



E-Research at VUW: Capability Building Strategy 2008-2010

Prepared by Prof. John Hine and Sam Searle, May 2008

Introduction

In an earlier document,¹ we argued that VUW must establish a strategy for the development of e-research capability. This approach was accepted by the Research Committee, Information Technology Oversight Committee and Information Technology Academic Advisory Group. This document presents that strategy. Developing e-research capability must include consideration of the appropriate human resources, knowledge, money, physical assets, systems and structures and how they can best be employed to further Victoria's strategic objectives.

A plan, which contains further details of actions, responsibilities, timelines and resource impacts, is attached as Appendix A.

E-research and VUW's Strategic Direction

The development of e-research capability will enable VUW to achieve the goals set out in its strategies and plans and to contribute to national objectives.

Research Strategy

VUW's Research Strategy aims to improve the University's research as measured by future PBRF revenue and results. This E-Research Strategy supports VUW's Research Strategy in several ways:

- Encouraging the wider adoption of e-research tools and services will assist VUW researchers to develop a national or international profile as part of collaborative research projects.
- Participation in collaborative research projects supported by e-research may open access to possible sub-contract funding from international sources such as the EU Framework Seven and the US National Science Foundation.
- Providing access to and support for e-research tools and services will help to attract high quality postgraduate candidates, staff and visiting scholars.
- Using new technologies to foster peer interaction and mentoring across institutions can assist with the goals of enhancing the postgraduate experience and improving completion rates. The BRCSS Talanoa Network (led by VUW's Va'aomanū Pasifika) is a successful example of the Access Grid being used to support postgraduate interaction.

Investment Plan

The Investment Plan lists interdisciplinary strengths that VUW will build on to develop its unique character. This Roadmap encourages the use of e-research tools as an example of Innovation and Future Technologies. E-research will also be an essential contributor to other high-value areas, like

¹ *The Contribution of E-Research to VUW's Research Strategy 2008- 2010*. Prepared by John Hine and Sam Searle. http://www.mcs.vuw.ac.nz/twiki/pub/EResearch/Resources/VUW_eResearch_Strategy_Proposal_FINAL.pdf

Global Change and Sustainable Futures, Biotechnology for Human and Environment Health, and International Engagement and Understanding. These are challenging research areas that require large national and international teams: e-research tools and the ability to use them will be necessary for VUW to participate as an equal partner.

E-research tools and services will also support the Key Shift in the Investment Plan towards cross-institution collaboration where critical mass cannot otherwise be achieved.

VUW already has strong collaborations with several Crown Research Institutes in the Wellington region. The presence of CityLink and development of the Wellington Loop secondary schools network provides a unique opportunity for involvement with schools and local business. The presence of other research and education institutions such as the National Library, National Archives and Te Papa offer further unique opportunities.

IT Strategic Plan

Research was added as a strand in the IT Strategic Plan in 2007, but no firm actions were assigned. To further develop IT support for research, a joint ITS/Library project has held workshops to determine researchers' information needs. The E-Research Development Coordinator participated in the organisation and facilitation of these workshops. The outcomes of these workshops have informed the development of this strategy.

The IT Strategic Plan is currently being revised and it is likely that there will be new actions in the area of Research that will cross over with actions in this plan. E-research development staff are participating in the review of the IT Strategic Plan, which will be a key starting point for many of the activities outlined in this strategy.

The Advanced Network Capability Building Roadmap 2008-2010

The Advanced Network Capability Building Roadmap² was written to guide the development of capability around KAREN. The recommendations in this document are consistent with the recommendations found in the national roadmap.

Resource implications

The Research Strategy notes that funding research development in the University's current environment will be challenging, but that much could be achieved through changes in the resource allocation decisions being made, rather than large sums of additional funding.

We believe that many of the recommendations in this report can be achieved within current operating budgets, using modest strategic investments from discretionary resources in the areas of IT and research management. An exception to this may be the recommended research computing service.

Because ICT supports so many University functions, the balance of ICT investment across different domains must be reviewed regularly to reflect the current relative strategic importance. Ongoing investment has strengthened ICT support for administration (e.g. finance, HR, student records, MyVictoria), library services (e.g. library management, electronic resources like catalogues and databases), and teaching and learning (e.g. Blackboard, Mediasite). KAREN represents a significant research investment, but prior to this the generic ICT platform was the only significant university ICT support for research.

