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# COORDINATED RESEARCH SUPPORT SERVICES AT QUEENSLAND UNIVERSITY OF TECHNOLOGY, AUSTRALIA

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#### Abstract

Queensland University of Technology (QUT) is a large multidisciplinary university located in Brisbane, Queensland, Australia. QUT is increasing its research focus and is developing its research support services. It has adopted a model of collaboration between the Library, High Performance Computing and Research Support (HPC) and more broadly with Information Technology Services (ITS).

Research support services provided by the Library include the provision of information resources and discovery services, bibliographic management software, assistance with publishing (publishing strategies, identifying high impact journals, dealing with publishers and the peer review process), citation analysis and calculating authors' H Index. Research data management services are being developed by the Library and HPC working in collaboration.

The HPC group within ITS supports research computing infrastructure, research development and engagement activities, researcher consultation, high speed computation and data storage systems , 2D/ 3D (immersive) visualisation tools, parallelisation and optimization of research codes, statistics/ data modeling training and support (both qualitative and quantitative) and support for the university's central Access Grid collaboration facility. Development and engagement activities include participation in research grants and papers, student supervision and internships and the sponsorship, incubation and adoption of new computing technologies for research. ITS also provides other services that support research including ICT training, research infrastructure (networking, data storage, federated access and authorization, virtualization) and corporate systems for research administration.

Seminars and workshops are offered to increase awareness and uptake of new and existing services. A series of online surveys on eResearch practices and skills and a number of focus groups was conducted to better inform the development of research support services.

Progress towards the provision of research support is described within the context organizational frameworks; resourcing; infrastructure; integration; collaboration; change management; engagement; awareness and skills; new services; and leadership.

Challenges to be addressed include the need to redeploy existing operational resources toward new research support services, supporting a rapidly growing research profile across the university, the growing need for the use and support of IT in research programs, finding capacity to address the diverse research support needs across the disciplines, operationalising new research support services following their implementation in project mode, embedding new specialist staff roles, cross-skilling Liaison Librarians, and ensuring continued collaboration between stakeholders.

#### Keywords

research support, escience, e-science, e-research, eresearch, cyber-infrastructure

# Introduction

Queensland University of Technology (QUT) is a large multidisciplinary university located in Brisbane, Queensland, Australia. The University is increasing its research capacity and features seven faculties and four research institutes, including its flagship, the Institute of Health and Biomedical Innovation (IHBI). QUT is also home to a number of initiatives, which together, strengthen its eresearch capacity. These include the Open Access Law (OAKLaw) initiative and the OakList Database, the Microsoft/QUT eResearch Centre, CAMBIA, and the Australian Access Federation (AAF). QUT is also a leading institution in Creative Commons Australia.

QUT has recognized the need to develop its research support services in parallel to its growth in research. Stokker (2008) provided an account of the need for the provision of access and support for eresearch activities and the frameworks being developed to address these needs at QUT. Young and Young (2008) presented a model for a coordinated university research support model and Borchert and Young (2009) reported on the progress of this work. This paper updates QUT's progress and includes a description of a wider range of research support services, incorporating those provided by the High Performance Computing group within Information Technology Services (ITS) integrated with Library services.

A discussion follows of the organizational frameworks being developed. Finally an account is given of the issues and challenges encountered, with suggestions made to the future.

# **Research support services**

#### Awareness and skills training

The provision of awareness and training programs promoting the use of research support services is a priority.

A Research Support web site (<u>http://www.tils.qut.edu.au/initiatives/researchsupport/index.jsp</u>) was developed in 2009 which brings together the relevant services from the Library, ITS and HPC. It also links to the University's Research web site (<u>http://www.qut.edu.au/research/</u>), which includes information from the Research Students Centre and the Office of Research (Division of Research and Commercialisation). This site provides information on a broad range of research support activities covered in this paper. It also provides a Wiki for QUT researchers and HDR students (QUT only at this time) to access resources used in seminars and workshops, to promote sharing and self-paced learning. The Research Skills Seminars and Workshops page provides a range of training opportunities for which researchers and HDR students can register online. Workshop and seminar topics include:

