Future-proofing: the academic library's role in e-research support

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Abstract

Purpose – The paper describes a project created to enhance e-research support activities within an Australian university, based on environmental scanning of e-research activities and funding both nationally and internationally. Participation by the university library is also described.

Design/methodology/approach – The paper uses a case study that describes the stages of a project undertaken to develop an academic library's capacity to offer e-research support to its institution's research community.

Findings – While the outcomes of the project have been successfully achieved, the work needs to be continued and eventually mainstreamed as core business in order to keep pace with developments in e-research. The continual skilling up of the university's researchers and research support staff in e-research activities is imperative in reaching the goal of becoming a highly competitive research institution.

Research limitations/implications – Although a single case study, the work has been contextualised within the national research agenda.

Practical implications – The paper provides a project model that can adapted within an academic library without external or specialist skills. It is also scalable and can be applied at a divisional or broader level.

Originality/value – The paper highlights the drivers for research investment in Australia and provides a model of how building e-research support activities can leverage this investment and contribute towards successful research activity.

Keywords - Australia, academic libraries, research support, e-research, eResearch, data management, project management

Paper type - Case study

1. Introduction

There is currently a strong push within Australian academic libraries to boost their capacity for offering e-research support. The merging of information and communication technologies (ICTs) with traditional research practices has created a new movement of e-research, which generates new research methods emerging from increasing access to advanced networks, services and tools.

Strong drivers for government investment in research have been highlighted in the influential "Cutler Report" (Australian Government, 2008), drivers to which the Australian government has recently responded with significant investment in the building of collaborative research infrastructure. The Queensland University of Technology (QUT) in Brisbane, Australia, is responding to this demonstrated support from the federal government by aspiring to lead in the development and delivery of e-research support services that logically evolve from the proliferation of e-research activities.

Thus, QUT's Division of Technology, Information and Learning Support (TILS) embarked on the *Building eResearch Support Capabilities and Capacity* project, which aimed to develop a strong understanding of QUT research needs upon which to build new and effective support services in e-research. This paper is a case study of the project and how QUT's division of TILS, which includes QUT Library, is readying itself to support a new wave of e-research.

2. What is e-research?

Traditional research practices at universities are evolving with the successful incorporation of ICTs. This is a movement more commonly known as e-research. QUT recognises the definition of e-research defined by the Department of Education, Employment and Workplace Relations as "research activities that use a spectrum of advanced information and communication technologies and that embrace new research methodologies emerging from increasing access to advanced networks, services and tools" (Department of Education, Employment and Workplace Relations, 2006).

In the education and research sectors, e-research as commonplace practice is growing both locally and internationally. In particular, as the capacity and portability of ICTs continues to grow, and as research projects become more sophisticated and ambitious in terms of data collection and sample size, the importance of good research data management practices has been brought to the forefront.

E-research can incorporate the following types of activities, systems and services:

- **Collaborative technologies** – these are technologies that facilitate communication and collaboration between researchers regardless of location and include:
    - video-, tele- and web-conferencing technologies
    - instant messaging
    - wikis
    - social bookmarking
    - Sharepoint/Google Groups
    - websites
    - content management systems
    - online workflow tools

- **Research data management** - research data refers to the data that is generated or collected to be used as primary sources in the production of original research and would be required to validate or replicate research findings (Callan et al, 2009). It can be classified according to the processes used to gather or generate it and includes:
    - experimental data generated by lab equipment
    - computational/simulation data generated from computation models
    - observational data of specific phenomena at a specific time or location
    - derived data produced via the processing or combining of other data (e.g. data mining)
    - canonical data extracted from reference datasets
    - data storage solutions
    - data curation

- **Scholarly communication** – this is the distribution of knowledge which is becoming more effective due to advances in technology, and includes:
    - scholarly publishing practices
    - electronic publishing
    - calculating research impact
    - institutional repositories (preferably open access)
    - Creative Commons[i]

- the legalities and management of copyright
- referencing software (such as EndNote, RefWorks and Zotero)

