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eResearch: access and support to university researchers

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Abstract

The way research is undertaken is changing fundamentally with eResearch, the uptake of web technologies and the application of advanced computational techniques. At the same time, rapid changes are underway in scholarly publishing and communication so that research outputs - both articles and data - are available in new and different ways. What does this mean for university libraries in our work to support research? Many university libraries are establishing and populating institutional repositories, undertaking e publishing of university journals and entering the field of research data management and curation with the consequential need for training researchers in data management skills. In addition to considering how these new endeavours integrate with our established roles in supporting research such as liaison librarian services, provision of information resources, current awareness, information literacy training, and document delivery, libraries need to explore what new services and roles we can offer in our universities. We need to consider research support from the researcher's perspective. We need to redevelop partnerships within the university with areas such as the Office of Research, IT Services, and national and international eResearch infrastructure. We need to work collaboratively across university departments to form new teams and develop new skill sets amongst staff to meet the emerging needs of researchers in this greatly changing environment.

The QUT Library has broadened its role in supporting research. In doing so, we saw we needed not only a Library Strategic Plan but a Divisional Research Support Plan. (At QUT the Library is located in a broader support Division with other elements such as IT Services.) The Plan which is for the next three years, encompasses establishing key partnerships in the University, creation of an eResearch Support Service Team including development of a model of support for research data management, Divisional research liaison initiatives, provision and access to information resources, management of the institutional repository and assumption of an expert role in the University a specialist advisor on scholarly communication.

Keywords: eResearch, University libraries, Scholarly communication, Data management

Introduction
eInfrastructure for research discovery can encompass many initiatives, ranging from the library catalogue, web portals to more recent activities in open access publishing and developing repositories. Not surprisingly repository management is an area embraced by university libraries, perhaps because it requires some of the long standing core skills of libraries relating to gathering, organising, describing and providing access to information.

New opportunities for libraries are arising in response to what some describe as the revolution in how science is being undertaken known in Australia as eResearch, in the UK as eScience and in the US as Cyberinfrastructure. Appelbe and Bannon [2007] remove some of the confusion around the term eResearch by distinguishing the infrastructure that makes eResearch possible from the actual research conducted using the infrastructure which is not only characterised by the use of IT, but also by the collaborative nature of the research which often involves sharing data via the internet.

Data management is recognised as one of the key challenges in the new research environment. In Australia, during the time of writing this paper the proposal for an Australian National Data Service (ANDS) was released. ANDS aims to:

"Provide common services in support of research data collections and provide integration infrastructure that facilitates sharing and reuse of data, so that researchers can more easily discover, access, use, analyse, and combine digital resources as part of their activities" [The ANDS Technical Working Group, 2007, p.4].

This development follows a considerable effort by the Australian Federal Government since 2004 to influence the national research priorities, and to boost research output through funding projects to establish the infrastructure necessary to facilitate collaborative, high quality research. ANDS seeks to address some of the problems created by the increasing data deluge which continues to grow as more research produces more data, and more data is digital.

University libraries are well placed to engage with others to provide leadership to their universities in the eResearch arena by undertaking roles as publishers through open access, copyright and IP experts, metadata advisors and trainers in research skills and information and data management [Harboe-Ree, 2006].

A scan of Australian university libraries' web pages searching on the term "eResearch" does not retrieve much evidence of libraries having a strong presence in the eResearch agenda of their home institutions. Libraries have taken the lead with institutional repositories which has been driven by the previous Government's research assessment exercise, RQF. Libraries are also becoming involved in ePresses, open access and supporting and advocating some changes within scholarly communication.

There are significant challenges ahead for universities as they develop the infrastructure and support services necessary to facilitate researchers working in an eResearch context. The management of research data, costly IT infrastructure, provision of highly skilled support staff in areas of research data visualisation, simulation and computation, and IP issues are some of the challenges. Changes in access to scholarly information and communication, both text and data, is another factor in the changing world of the researcher. Assisting researchers to understand the new environment and to become skilled users of the infrastructure and services available is needed. This paper discusses some of the issues and opportunities for libraries, and a conceptual model for developing the role of libraries in the emerging eResearch environment.

e-infrastructure – It's not only the technology

Scholarly Communication

The revolution in research and specifically in science is being accompanied by a revolution in scholarly communication. The challenges and opportunities for libraries in the eResearch arena are very much related to scholarly communication and the dissemination of research output.

Libraries are being called upon to lead in promoting and maturing the open access (OA) movement [Johnston, 2007]. Cochrane [2007] in his keynote paper to this conference last year argued for libraries to take a more active role in response to the revolution in science and the communication of research stating that libraries will need to have a deep understanding of the changes in science and developments in scholarly communication, and be able to share the lead in their institutions.