- Managing research data
- Accessing external research datasets
- Open access publishing
- Measuring impact using bibliometric tools
- Managing research related copyright issues
- Technologies for research collaboration
- Navigating the patent literature

- TechWatch researchers talk about their use of technologies in research
- Information discovery, database searching
- EndNote training
- IT skills training (Microsoft suite)
- High Performance Computing Services
- Quantitative and qualitative data analysis
- Online surveys using KeySurvey

In 2010 the Deputy Vice Chancellor (Technology, Information and Learning Support) and the Deputy Vice Chancellor (Research) introduced the *Making connections – innovation in research at QUT* seminar series which brought together a range of prominent researchers to talk about their use of eresearch technologies.

The HPC group provides training in quantitative statistics and the use of associated software packages. These offerings have been expanded to include training in qualitative data analysis and data mining (during 2009, 30 training workshops were conducted with more than 250 researchers attending). The group has recently established a university-wide on-line survey service. Introductory and intermediate training courses are now run throughout the year (during 2009, 15 workshops with over 80 participants).

The Library also teaches the IFN001: Advanced Information Retrieval Online course which is a requirement for candidature of PhD students at QUT. It is taught in both face-to-face workshop mode to on-campus students and online to remote students and covers a broad range of skills for information searching, keeping current and writing literature reviews. The HPC group delivers formal PhD and Masters level training through associate supervision activities and ongoing, informal research training is provided through continual engagement with, and support of, PhD and other research projects.

The Research Students Centre (Division of Research and Commercialisation) provides a range of training workshops also and topics include:

- Supervisor solutions
- Project management
- Writing abstracts
- Writing a literature review

- Managing your intellectual property
  Presentation skills
- Writing abstracts

#### Research data management

Since 2004, the Australian Government has announced a range of research support initiatives including the Platforms for Collaboration investment plan, National Collaborative Research Infrastructure Strategy, the Education Investment Fund, National eResearch Architecture Taskforce (NeAT), Australian National Data Services (ANDS), the Australian Research Collaboration Service (ARCS), and the Australian Access Federation (AAF). Together these have been tasked with providing the political environment, funding, infrastructure and support for the development of eresearch environments within Australia, and including universities.

A focus has been placed on the development of research data management frameworks provided by ANDS and including the Research Data Australia, Publish My Data, Register My Data, and Identify My Data services. These services are being implemented in the recognition of research data as a valuable product of research (and not just a by-product of the research process resulting in the publication of a book, conference paper or journal article), the need to share and reuse data to leverage greater value from research investments, to speed up the research cycle, and to provide public access to the datasets funded from public money. The NHMRC has published the Australian Code for Responsible Conduct of Research which has been a major policy driver and includes a section on institutional responsibilities for policy and frameworks around data issues.

One of the first tasks embarked upon at QUT in the area was the development of a University policy for the Management of Research Data (<u>http://www.mopp.qut.edu.au/D/D\_02\_08.jsp</u>) which was led by the Library and in collaboration with stakeholders from the Office of Research, Research Students Centre, Office of Commercialisation, University Copyright Officer, High Performance Computing and other ITS areas, and University lawyers. This policy pulled out and expanded upon a former section of the QUT Code of Conduct for Research, and hence giving the issue more prominence. Features of the policy include a description of good practices related to ownership of data, storage and backup, data formats, documentation and metadata, privacy and confidentiality, retention and disposal, and access and re-use of metadata. The policy also *mandates* the use of the data management checklist and secure storage of data on either faculty or centrally provided infrastructure.

In support of the policy above, Guidelines for the management of research data at QUT (<u>http://www.tils.qut.edu.au/initiatives/researchsupport/datamanage/planning.jsp</u>) were developed which provide considerably more information surrounding good practices. The web site also provides a Data Management Checklist which researchers and HDR students can use to develop a data management plan for their research projects.

QUT has developed a partnership with ANDS which has granted QUT project funding based on numerous successful funding proposals. Projects include Seeding the Commons, Data Capture, and participation in the development of a sharable Metadata Hub system in collaboration with Griffith University.