We would draw a parallel between the current investment in KAREN and the ongoing processes of adoption of e-learning and teaching technologies across VUW. Like research, ICT support for teaching and learning relies on the provision of a strong basic platform by ITS, but has also required significant additional effort, both within ITS (in the distinct Teaching Services team) and from outside ITS, notably from the University Teaching Development Centre (UTDC) and recently from CSA.

² *Advanced Network Capability Building Roadmap 2007-2009*. 2007. Prepared by Sam Searle for Research and Education Advanced Network New Zealand (REANNZ). <http://www.karen.net.nz/publications/>.

Similarly maximising the benefit for research from KAREN will require the development of new support services.

Governance

The recommendations contained in the E-Research Strategy are designed to assist the University to achieve the objectives in its Investment Plan and Research Strategy and are expected to impact on the ICT Strategic Plan and future investment in ICT. Consequently the Vice-Chancellor's Office, the DVC Research, the Research Office, the Research Committee and the Information Technology Strategic Oversight Committee all have a degree of interest in the implementation of this strategy.

It will be important that the University's governance structures ensure the appropriate level of communication and agreement on priorities amongst these entities.

Recommendations

A. Technical Support for Researchers

Addresses direct support for e-research through providing advisory services and ICT support.

1. Establish a new service dedicated to meeting research computing needs.

B. Capability Building for Researchers

Addresses areas such as professional development needs and fostering new e-research talent.

2. Provide targeted funding to support e-research.
3. Help researchers access external funding for e-research development.
4. Support staff to take up internal and external professional development opportunities in the area of e-research.
5. Provide targeted support to raise e-research capability amongst postgraduate research students and new researchers.

C. E-Research Infrastructure

Addresses the need for institutional capability and the importance of contributing to the development of national research infrastructure.

6. Participate in the development of national shared resources.
7. Provide support for inter-institutional collaboration.

D. Data Management

Addresses the need to take coordinated approach to the management of research data.

8. Develop a research data management strategy.
9. Support strategic initiatives to provide enhanced digital resources and open access platforms that support research.

E. Regional and National Leadership

Addresses the need for VUW to actively contribute to e-research policy and governance, and to facilitate regional activities for the benefit of the research sector.

10. Take a national leadership role in the development of e-research.

A. Technical support for researchers

1. Establish a new service dedicated to meeting research computing needs.

The Research Strategy emphasises the need for research support, but currently covers only funding and administrative mechanisms such as research and study leave, funding attendance at conferences, and internal research grants (see Recommendation 2 below).

There is a significant gap in the Research Strategy, in terms of harnessing the University's existing investment in advanced information and communication technologies (ICT) to support more efficient and effective research.

We propose that a research computing service be established to fill the gap between current services and the needs of researchers. Such a service is necessary for an accelerated uptake of e-research, and would contribute to overall research development.

The initial step in establishing this service would be the development of a business plan: we envisage the DVC would take ownership of this activity and it could be facilitated by the Research Office.

By providing ICT support and advisory services the research computing service would give researchers more time to focus on research itself rather than related ICT issues, and enable greater use to be made of expensive research infrastructure like KAREN and the BlueFern supercomputer.

What is currently provided?

VUW currently provides ICT support for research in the form of:

- a basic platform (operating system, commodity internet, office applications, printing, etc.)
- connectivity to the high bandwidth Kiwi Advanced Research and Education Network
- facilities and staffing for videoconferencing, webcasting and multimedia recording
- some generic applications (e.g. SPSS for statistics) and services (e.g. some shared data storage, secure machine room).

Outside of this, researchers are largely expected to meet additional requirements (e.g. large-scale storage, domain-specific research applications and systems). The ICT support researchers receive at the school level varies from school to school in both quantity and quality. SMSCS programming staff, including 0.5 FTE funded by the Research Office, contribute to e-research support.

Provision of ICT services has been driven by the immediate demands of researchers, with no specific strategic identification of new services likely to promote the development of VUW's research in ways suggested by the Research Strategy.