- **Computation** – the increasingly immense processing power of computers is decreasing the limitations on computational processes in research activities, and computation includes:
  - programming support
  - code optimization
  - supercomputing

- **Visualisation –** this is the visual representation of data for analysis or simulation, and from which to identify patterns in datasets. It has a wide range of applications such as:
  - comparing relationships between datasets
  - tracking data over a period of time
  - analysing text

- **Data collection and analysis** – good research begins with quality design which incorporates choosing an appropriate research methodology and designing suitable data gathering and data analysis techniques. Factors to be considered in this process include:
  - qualitative and quantitative data analysis
  - data mining to retrieve information that may otherwise have been missed
  - being skilled in supported software
  - using mash-ups to create meaningful information

In Australia, the federal government has supported the development of e-research since 2004 through its National Collaborative Research Infrastructure Strategy (NCRIS)[ii] and the associated National eResearch Architecture Taskforce (NeAT)[iii], Australian Access Federation (AAF)[iv], Australian Research Collaboration Service (ARCS)[v], and the Australian National Data Service (ANDS)[vi].

2.1. Funding e-research in Australia

The Australian government's reaction to the 2008 global financial crisis was to "stimulate" the Australian economy. The resulting rescue stimulus package involved diverse measures including targeted bonus payments to citizens, measures to create sustained employment and a "crucial boost" of $2.7 billion into tertiary education, research and innovation (Australian Government, 2009).

The influential "Cutler Report", entitled *Venturous Australia: building strength in innovation* (Australian Government, 2008) highlights the following issues as drivers for investment in research in Australia:

- Australia is falling behind developed and emerging economies in its commitment to investment in research

- Australia - representing only 2 percent of the world's knowledge-generating capacity - needs to recognise the importance of international collaboration in increasing the impact of Australian research internationally

- There are *financial* and *structural* problems with the current public research funding system in Australia, with insufficient resources and few incentives for collaboration. Much money is spent duplicating basic infrastructure and expertise, rather than adding new research capacity

- Providing, operating, accessing and maintaining high quality research infrastructure is of critical importance, as this drives collaboration and enhances the quality of research by avoiding underutilised equipment and experts.

The Australian government has heeded the Cutler Report and recognised the growth in research activities worldwide by recently channeling a significant portion of funding into research and research infrastructure, including $527 million allocated to NCRIS. The government's Education Investment Fund (EIF) has allocated $48 million to ANDS to build an Australian Research Data Commons (ANDS, 2008) and ARCS has also received millions of dollars to build and deliver collaborative infrastructure to the Australian research sector (ARCS, 2009).

The government has recently reported on the progress of this work to date, and announced a commitment of $9.6 billion to be invested in research from 2008 – 2012, a significant jump on research spending from the previous four year period from 2004 – 2008 (Gillard and Carr, 2010). This investment indicates Australia's dedication to enhance its research activities through building useful research infrastructure while simultaneously attempting to attract good researchers and increase quality research exports.

3. Supporting e-research at the Queensland University of Technology

Buoyed by this investment from the highest level of government, the Queensland University of Technology (QUT) in Brisbane, Australia, aspires to lead in the development and delivery of e-research support services. Additional factors indicating QUT's readiness to commit to this undertaking include that it is:

- a centralised university with the disposition and readiness to succeed now
- home to the OAKLaw[vii] (Open Access Knowledge) and Microsoft QUT eResearch[viii] Centres
- home to CAMBIA[ix]
- home to respected research institutes including the flagship Institute of Health and Biomedical Innovation (IHBI)[x]
- a leading institution in Creative Commons Australia
- a leader in the open access movement with QUT ePrints[xi]
- able to build upon a mature High Performance Computing (HPC) service with expertise in data visualisation and data analysis
- able to leverage the valuable skills of liaison and reference librarians
- able to build upon existing and developing e-research infrastructure, including: eStore (institutional digital storage), MediaFlux, Drupal, Confluence Wiki, Sharepoint, Access Grid and EVO – (EVO is high quality web-conferencing technology, similar to Skype, that has been developed by ARCS)
- currently endorsing a draft research data management policy

With these factors, QUT is in a good position to develop effective services in support of e-research. QUT's Division of Research and Commercialisation[xii] has long played a key role in supporting researchers in their delivery of research solutions to real world problems, and to complement this good work, the university's Division of Technology, Information and Learning Support (TILS) has embarked upon the *Building eResearch Support Capability and Capacity* project, in which divisional member QUT Library, is playing an intrinsic role.