The Seeding the Commons project has seen the employment of two new Data Librarians. These positions were filled by two experienced Liaison Librarians whom were selected for their interest in research activities, willingness to explore and develop new services, their well developed technical ability, and also for their interpersonal skills and well developed connections with QUT researchers. QUT's strategy was to identify its research projects funded by the Australian Research Council (ARC) and the National Health and Medical Research Council (NHMRC) under the Australian Competitive Grants Register (Category 1) for Australian Government research institutions. The choice of Category 1 (government funded) grants for the project was important because it removed many of the barriers to sharing data that would be expected to come with the inclusion of commercially funded projects under contract.

The Data Librarians worked with the Office of Research to download a list of ARC and NHMRC Category 1 research activities from the University's Research Activity Database. They then assessed what they knew about each research project in terms of progress, outputs and the likely receptiveness of each researcher to the project based on their professional relationship.

The next step was to become familiar with the Registry Interchange Format - Collections and Services (RIF-CS) metadata schema developed and recommendation by ANDS and use the fields in this schema to frame the development of the data interview methodology. The Data Librarians developed the methodology incorporating elements of prior investigation into the researcher, their prior work and the research project being described, a series of questions covering the research activity, party, collections (datasets) and services (these are the RIF-CS record types) used in Research Data Australia. The Data Librarians contacted QUT's researchers by phone and email to arrange data interviews in order to obtain additional information about collections (datasets) in particular. At the time of writing this paper, data interviews had been conducted for about 200+ of the 570 research activities included in the project scope. Additional objectives of the project included contributing QUT's RIF-CS records to QUT Research Data Repository (see below) and then contributing what would be a subset of suitable records to the Research Data Australia service. Links would be made between records available in these data repositories to the relevant records in QUT ePrints, which is the University's institutional repository of published research outputs. QUT will probably expand on this activity in a subsequent paper.

The *Data Capture* project was still in the scoping and negotiation stage at the time of writing this paper, and is led by the HPC team. It includes partnering with a number of prominent QUT researchers to ascertain the viability of developing software to interface a variety of super science (sensor) machines to automatically capture metadata feeds and deliver this metadata to Research Data Australia. A variety of research projects are being selected to provide diversity to the types of data available. Software deliverables will be made available via open source. It is probable QUT will expand on this activity in a subsequent paper.

The *Metadata Hub* project is led by Griffith University and is charged with developing or implementing a middleware software solution to be made available via open source, which will aggregate numerous data sources from within the University (including the data repository,

research activity database, human resource systems etc) and allow for interfacing with Research Data Australia.

Finally, within the research data management area, QUT has selected the Arcitecta Mediaflux digital asset management system, Microsoft SharePoint, Confluence Wiki and SAN tiered storage (eStore) systems on which to develop its *Research Data Repository* services. The repository is being developed to support the RIF-CS metadata schema and will work via the Metadata Hub to deliver selected QUT data records to the Research Data Australia service. It is envisaged that QUT's data repository will support multiple access levels as appropriate for each collection record – project team access only, QUT access only, and a public interface to suitable publically accessible records. It will be a centralized repository of metadata records about QUT's datasets and will support a distributed model for the storage of the actual datasets – whether on faculty, institutive or centrally supported storage facilities. The ITS Infrastructure Services group has also implemented eStore – a university-wide tiered SAN storage solution. A challenge facing the university will be to resource eStore to meet the growing research data storage requirements. The Mediaflux repository is in development and makes use of eStore.

#### Publishing strategy

The choice of journals and conferences that QUT authors choose to submit papers to for publication has a direct effect on the impact and reputation of QUT's research. The service is available to all researchers, but is specifically targeted at early career researchers and HDR students who may not be as aware of the differences between publications, or whom may need advice on how to select high impact sources. The Library's Research Support Team and Liaison Librarians provide advice based on journal rankings obtained from Elsevier's Scopus Journal Analyzer and Thomson Reuter's Journal Citation Reports services and also from the Ranked Journal Lists and Conference Lists provided for the Excellence in Research for Australia (ERA) exercise managed by the Australian Research Council.