For the first time research was included in the Information Technology Strategic Plan 2008-2010, and recent activities in ITS in support of research include:

- a joint ITS/Library project which has elicited information from researchers about their current and future needs in the areas of information resources, ICT, and training;
- working with technical staff from the School of Biological Sciences on a tool for facilitating easy transfer of extremely large files;
- up-skilling in the area of identity and access management (IAM) and preliminary discussions with Computer Science about pilots to test federated IAM in the research environment;
- exploring communication tools to support internal collaboration.

These activities are welcomed, and should result in an expansion and improvement in the generic platform that is provided to researchers.

However, consultations with researchers suggest that for VUW to improve its standing as a research university, a different culture is required. Supporting research is fundamentally different from supporting the enterprise's business. There is a need for technical support with some domain knowledge able to both solve immediate problems and assist with medium term developments.

Why is there a need for a separate service?

The delivery of ICT support for research requires a different approach from the enterprise-level work of most universities' IT service providers. Many research universities offer support services for "research computing" or "advanced technologies". In some cases, help with other aspects of e-research development, e.g. training, policy and strategy, is also provided.

In New Zealand, the Universities of Auckland and Canterbury have already moved to establish such teams.

The success of these services in other universities seems to depend as much upon *how services are provided* as on the services themselves. The models adopted for the provision of research computing services have common attributes such as:

- Flexible approaches; adopting a 'proactive' rather than a 'reactive' model;
- Recruitment of staff with a combination of IT skills and research background, i.e. subject expertise and the ability to work in teams with researchers are just as important as ICT skills;
- Partnership and collaboration with researchers and teams, the building of long-term relationships and the provision of customised, individualised support when and if required;
- Collaboration with similar services across institutions to develop shared resources;
- A commitment to strategically building internal expertise in support of technologies produced by the open source and research communities, and contributing expertise to these collaborative developments where possible;
- A focus on strategic or value-added activities, rather than day-to-day operations such as helpdesk duties, upgrades to enterprise systems etc.

These attributes make research computing services very different from current ICT service provision.

What would a research computing service provide?

A research computing service would focus energies on strategic support for researchers in three areas:

a. **Information**

Promoting awareness amongst researchers of existing tools and services, and of relevant standards and best practice; acting as a 'shop front' or 'first port of call' for services that might be delivered by different units across VUW, or by other organisations;

b. **Support:**

Helping researchers to make the most of existing tools and services by providing research services including a modest level of direct programming support; supporting researchers who wish to access remote resources or share resources with their own collaborators; and

c. **Knowledge base:**

Proactively identify emerging advanced technologies and research computing requirements.

The provision of this support would be developed from the best practices of other successful research computing services. The research computing service would complement the enterprise services offered by ITS and should use the ITS infrastructure as much as possible.

B. Capability building for researchers

2. Provide targeted funding to support e-research.

Targeted funding can directly support the work of researchers, as well as signalling more widely the strategic importance of the funded initiative.

The Research Strategy notes that improved research performance may require increased funding for research and study leave, attendance at conferences, and internal research grants, as well as “supplementary schemes where specific needs can be identified.” We propose that e-research development is one such area of specific need that VUW could develop through existing mechanisms.

The Research Office should investigate targeted e-research funding in areas such as the following:

- Internal research grants (i.e. URF).
- Post-doctoral fellowships
- Postgraduate scholarships
- Conference and travel support.

The collaboration and interdisciplinarity that is sought within the Investment Plan is a natural characteristic of e-research. Targeted funding should emphasise this synergy.

In some cases, changes to criteria may not be required, provided that a broad understanding of e-research capability building as a VUW objective is developed amongst staff who assess funding applications. In other cases, some changes to criteria and systems may be helpful in highlighting e-research opportunities for both applying researchers and those assessing applications

3. Help researchers find external funds for e-research development.

A comparatively small amount of money has been made available nationally for the initial development of e-research. Compare the \$5M in the KAREN Capability Build Fund plus \$1.7M from the TEC for BeSTGRID with the \$28M provided for e-Learning Collaborative Development Fund. There are ways in which the University can work to “create” additional external funds:

- Work with the KAREN community to engage the government in the further development of New Zealand’s research infrastructure through avenues such as further funding of the CBF, MoRST’s Research Infrastructure Advisory Group (RIAG) and the TEC Strategic Development Initiative.
- Engage MoRST and FRST in discussions on how infrastructure and capability development can occur within the current research funding programmes.
- Work with researchers to ensure grant applications address capability development requirements.