3.1. The *Building eResearch Support Capabilities and Capacity* project at QUT

The *Building eResearch Support Capabilities and Capacity* project carries on with prior work carried out by TILS in 2008, in partnership with other Australian universities, which investigated the e-research support needs of researchers (Henty et al, 2008). Significant findings from this report were that:

- most researchers have no data management plan in place

- a significant proportion store their research data on unsustainable media such as USB sticks, CDs or DVDs, and
- there is a lack of understanding about data ownership and length of data retention

These alarming findings, hand in hand with the need for QUT researchers and research support staff to develop their e-research skills, highlighted the need for a more intense focus on e-research support at QUT. Hence the *Building eResearch Support Capabilities and Capacity* project was created.

3.1.1. Project stakeholders

The two main stakeholders of the project are:

- **QUT researchers** - these include all research staff at all levels and PhD students

- **TILS staff with responsibilities in e-research support** – these include liaison librarians, reference librarians, service point staff and High Performance Computing staff who provide support to QUT researchers on a regular basis

3.1.2. Project objectives

The main objectives of the project are to:

- develop data management systems and procedures at QUT
- develop a greater understanding of researcher needs upon which to build new and effective e-research support services

Three separate working parties, each consisting of TILS staff have been established to pursue the project objectives. Working Party One has created the *Guidelines for the Management of Research Data at QUT* document, (Callan et al, 2009), the purpose of which is for researchers and research support staff to benefit from the availability of guidelines for good data management practice and planning. Working Party Two has developed e-research training programs for TILS staff and QUT researchers in order to build their e-research skills and knowledge. In 2010, these training programs will be based on the findings of online surveys that were sent out to each main stakeholder group in 2009, testing understanding and knowledge of key e-research concepts and technologies. Working Party Three developed a research support website which has been built and completed as part of the project (Division of Technology Information and Learning Support, 2009b).

Longer term objectives of the project include:

- the implementation of a Research Data Management Support team within HPC
- to centralise and operationalise research data management infrastructure (MediaFlux) in collaboration with ANDS, and
- to seed the ANDS Research Data Australia catalogue with metadata about QUT datasets

These objectives will eventually be realised with workforce planning and the tested establishment of MediaFlux. A related project, *NCRIS–ANDS Research Datasets and Metadata*, has also been established within TILS with two Data Librarians employed to carry out the seeding of the ANDS catalogue with metadata about QUT datasets. TILS has provided the majority of funding for these projects with a significant proportion of funding being successfully sourced from ANDS.

3.1.3. Developing data management systems and procedures

The document *Guidelines for the Management of Research Data at QUT*, created by Working Party One, is an outcome of the project that contributes to the establishment of data management systems and procedures. The Guidelines observe the *Australian Code for the Responsible Conduct of Research* (National Health and Medical Research Council, 2007) which describes responsible research practices and clearly indicates that researchers have a responsibility to manage their research data effectively.

As some data is impossible to collect again (e.g. earth movements and weather patterns) the Guidelines recognise that research data is a valuable product, not simply a byproduct, of the research process. It espouses that by having good data management practices in place, researchers can:

- meet any obligations regarding data retention by guarding against the catastrophe of data loss
- strengthen research integrity by enabling the tracking of data from collection to results
- enhance the usefulness of their data to other researchers if their data is able to be shared, reused or published.