Changing researcher behaviour and beliefs is key to the success of leading OA developments. Results of the University of California Office of Scholarly Communication survey of researchers show significant impediments to researchers embracing the OA approach including:

- *"Current tenure and promotional systems impedes change in faculty behaviour…*
- *Faculty tend to see scholarly communication problems as affecting others, but not themselves….*

- *Scholars are concerned that changes might undermine the quality of scholarship"*

[University of California Office of Scholarly Communication, 2007, pp 1-2].

The survey report also identifies that:
"Faculty remain largely unaware of and disengaged with scholarly communication issues….
and ……Some respondents voiced concern that it [open access] would undermine the
financial viability of societies and commercial publishers" [University of California Office of
Scholarly Communication, p.7].

There are many similarities between the early experiences at QUT with developing QUT
ePrints, the institutional repository for QUT, and the University of California survey findings.
QUT ePrints is a well documented success story with QUT being one of the few institutions to
mandate deposit into the repository. At December, 2007 the repository held 8,173 full-text
papers with an additional 1,053 in transition to submission. Mandating deposit was a critical
factor in the success of the repository, but equally important were the efforts by the Library's
staff to change researcher behaviour and beliefs.

The development of QUT ePrints taught us that we needed to manage upward, outward and
downward to bring change in the non-technical, softer issues of open access, such as
influencing beliefs and changing behaviours of researchers. We learnt that change in the
researchers' behaviour can only be achieved by:
- Well presented arguments that address concerns, some of which were very similar to
those identified in the University of California survey;
- Saturation of the messages;
- Multiple approaches to getting the message out;
- Understanding that different messages are needed. A researcher who is also the
editor of a journal may have a different view about OA to an early career researcher
who is keen to have his or her work available to the research community;
- Removing barriers to deposit e.g. copyright concerns. Making it technically easy to
deposit in native applications with the Library undertaking conversion of documents to
PDF was essential;
- Embedding knowledge and skills from the eprint specialists into all faculty librarians
so they could spread the message further afield; and
- Being able to demonstrate the benefits of high citation rate for deposited papers.

The success of QUT ePrints also showed the Library and others in the University that the
Library could lead in an area of strategic importance to the University's research agenda.

Leading in the OA area is not only about changing researchers' behaviour and beliefs. The
skills of library staff are critical for libraries to be successful in leading OA initiatives. Turtle
and Courtois [2007] provide a practical guide to how librarians can champion open access
that includes: sources for staff to learn and keep current with the OA developments, tips for
making open access part of your job and how to advocate OA by being a role model.

Turtle's paper is based on an assumption that library staff understand, or at least are willing to
develop their understanding of, the importance of OA and are on the side of the "Believers". If
libraries are to champion open access we will not only have to convince faculty and university
administrators, but also lead our own staff through this significant change. Library managers
would be naïve if they assumed that some of their staff may not share the same
misconceptions and fears with respect to OA as researchers. Interestingly, despite OA being
a prominent topic for at least the last five years and QUT leading with the early establishment
of QUT ePrints, not all Library staff are fully engaged with, or indeed deeply understand the
issues about OA. I wonder how many of our faculty librarians in Australian university libraries
are aware of statements from our professional bodies about open access, for example, the
Council of Australian University Librarians (CAUL) Statement on Open Access [CAUL
statement on Open Access, 2004].

A move to OA that replaces the bulk of our subscriptions would be a revolutionary change for
libraries. Until recently our staff have worked in a subscription based model only. Libraries
have large departments staffed by people whose jobs are entirely based on the subscription
model. Library staff may understandably become resistant to change as OA matures and staff
realise that the institutional repository which they may have considered to be a small scale

successful experiment now represents the future. Library managers will need to undertake planning and significant change management processes to accommodate the shift to OA on a larger scale.

Data Management – An Emerging Picture

In Australia both the Federal Government and the research funding authorities are establishing an expectation that universities and research institutions will be responsible for providing robust and sustainable solutions, including the establishment of infrastructure and governance, at an institutional level for managing research data.

In late 2007 a few Australian universities undertook a survey of research data management practices at their institutions using the Australian National University (ANU) Polling Online (APOLLO), a web-based application. The results of all these surveys were yet to be published at the time of writing this paper.

At QUT the preliminary results of the survey confirmed our concerns about the lack of researchers' awareness of the importance of managing and storing research data, and less than adequate data management practices.

The survey comprised 19 questions relating to: storage of data, use of a formal research data management plan, current data storage and back up methods, access, ownership and responsibility of maintenance of research data, and interest in training related to data management issues.

Preliminary analysis shows that 84% of researchers have no data management plan in place and that:
- 76% of researchers reported using USB/flash drives as one option for storing research data;
- 50% of researchers reported storing their data on CDs as on option; and
- 41% of researchers reported storing data on DVDs.