Librarians also advise researchers of the suitability of true gold road open access publishers supported by the Library. The Library uses the QUT Library Resource Allocation to pay authors' publication fees for articles accepted by BioMedCentral (BMC), Public Library of Science (PLoS), and Hindawi publishers. QUT is careful to distinguish true open access publishers from the "double dipper" publishers which use open access as a means to charge both authors to publish and libraries to subscribe to the same materials.

#### QUT ePrints

The operation and success of QUT ePrints has already been well documented by Cochrane & Callan (2007), and Callan (2007). QUT ePrints now features over 23,000 records and 13,000 fulltext versions available via open access. QUT ePrints was recently ranked 22 out of 666 repositories worldwide and the top ranked Australian institutional repository by the 2010 Webometrics survey. The service is popular with QUT researchers, many of whom have come to value the download statistics by author service.

#### Bibliographic citation reports

The Research Support Librarians and Liaison Librarians offer researchers a bibliographic citation report service using report data about individual researchers' research outputs obtained from the Elsevier Scopus and Thomson Reuters Web of Science databases.

Whereas researchers are currently required to request a report, the Library is moving towards scoping and implementing a more systematic and regular reporting service to be provided to Faculty Deans of Research and Directors of Institutes which will provide citation data for each individual from each faculty or institution, and an aggregated management report for the faculty or institute as a whole. It is expected these will be provided on a standard template and will be useful management tools for research executives.

#### Information discovery and access

QUT Library's collections are supported by a sizable Library Resources Allocation of about A\$10 million in 2010, of which about 80% is expended on electronic resources. The Library buys most of the large publisher databases and is currently replacing its print journal backset holdings with online backsets. There are 75,000 ejournal titles in total, including duplicate titles across various platforms. The Library is expanding its ebook collection across a widening range of publisher platforms and has found success with the EBook Library (EBL) patron-driven selection model.

The Library's homepage now features "Quick Search" which is a recent implementation of the Serial Solutions *Summon* single-search product. This replaced 360 Search in 2010, and significantly lowers the barrier to easier searching across a very wide range of information resources, while providing improved search results. At last the Library's hundreds of online publisher collections can be access as a single digital collection. An Open URL Resolver and Proxy service provide for easier connections to fulltext and from off-campus respectively. The University pays for all Internet access to Library resources.

Document delivery services are provided to all staff and HDR students free of charge. The increasing depth and quality of the Library's online collections have led to a decrease in demand for document delivery.

The Library will soon join the BONUS book lending consortium in Australia which provides unmediated client-side requests from QUT students and staff of books held in other consortium member libraries. The Library is also anticipating the imminent availability of Print on Demand (POD) services from library book supply vendors in Australia, which, because of fast delivery time, is expected to partially replace the document delivery services for books.

#### Reference management software

EndNote and EndNote Web training is available in face-face-mode from Library staff. ITS also provides MS Word training for HDR students in preparation for writing their thesis, and this also includes an element of EndNote training. The University has a site license for EndNote. Students and staff can download the software, register for training events, and access online help and FAQs from the Library web site.

#### Online collaborative technologies

The QUT Access Grid Node provides high-end videoconference and collaboration facilities suited to large scale distributed meetings, seminars, or lectures. The HPC group runs this facility and also provides advice to faculties wishing to establish local Access Grid facilities.

Enabling Virtual Organisations (EVO) software is provided to the University by ARCS under a national site license for the purpose of research. It is downloadable videoconference software, not unlike Skype, but more powerful and better suited to a greater number of online participants. The system displays thumbnails of participants on the screen which are enlarged when participants speak. Files and presentations can be displayed. Online meetings can be booked, and users can set up online groups. Uptake of the service has been gradual and it likely needs more promotion. Researchers who have seen it, like it, and may use it for internal or external collaborations.

The ARCS Data Fabric allows researchers to store up to 25GB of research data on the national network free of charge, upon application. The service is designed to facilitate the sharing, replication, transfer and re-use of research data. The ARCS OPeNDAP Network is a series of servers allowing researchers and data providers to serve datasets through the web.