The Guidelines are accompanied by a data management checklist (Division of Technology Information and Learning Support, 2009a) for researchers to complete prior to undertaking their research and to be revisited during the course of their research. The checklist prompts researchers to consider how they will handle any pre-existing data to be used and any new data to be collected or generated in terms of:

- data ownership, copyright and intellectual property
- digital data storage
- confidentiality and privacy requirements
- file formats to be used
- volume of data
- metadata and naming conventions
- retention periods
- post-project storage, access and re-use

A QUT data management policy (QUT, 2009a) is also in the process of being approved, which will mandate that all QUT research data are considered to be university records and must be stored, disposed of or transferred in accordance with the QUT records management policy (QUT, 2009b). It will also mandate that research data should generally be made available, via open access, for use by other researchers unless a specific and valid reason exists for not doing so.

With the creation of the Guidelines, checklist and policy, a supportive environment in which QUT researchers can develop effective data management habits has been fostered.

3.1.4. Understanding researcher needs to build effective e-research support services

Working Party Two developed training programs to provide current awareness and to upskill TILS staff and QUT researchers in e-research developments. Some of the activities included in the 2009 training programs included:

- Managing your Research Data
- EVO and Other Research Collaboration Tools
- Navigating the Patent Literature: Using PatentLens
- Principles of Managing Research Data, The Australian Code of conduct for Responsible Research and the Research Cycle
- Intellectual Property Issues and Research
- Using the online survey tool Key Survey, for research
- Australian Access Federation – an overview

In 2009, these activities were delivered by staff already skilled in these areas. Many of these activities overlapped, with members from each stakeholder group often attending the same activity.

3.1.4.1. Understanding e-research needs via skills audits

In 2010, the training programs will be based upon the results of skills audits that were carried out in 2009 on TILS staff and QUT researchers. These audits were developed to identify gaps in e-research knowledge and skills and reveal a robust pool of e-research needs from which to develop the training programs.

The skills audits took the form of online surveys and focus groups and the types of e-research skills that were audited included an awareness or use of:

- scholarly communication practices
- collaborative technologies
- data management practices
- data collection and analysis
- data sharing and re-use
- visualization
- computation
- research infrastructure and high performance computing
- Australian research agencies and institutions

Responses were recorded on a Likert scale ranging from *No Knowledge/Not Applicable* to *Advanced Skill/Expert*. Free text responses were also solicited regarding the top three e-research skills that respondents individually felt were most needed. Preliminary findings have revealed that:

- TILS staff have a general awareness of the e-research skills and knowledge surveyed, but feel their actual skills are quite low across all the areas
- Researchers list training as their preferred method of knowledge transfer, yet indicate that if they are not aware of the benefits of a particular skill, they would not be interested in attending training
- Knowledge of research data management is a priority skill area for TILS staff
- Statistical and qualitative data analysis is a priority skill area for QUT researchers
- Both groups reveal a need for training and awareness-raising in relation to copyright and the legal issues surrounding data management and publishing

As mentioned, findings from the audits will be synthesised and implemented into the development of the 2010 training programs for both stakeholder groups. A comprehensive report on the skills audit process will also be published later in 2010.

3.1.5.   The TILS Research Support website

As part of the project, the TILS Research Support website has been created by Working Party Three where resources such as training materials and instructional videos on e-research can be uploaded, accessed and shared (http://www.tils.qut.edu.au/initiatives/researchsupport/index.jsp).

In developing the site, QUT's existing websites that provide research support were trawled, evaluated and integrated as appropriate with the purpose of the providing researchers with a more seamless e-research support service. The TILS Research Support website has gone live but will subject to continual improvement.

3.1.6. Outcomes of the project

The work undertaken in the *Building eResearch Support Capabilities and Capacity* project will continue in 2010, particularly regarding the ongoing implementation of data management systems and procedures, the delivery of the e-research training programs and the continued monitoring of the TILS Research Support website.

With the *Guidelines for the Management of Research Data at QUT* document and data management checklist complete and live on the Web, and with the QUT research data management policy soon expected to be endorsed, a solid foundation has been laid in which QUT researchers can develop expert skills in research data management. The 2010 training programs for TILS staff and QUT researchers will also be delivered, targeting the knowledge and skills that were revealed by the 2009 skills audits. Additionally, with researchers indicating that they prefer hands-on training when learning a new skill, but also needing to know the benefits of attending due to being time-poor, efforts will be made to ensure the training programs are precisely targeted with clear benefits at the point-of-need.