4. Support staff to take up professional development opportunities in the area of e-research, both external and internal to VUW.

Internationally and increasingly in Australasia, researchers and other support staff can participate in professional development events such as training courses, conferences and workshops.

Staff attendance at these events raises awareness and skill levels, but researchers need to know about such events and be encouraged and supported to attend. This support is especially needed where staff

time and resources (e.g. conference funds) for e-research-related activities must be balanced with researchers' professional development needs in their specific areas of academic expertise.

VUW has a good track record in seeking matching external funding in this area: in 2007-08 we have made five successful applications to the KAREN CBF Travel Fund to support professional development at events in Australia and the US. This external income contributes to our overall PBRF rating as well as to the professional development of the staff members.

As well as supporting staff attendance at external events, VUW must ensure that its internal professional development programmes (e.g. those run by the Research Office, UTDC, and CEED) evolve to meet the needs of staff embarking on e-research activities. An e-research skills development plan would help in highlighting any gaps that need to be addressed in the next 2-3 years.

The new staff induction programme is critical in ensuring that staff have access to information about tools, services and expertise that can assist them with e-research. In 2008, staff at the research induction day received a leaflet about e-research at VUW. Future inductions may include presentations from e-research support staff and/or early adopters that can encourage new staff to take up the opportunities presented by tools and services such as the BlueFern supercomputer.

5. Provide targeted support to raise e-research capability amongst postgraduate research students and new researchers.

The national *Roadmap* notes that "postgraduates are seen as a vital group for targeted capability building across all disciplines because they are the e-research leaders of tomorrow."

Our experience at VUW also suggests that postgraduates and new researchers often have the technical savvy and interest in new ways of doing things required to become early adopters of e-research tools and techniques: they then transfer their new e-research knowledge to their supervisors, postgraduate peers, and other researchers in their school or centre.

New researchers will benefit from professional development events and networking opportunities, such as training courses, conferences and workshops, as outlined above. Attendance at events specific to postgraduates, e.g. grid computing summer schools and e-research related internships, should be encouraged. Mechanisms such as Faculty Research Grants for enhanced postgraduate experiences are an appropriate funding mechanism.

Inductions / orientations for new postgraduates are also key areas for raising e-research awareness: up-to-date information and guidance for supervisors also needs to be provided about services above and beyond those provided by the Minimum Resource Agreement.

Identifying opportunities for undergraduate and Honours courses to contribute to e-research skills and awareness in future graduate students and new researchers will also be important. Schools such as Computer Science and Digital Media Design have an obvious part to play, but it will also be important to look at fostering interdisciplinary work, e.g. between the scientific disciplines and Computer Science (e.g. bioinformatics) or Design (e.g. data visualisation).

C. E-research infrastructure

The recommendations in this section require a proactive approach to the development of support for collaborative research between NZ institutions and overseas institutions. The activities that these recommendations imply are examples of the work that would be done by a research computing service.

6. Participate in the development of national shared resources.

Resources critical to modern research are increasingly expensive. MoRST's Research Infrastructure Advisory Group (RIAG) conducted a scan of NZ's large-scale research infrastructure needs in the next five years that identified around \$250 million in investment excluding "the funding of the science which is enabled by such facilities."³

The RIAG scan notes that ongoing sustainability will require shared facilities that provide an effective infrastructure backbone for the country. New Zealand cannot afford to replicate these resources at each organisation that may have a researcher requiring their service: the RIAG scan notes that the current model of "a mass spectrometer here, an NMR there, a screening facility and a sequencing facility somewhere else...." makes little practical sense in a country of the size of New Zealand". Historically researchers travelled to resources at other sites: e-research tools mean that it is now possible to provide remote access from the researcher's university to many required resources:

There is a compelling case to build national centres of high level competence where at least some of these capabilities are clustered and an effective access regime instituted. Where the initiative has been taken with key large-scale infrastructure, the challenge is to build on this momentum. For example, the arrival of the KAREN network and the likely rapid development of network coverage and capability, oblige the country to make use of this resource to get serious computational power, accessible from the desktop, in the hands of as wide a spectrum of users as possible. Such capabilities are a cornerstone of research infrastructure in most countries, evolve rapidly and thus feature prominently in infrastructure planning.