The survey also identified that researchers are taking ownership of the data themselves and have mixed understandings about ownership, length of time they should keep data and policy regarding data management.

The free text comments of the survey responses make a compelling case for an urgent response at an institutional level to meet the needs of researchers:

"The amount of video data that we generate in our research will become increasingly problematic to store using current methods as I anticipate we will produce significantly more than 0.5TB a year of raw video through staff and postgraduate student projects…

The university is considering a central data repository, but this is only useful if the data placed there is well organised and is accompanied by metadata which includes the (instrumental) conditions under which it was obtained. For example, spectral or diffraction data tends to be specific to the instrument it was measured on

I realise I don't really know what I'm doing because this survey has raised a lot of questions that I hadn't thought about. I would certainly get a lot out of training……" [Bradbury, 2007, pp 7-8].

The survey results confirm that the management of research data is not simply a matter of providing the infrastructure. Researchers have concerns about loss of control over their data, the reliability of central systems and training.

Earlier research, undertaken in 2006 by Monash University, identified some of the same concerns to those found in the QUT survey. Researchers identified that they have concerns about:
- control of access to the data;
- the need to protect Intellectual property, privacy and security; and
- trust in others to manage the data

[Dennison, Kether, McPhess, 2007].

The same survey found that researchers view curation of data as a low priority [Dennison, Kether, McPhess].

Resolution of these issues and the trust of the research community will be required if libraries, in collaboration with other service providers, are to take a central role in research data management.

The Library Role – A Conceptual Model for Innovation

The QUT Library approach to engaging with the eResearch agenda and the changes in scholarly communication can be described as a journey from which has emerged a model for developing innovative solutions that will inform and lead to a wider implementation of services and infrastructure across the Library and the University.

Rather than wait for advances in eResearch to mature, the Library has engaged with others to initiate strategic, high impact, and, to some extent, high risk specialist positions to lead our response. As the roles developed and advances in the eResearch context unfolded, the Library's response has matured to a more comprehensive approach to supporting eResearch with the development of a **Research Support Plan** which will in turn lead to the embedding of new services and work groups across the Library and IT Services.

Specialist roles	Strategic planning	Ongoing roles
Targeted high Impact	Wider impact	Ongoing business – all relevant stakeholders
High risk - untested	Considered risk	Low risk
Key individuals – specially recruited	Some specialist but a wider group	All relevant staff
New skill set	New business	Training all relevant staff
Special funding	Planning for funding	Ongoing funding
Awareness raising – general communication to staff	Change Management	Inclusion of new roles in position descriptions

Table 1 A Model for Developing and Embedding Innovation

Specialist Roles

eResearch Access Coordinator
The eResearch Access Coordinator position was established in 2005. A fundamental requirement of the role is the ability to work collaboratively. All aspects of the eResearch Access Coordinator's responsibilities require working with stakeholders from outside the Library. The eResearch Access Coordinator is responsible for working across QUT faculties, research institutes and other departments within our Division of Technology, Information and learning Support (TILS) to enable researchers' uptake of eResearch opportunities. Specifically, the role is responsible for:
- the provision of repositories;
- investigating and developing systems for the organisation and curation of datasets; and
- promoting publishing through open access journals.

The eResearch Access Coordinator has been the driving force behind the establishment and ongoing success of QUT ePrints. Through sustained and intensive work with researchers the eResearch Access Coordinator has brought about a shift in researchers' behaviours and beliefs with respect to OA.

QUT's adoption of a policy to mandate submission of papers to the ePrints repository required the eResearch Access Coordinator to work with researchers to explain the importance of the repository, remove the barriers to submission, and raise awareness of the advantages of the repository including the increased citation rates for papers written by QUT researchers.

The position was the first in the Library to have dual reporting lines, reporting to both the Library and the Deputy Vice-Chancellor, TILS.

IHBI (Institute of Health and Biomedical Innovation) Information Manager

A 2006 report by the Association of College and Research Libraries (ACRL) identified that the growth of interdisciplinary research is a significant issue for libraries because it will require libraries to "Retool their services" [ACRL, 2006, p.6]. QUT's Institute of Health and Biomedical Innovation (IHBI) Information Manager position is an example of retooling our services to meet the needs of a new organisational model.

QUT's IHBI was established in 2006 and is the largest of QUT's interdisciplinary research institutes. It comprises research staff and research level students from three faculties: the Faculty of Health, Faculty of Science and the Faculty of Built Environment and Engineering. The objective is to establish a physical research environment and culture based on collaboration, where researchers from various disciplines are encouraged to get to know each other, talk, share and work together. The underlying premise of the IHBI model is that solving most real world problems, such as public health issues, requires the successful collaboration of experts from many fields. The collaborative culture of IHBI means that it is fertile ground for eResearch.