The Research Support website is live and will be continually updated with information about new and emerging e-research activities and technologies. Where appropriate, it will be linked to other QUT websites which contain information about research support services. Efforts will be made to ensure it is a dynamic website with interesting and interactive content.

Some of the project outcomes will come to fruition in the longer term. The Data Librarians working on the NCRIS-ANDS project are soon expected to seed the ANDS catalogue with metadata about QUT datasets, as the configuring of the MediaFlux infrastructure to enable this seeding is on target for completion in mid-2010.

To cease carrying on with the work of the project would hinder the building of e-research support capabilities and capacity at QUT, which has begun well. With favourable resourcing and funding conditions, it is anticipated that by 2012 TILS will have created and mainstreamed new e-research support services as core business.

4. The future of e-research support at QUT

In order to establish a desired lead in the development and delivery of e-research support services, TILS will monitor advances in e-research activities both nationally and internationally and develop support services at QUT accordingly. It is anticipated that future services will include:

- The growth of a research data management support team within QUT Library and HPC
- The enhancement of QUT ePrints to incorporate a dataset repository
- Customised training for TILS staff and researchers
- Enhancing services to early career researchers including support for writing

Fostering partnerships is another priority area. TILS encourage their staff to collaborate, share information and communicate with a range of external stakeholders for the purposes of learning, benchmarking and good practice. Collaboration is already occurring with ANDS on the NCRIS-ANDS project, and with Monash University and Griffith University in discussions on infrastructure and metadata. Internally, TILS plans to partner more with QUT's Division of Research and Commercialisation in providing a more streamlined research support service across the wider QUT community.

However, ambitions for research support are reliant on sufficient funding and staffing. As newly emerging e-research practices increasingly harness resources and services offered by academic libraries, these libraries are compelled to rethink their workforce planning and service delivery models

to incorporate these new practices. QUT Library is currently rolling out its workforce plan which strongly reflects QUT's e-research agenda; positions with responsibilities in research support are a priority area for development. Dependent on the success of current project roles such as the Data Librarians and the currently trialed Research Support Librarian, such roles may become a permanent fixture in the QUT Library landscape. There is also scope for Liaison librarians to specialise in research support.

5. Conclusion

With the increased capability and capacity of ICTs finding new roles in research, e-research activities are ramping up in universities worldwide. It is important that services in support of e-research expand simultaneously to guard against problems that may arise such as data loss, mismanagement of copyright and prevention of data re-use.

With the Australian government's recent and substantial funding into the research sector, universities are presented with an opportunity to leverage their ability to attract researchers, increase research quality and build effective and useful services in support of research. QUT's division of TILS has embarked upon this journey of offering a cutting edge e-research support service in support of QUT's aspirations to become a highly competitive research institution. Furthermore, the continued work of the *Building eResearch Support Capabilities and Capacity* project builds TILS' potential to play a leading role in the e-research support agenda, not only within the QUT, but also within the national and international academic library sector.

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Notes

[i] [More about Creative Commons Australia is available at http://www.creativecommons.org.au/]

[ii] [More about NCRIS is available at http://ncris.innovation.gov.au/Pages/default.aspx]

[iii] [More about NeAT is available at https://www.pfc.org.au/bin/view/Main/NeAT]

[iv] [More about the AAF is available at http://www.aaf.edu.au/]

[v] [More about ARCS is available at http://www.arcs.org.au/]

[vi] [More about ANDS is available at http://ands.org.au/]

[vii] [More about the OAKLaw project is available at http://www.oaklist.qut.edu.au/]

[viii] [More about the Microsoft QUT eResearch Centre is available at http://www.mquter.qut.edu.au/]

[ix] [More about Cambia is available at http://www.cambia.org/daisy/cambia/home.html]

[x] [More about the Institute of Health and Biomedical Innovation is available at http://www.ihbi.qut.edu.au/]

[xi] [More about QUT ePrints is available at http://eprints.qut.edu.au/]

[xii] [More about QUT's Division of Research and Commercialisation is available at http://www.resacom.qut.edu.au/]

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