QUT has a site license for Microsoft SharePoint which is a portal product designed to support groups with online meetings, discussions, and information and document sharing.

Confluence Wiki is used as a simple repository system to share files.

Google Groups, Google Docs, and a range of popular social bookmarking and tagging tools such as Delicious, Connotea and CiteULike are also supported.

Supported instant messaging and videoconferencing tools include Windows Live Messenger, Yahoo7 Messenger, ICQ (chat), Trillian and Skype.

#### Online survey tool

The HPC group manages a University site license for the WorldApp KeySurvey online survey tool. Students and staff can request an account. Advice and training is provided and recommended. The system is extensively featured and easy to use and provides a platform for the development and delivery of sophisticated online surveys. It provides the researcher with a range of useful data (response) aggregation, analysis and presentation tools. Uptake of the service has increased rapidly and a fulltime staff member now supports the service.

#### Data analysis services

A range of data analysis services is provided by the HPC group including quantitative and qualitative analysis and data mining. HPC data analysis consultants are available to assist researchers and HDR students using data analysis tools including SPSS, Nvivo and Leximancer. HPC staff can also assist researchers to identify complex or hidden data patterns from datasets. A common issue with data services is that HDR students in particular engage with the range of services once they have already designed and begun their research and data collection process, or even once at the data analysis stage, rather than consulting HPC at the start of the project. For this reason, the HPC partners with the Research Students Centre to promote these services to HDR students very early in their research program.

#### Scientific Computation and Visualisation

The growth in eresearch has seen an ever increasing reliance on supercomputing and visualisation resources (e.g. in 2009, QUT's computational cluster was doubled in size – this capacity increase is now saturated and another substantial upgrade over 2010/ 2011 will take place). Researchers and HDR students have access to a range of supercomputing and visualisation services for the purpose of dealing with very large datasets and high demand computation. QUT's supercomputer facilities are available, as are those of the Queensland Cyber Infrastructure Foundation (QCIF), a consortium of local universities, and also the national supercomputing facility located at the Australian National University in Canberra. Optimisation and parallelisation techniques increase the efficiency of programs to compute programs across large datasets and using available computing power. The HPC group also provides scientific visualisation services, which allows research outputs to be represented visually. A <u>visualisation laboratory</u> is available for researchers with advanced graphics workstations, immersive visualisation capabilities and 2D/ 3D digitization facilities.

Currently, the HPC group is actively working with research groups to explore the adoption of newer technologies in this area. In the computation area, hybrid/ heterogeneous computation is being explored (the use of GPUs and/ or FPGAs). These have the potential to dramatically speed-up research codes. Recently, the HPC group has also built an Optiportal (also known as

Optiputer or Visualisation Wall), a scalable multi-screen system which allows very high resolution images to be viewed in full at individual pixel resolution. Outputs from large simulations and 3D models can also be viewed in detail.

#### Research Infrastructure

The ITS Infrastructure group provides university-wide networking infrastructure along with specialised networking services to a growing range of research facilities located off campus (around Brisbane and the state, interstate and international). The group is developing virtualisation services, particularly virtual systems that can be provided to research teams to test and develop software for example. QUT is leading the AAF (<u>http://www.aaf.edu.au/</u>) which will provide easy, authenticated access to remote research resources.

#### University Research Management and Information Systems

The ITS Enterprise Information Services (EIS) group provide and support a wide range of corporate information systems. They work collaboratively with the Office of Research to integrate/ develop research support systems such as RAD (Research Activity Database), PORTIA (POstgraduate Research Training Information Assistant) and ResearchMaster.

## **Organisational frameworks**

Advocacy for the use of research (and eresearch) methodologies and technologies is vital to increasing awareness and uptake of new research methods and technologies. The Deputy Vice Chancellor (Research) and Deputy Vice Chancellor (Technology, Information and Learning Support) are very active advocates. The University has established the Research and Innovation Committee and University Academic Board to set strategic directions. The eResearch Working Party brings a number of researchers and support staff together to discuss and plan awareness strategies and events.