Examples of resources that VUW researchers current require access to include Canterbury's BlueFern and Power 5 supercomputers, and the GeoNet sensor network. Conversely, VUW and local centres like the MacDiarmid Institute have facilities, e.g. SBS's confocal microscope facility, that could be more easily shared with collaborators in NZ and overseas.

High performance computing (HPC) is an example of an expensive resource that is for researchers in many disciplines. VUW has made a decision to make use of Canterbury's Supercomputer Centre (UCSC). Both VUW and the MacDiarmid Institute are partners in the BlueFern project. Through the BeSTGRID project VUW researchers also have access to computing clusters at the University of Auckland and Massey University. Discussions at the Research Infrastructure Advisory Group suggest that one or two additional HPC facilities will become available in the medium term.

Although VUW is already making strategic use of shared resources, this currently happens in ad hoc ways: a more systematic approach at VUW, in the context of national developments, is required.

VUW was a leader in the development of campus computational grid services capability. It has been slow to contribute to developing national grid capability. VUW should be involved in discussions about cost-sharing for various resources and how researchers should gain access to these resources.

KAREN is rapidly becoming an important part of New Zealand's research infrastructure. Overseas experience suggests that the technology underlying KAREN will need to be refreshed on a three yearly cycle. Given VUW's investment in KAREN it should be aware of and involved in the forward planning for KAREN. The knowledge from this involvement should inform the planning for the development of VUW's international network.

³ Research Infrastructure Advisory Group. August 2007. Scan of New Zealand's Large Scale Research Infrastructure Needs 2007- 2012: Report by the Research Infrastructure Advisory Group. <http://www.morst.govt.nz/Documents/work/riag/Scan-of-NZs-Large-Scale-Research-Infrastructure-Needs-2007-2012.pdf>

7. Provide support for inter-institutional collaboration.

Providing network connectivity to shared resources is necessary but not sufficient to support the use of such resources or collaborative research between institutions. Researchers require comparatively easy and intuitive access to resources.

A good example of this is the BioPortal developed as part of the BeSTGRID project. The BioPortal hosts a set of nine common bioinformatics packages, attached to the BlueFern supercomputer at Canterbury. Researchers access the software through a web interface. A group of approximately thirty VUW researchers in SBS would like access to the BioPortal for research that fits within the Investment Plan's Biotechnology for Human and Environmental Health interdisciplinary strengths.

Whether or not expensive resources are involved, many collaborative research projects benefit from access to a virtual research environment (VRE), a shared online workspace for document sharing, joint authoring, and project management. Victoria Management School researchers on a FRST-funded project, Building our Productivity, are currently using a VRE called Sakai (provided free to the KAREN community by the University of Auckland under the auspices of the BeSTGRID project) to support collaborative research with colleagues in Australia and the UK. A forthcoming KAREN CBF-funded project between SGEES and GNS Science will also use a Sakai workspace.

Researchers expect transparent and intuitive access to shared resources, whether they are expensive resources or simple repositories. The following detailed recommendations address removing obstacles to the use of shared resources and collaborative research.

- **Deploy identity and access management (IAM) middleware to support research.**
- **Join the Australian Access Federation.**

A unified system for identity management has many potential benefits for a large organisation including efficient management of the comings, goings and internal movements of staff and the ability to develop reliable policy for managing access to information resources. In a research context this can be extended to managing the access of collaborators and researchers from other institutions to VUW resources (the network, VREs, selected instruments) without the overheads of managing additional individual accounts.

Successful implementation of IAM middleware and membership of the Australian Access Federation will also allow VUW researchers to more easily access shared, remote resources using their VUW userid and password. Participation in an access federation with other universities and CRIs can be achieved concurrently with the implementation of an internal identity management system. Indeed it may actually be easier as research resources are seldom deemed to be critical to the enterprise and are often shared using less efficient mechanisms.

VUW resources can also be made available securely to eligible collaborators at other organisations in more efficient ways that do not require the administration of userids and passwords for external users.

In the medium term this will significantly reduce the administrative cost of collaborative research projects.

- **Continue to develop real-time collaboration capability for research, and partner with other KAREN members to create national administrative and support services.**

Direct communication amongst researchers is another important aspect of collaborative projects.

