePress. An objective of our work is that it is reflexive and experiential, drawing from the experiences of practitioners and contributing to the creation of actionable knowledge about scholarly ePublishing. We seek, in Argyris' words “implementable validity” (Argyris, 2004). To achieve this objective we adopt an action research strategy. This places knowledge creation as a “living, evolving process of coming to know rooted in everyday experience” and involves all participants (practitioners and academic researchers) in the “questioning and sensemaking that informs the research, *and* in the action which is its focus” (Reason & Bradbury, 2001: 2). Our goal is to form communities of inquiry involving representatives from all stakeholder groups in order to advance scholarly ePublishing theory, practice and praxis.

## Conclusion

In this paper we argued the need for critical and evaluative research into scholarly ePublishing implementation and use. Drawing from our experiences with the UTS ePress we propose that such work must be sensitive to and accommodating of the emergent and improvisational nature of such implementations. We propose a research agenda that uses socio-technical change theories and research practice grounded in participatory action research to investigate and explain the impact of scholarly ePublishing in context and over time.

## References

- Antelman, K (2004) Do Open-Access Articles Have a Greater Research Impact? *College & Research Libraries*. 65(5). 372-382. Also available online. Retrieved July 27, 2005 from [http://www.lib.ncsu.edu/staff/kantelman/do\\_open\\_access\\_CRL.pdf](http://www.lib.ncsu.edu/staff/kantelman/do_open_access_CRL.pdf).
- Argyris, C. (2004) *Reasons and rationalizations: The Limits to Organizational Knowledge*. Oxford: Oxford University Press.
- DSPACE <http://libraries.mit.edu/dspace-mit/>
- Gadd, E., Oppenheim, C. and Proberts, S. (2003) The Intellectual Property Rights Issues Facing Self-archiving: Key Findings of the RoMEO Project. *D-Lib Magazine*, 9(9). Retrieved May 7, 2005 from <http://www.dlib.org/dlib/september03/gadd/09gadd.html>
- Harnad, S. (1995a) Electronic Scholarly Publication: Quo Vadis? *Serials Review*, 21(1), 78-80. Also available online. Retrieved July 11, 2005 from <http://cogprints.org/1691/00/harnad95.quo.vadis.html>
- Harnad, S. (1995b) The PostGutenberg Galaxy: How to Get There From Here. Retrieved July 11, 2005 from <http://cogprints.org/1689/00/thes.html>.
- Huberman, A. M. and Miles, M.B. (2002) *The Qualitative Researcher's Companion*. Thousand Oaks, CA: SAGE Publications, Inc.
- Latour, B. (1987) *Science in Action: How to Follow Scientists and Engineers through Society*. Cambridge, MA: Harvard University Press.
- Lavoie, B. & Dempsey, L. (2004) Thirteen Ways of Looking at ... Digital Preservation. *D-Lib Magazine* 10(4). Retrieved July 28, 2005 from <http://www.dlib.org/dlib/july04/07lavoie.html>.
- Law J. & Hassard, J. (Eds.). (1999) *Actor Network Theory and After*. Oxford: Blackwell Publishers.
- Lawrence, S. (2001) Online or invisible? *Preprint*. Retrieved July 27, 2005 from <http://citeseer.ist.psu.edu/online-nature01/>.
- Liu, X. et al (2001) Arc - An OAI Service Provider for Digital Library Federation. *D-Lib Magazine* volume 7 number 4. Retrieved July 28, 2005 from <http://www.dlib.org/dlib/april01/liu/04liu.html>
- LOCKSS <http://lockss.stanford.edu/>
- Maxwell, T.A. (2004) Is Copyright Necessary? *First Monday*, 9(9). Retrieved July 7, 2005 from [http://www.firstmonday.org/issues/issue9\\_9/maxwell/index.html](http://www.firstmonday.org/issues/issue9_9/maxwell/index.html)
- Odlyzko, A. (2002) The rapid evolution of scholarly communication. *Learned Publishing*, 15(1), 7-19. Open Journal System <http://pkp.sfu.ca/ojs/>

Pinch, T.J. & Bijker, W.E. (1987) The Social Construction of Facts and Artefacts: Or How the Sociology of Science and The Sociology of Technology Might Benefit Each Other. In Bijker, W.E., et al (Eds.) *The Social Construction of Technological Systems*. Cambridge, MA: MIT Press, 17-50.

Portal: journal of international multidisciplinary studies, <http://epress.lib.uts.edu.au/journals/portal/>

Quandt, R.E. (2003) *Scholarly materials: paper or digital?* Library Trends, 51(3), 349-375.

Reason, P. & Bradbury, H. (2001) *Handbook of Action Research: Participative Inquiry & Practice*. London: SAGE Publications Limited.

Rowland, F. (2002) The Peer-Review Process. *Learned Publishing*, 15(4), 247-258.

Smith, M. et al (2003) DSpace An Open Source Dynamic Digital Repository. *D-Lib Magazine*, 9(9). Retrieved July 27, 2005 from <http://www.dlib.org/dlib/january03/smith/01smith.html>

Stephen, T. & Harrison, T.M. (2001) Building systems responsive to intellectual tradition and scholarly culture. *Journal of electronic publishing* 8(1)

Van de Sompel, H. & Lagoze, C. (2002). Notes from the Interoperability Front: A Progress Report on the Open Archives Initiative. 6th European Conference on Research and Advanced Technology for Digital Libraries, Rome. Retrieved July 28, 2005 from <http://www.openarchives.org/documents/ecdl2002-oai.pdf>