The Division of Technology, Information and Learning Support of which the Library and ITS (including HPC) are departments, also has a Research Support Committee to oversee research support coordination and integration across the Division and to make recommendations on new research support projects and services.

The Library, ITS and HPC have been working towards providing coordinated services for some time, and are now working more closely with the Research Students Centre and the Office of Research (Division of Research and Commercialisation) to provide a more holistic and integrated approach to the provision of services. This sort of coordination and integration makes it easier for researchers, and new higher degree research (HDR) students to discover and take advantage of the support services.

A Research Support Action Plan 2010-2012 is now a second generation plan and it combines strategic action initiatives from the Library, HPC and ITS into one document. Key activities for the current three year period include the development of research data management services and infrastructure, faculty and institute bibliometric citation reporting, refreshing of the QUT Digital Repository including QUT ePrints, increased availability of a wider range of research skills training opportunities, and improved integration and online presence.

QUT's approach to organisational structure has been to retain traditional structures, and promote collaborations across departments to bring staff and expertise together to deliver new services (Young and Young (2008), Borchert and Young (2009)). Using this approach, QUT has been able to maintain a strong and healthy culture and existing suite of services to a high standard, and yet still be open to change.

Change management has been largely brought about by the introduction of new expert positions to research and implement new research services, and then mainstreaming the provision of these services by existing staff through a program of awareness and skills development. Staff are provided appropriate information and training prior to training and services being offered to researchers and HDR students.

QUT uses its own project management framework developed from the PMBOK framework and also uses the Information Technology Infrastructure Library (ITIL) to manage its IT services. Using two such frameworks greatly increases the probability of success when developing and implementing new IT based services, and then successfully managing these into the future.

#### **Issues and challenges**

Although considerable progress is being made at QUT, the development of new services has not been without issues and challenges.

Hiring staff for new expert positions and developing new systems and services costs money. These costs compete with existing library, IT and learning support services for funds. QUT has been enjoying a period of rapid growth, and considerable funding is being invested in new infrastructure. Sufficient storage space to meet probable research needs will require a considerable investment. QUT had successfully found project money in 2009 to move a number of its research support projects forward, however this funding needs to be continues in either project or operational mode to maintain momentum. Young and Young (2008) raised this issue and noted that highly skilled research support staff will be much sought after within the sector and, hence, the most crucial issue for research support is sustainable funding streams to end reliance on project based, soft funding for existing and new services.

Once projects are completed and new systems and services are available to researchers, some operational capacity needs to be aligned to maintaining these systems and providing services to clients. QUT Library's Research Support Team is both skilled and highly motivated, yet is also very busy dealing with the Excellence in Research Australia research assessment exercise. Liaison Librarians already have a very broad range of knowledge, skills and services to provide, and the addition of more complex data management and other services will prove challenging. Management can alleviate the tension by communicating with staff that it is allowable to do something else less comprehensively. Another solution being trialed is to allow Liaison Librarians to specialize in learning support or research support, in additional to other responsibilities such as collection development. An important change management strategy is to keep staff well informed of developments as they happen. The Library's information sessions for staff have been designed to address this issue, but it is very easy for already busy staff to feel overloaded.

Coordinating and integrating Library, ITS and HPC research services is a positive step towards making research services more accessible. Taking the client perspective however, would suggest that research support services should be integrated University wise, incorporating services from the Research Students Centre, Office of Research, and Commercialisation Services. This requires considerable collaboration between two university Divisions. Although discussions are progressing and progress is being made, this will take time, considerable information sharing, cross skilling and integrating of information sources and help services.

# Conclusion

It is very likely that QUT's story is similar to that of many other institutions which are dealing with the same issues and challenges. QUT's biggest assets in successfully developing new research support services are perhaps the advocacy provided by its executives, the strength of the individual research support services, its organisational structures which foster good relationships between its departments, and its planning processes.

Change management brought about by having a Research Support Action Plan, information sharing and the hiring of expert staff to lead projects and implementation is a successful recipe, but required the continued allocation of project and then additional or realigned operational funding.

# Acknowledgements

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