The interdisciplinary structure of QUT's research institutes required the Library to rethink its existing services and faculty-based service model. It was critical that the Library adapt its services to meet the needs of our changing research environment.

The IHBI Information Manager provides value-added information services. An important focus of the Information Manager is to help to build the collaborative culture of the newly formed Institute. The Information Manager has been responsible for the recording and disseminating of tacit knowledge within the enterprise such as research specialisations. The Information Manager has delivered workshops to assist new researchers with the grant writing process, is a member of a team responsible for building the web based research knowledge database, and recently coordinated the earlier mentioned survey of QUT researchers' research data management practices.

The Information Manager does not replace the subject specialist librarians, but adds another top level specialist service. The subject specialist librarians located in the University Library continue to offer the full range of reference services to the research staff and PhD students of their faculties who are also members of IHBI, including one-on-one expert advice sessions, information literacy training and collection building to support research specialisations.

The Information Manager is both a Library staff member and an IHBI staff member, and is funded by a three-way arrangement with the Library, IHBI and the Division of Technology, Information and Learning Support (TILS) all contributing equally.

The IHBI Information Manager is located in the Research Institute. Immersion in the research environment has been key to the success of this role and enabled the Information Manager to develop a deep understanding of researchers' needs and issues. This knowledge is informing future Library-wide and Divisional service innovation.

At the time of establishing both specialist positions the Library was unable to identify any parallel positions in Australian university libraries. The success of these high profile "Trail-blazing" positions has not only assisted the University to meet its research aspirations, but

has had the added benefit of establishing the Library's credentials in the University's research arena to take on new roles in research support, and to be seen to be able to go beyond our existing, well-established roles.

Research Support Plan

Migrating from targeted strategic initiatives to a more comprehensive, sustained and embedded approach to supporting research requires a plan. While the Research Support Plan was initiated and driven by the Library it is not a Library plan, but a Divisional plan. This is because the Library is one of several stakeholders involved with eResearch. The Library is working collaboratively with colleagues from IT Services and, in particular, staff from the High Performance Computing (HPC) team who provide specialist services with data visualisation and computation.

The Research Support Plan has seven key areas:
- Building partnerships;
- Enhancing Divisional support services;
- Developing eResearch support services;
- Developing Library information resources;
- Accessing Library information resources;
- Scholarly communication initiatives, Institutional Repository and RQF support services; and
- Physical facilities for researchers.

The formation of new cross-departmental work teams is a focus of the plan. To date informal groups have worked together to undertake new research support initiatives. The formation of cross-departmental teams establishes a collaborative approach as core ongoing business. One such group is the eResearch Support team which will include the specialist roles of the eResearch Access Coordinator, other Library staff and other HPC and IT Services staff.

Research data management is another key area of the Plan and will see the Library collaborate with IT staff and researchers to develop a University Research Data Management Policy and Plan, support services and infrastructure.

Through this Plan the lessons learnt by the specialist roles will be embedded across our Division with Liaison librarians offering a research support service model aligned with the researchers' life cycle – research assistant, early career researcher, mid-career researchers, and established leading researcher.

The Plan addresses the training needs of Library staff and the training needs of researchers. Training in research data management practices is an obvious area for development by the Division.

Conclusion - What's different - What's the same

As for what's different, librarians, like researchers, are going to have to work in a truly collaborative way with other stakeholders such as IT Staff, university research administrators and researchers. Librarians are going to be *partners* in the research process by being immersed in the various stages of the research process, and through activities such as:
- assisting with the writing of research grant proposals;
- providing advice and support for the management of research data; and
- publishing research output, text and data.

The Library will have shifted from passively providing access to information resources needed for research and supporting researchers in the use of that information, to having input to, and being a critical part of, the research process. We will have expanded our skill sets so we can work closely with IT and research staff in the eResearch/eScience environment.

Applebe and Bannon state that "eResearch support is not a one size fits all ….there is no such thing as eResearch Support In a Box" [Applebe and Bannon, p.84]. Libraries will need to be flexible and changing more quickly than ever before. We must be ready to develop new roles and services and build our skill sets.

Developing new roles and services, while at the same time maintaining existing services, will be a challenge for university libraries. The take up and nature of the eResearch undertaken will vary depending on the discipline. Libraries will need to be able to continue to offer our existing support services in addition to new services.

What's the same? By sharing the lead with others in the support of our universities' eResearch initiatives libraries will be carrying on the tradition of adapting to change and continuing to add value to the scholarly pursuits of our faculty and research staff in whatever form required. The Library will continue to be the trusted service provider that we know our clients perceive us to be.

Thank You

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