VUW should continue to support and develop:

- room-based videoconferencing and Access Grid tools

- desktop videoconferencing, for both internal and external communication
- “virtual research environments” (VREs - mentioned above)
- advanced functions such as collaborative data visualisation.

Support for real-time collaborative tools will enable VUW researchers to build and maintain strong relationships with research partners and colleagues across NZ and overseas. These relationships are necessary if VUW researchers are to produce research with the national and international impact that PBRF rewards.

A further positive spin-off will be a reduction in the environmental impact of VUW staff travel: once trust has been built within research teams, these new technologies may facilitate the ongoing management of projects and relationships with a significant reduction in travel. This not only assists with reducing costs, but provides opportunities for researchers in VUW’s interdisciplinary strength areas – e.g. Innovation and Future Technologies, Global Change and Sustainable Futures – to demonstrate their leadership in the way their research is conducted, as well as in the outcomes that flow from it.

As a “virtual institute” the MacDiarmid Institute is a leading example of the use of these technologies. The Institute’s monthly research seminars are all held via videoconference or Access Grid. In 2008, the MacDiarmid Institute also began using the Access Grid for regular Science Executive meetings that previously involved several participants flying in from Christchurch and Dunedin. This has reduced travel time for the participants, as well as running costs.

D. Data management

8. Develop a VUW research data management strategy.

The amount of data generated by research projects is increasing exponentially; a recent report from the UK suggests that in many disciplines data production is doubling annually.⁴ A recent Monash University presentation identifies the scale of these issues for a research university:

Monash University Library has 2 million books on its shelves. This is equivalent to approximately 28 terabytes of data. It is estimated that the Synchrotron, once it is online, will be capable of producing 1 terabyte of data per day, i.e. more than 2 millions books worth of data a month. Monash's micro imaging and electro microscopy activities can also produce terabytes of data relatively quickly. And it is not only scientific research that can produce large datasets. The school of music's archive already contains more than a terabyte of data, and the collection of Holocaust information from the Shoah Foundation held at Monash is envisaged to grow to a petabyte of data.⁵

There is an urgent need for research datasets to be protected as information assets. No VUW policy – including the Information Systems Statute, the Communication Systems Policy, or the Research Policy – currently covers data management. Recent workshops confirmed that datasets are most often handled by individual researchers and/or at the level of projects, schools and centres. The risks of storage failures, software obsolescence, and poor data management practices can be mitigated, but this will require investment in technology, data skills, and awareness raising amongst staff of best practices.

There is also increasing emphasis on providing access to data, as well securing it. Data from publicly-funded research is on the radar of the policy-makers and funding agencies: in future NZ researchers will likely have to comply with more stringent data sharing requirements in research contracts, national legislation, and international declarations. MoRST is investigating policy changes in this area as part of the Scientific and Research Action Programme under the auspices of the Digital Strategy.

Sharing and re-using data raises intellectual property, data privacy and other digital rights management issues. Emerging national and international best practice for management of datasets will need to be adopted (e.g. provenance metadata standards for datasets, access policies).

With an appropriate research data management strategy VUW researchers will be able to securely manage, share and re-use their own and others' datasets. VUW will be better prepared to meet new mandatory requirements (not yet in place, but likely to emerge in 2008-09) from funding agencies (e.g. FRST) for open access to the results of publicly funded research.

A VUW management plan must also take into account the need for VUW to support contributions to national, and possibly international, research data management activities.

In Australia, research data management forms part of The Australian Code for the Responsible Conduct of Research and a coordinated national approach to research data management is being taken through the Australian National Data Service (ANDS) initiative. Should a similar code and work programme be undertaken in New Zealand, VUW should be prepared to participate.

National and international research data management initiatives also arise out of different disciplines. The NZ Social Science Data Archive at the University of Auckland will help social scientists to store and share data. Internationally, initiatives such as the fMRI Data Centre, Incorporated Research Institutions for Seismology (IRIS) and Geosciences Network (GEON) Portal are sources and destinations for data created and shared by and with VUW researchers in areas of identified strength.

Development and implementation of a data management strategy is a large and complex undertaking. A useful first step would be a survey of researchers about current data management practices. This survey has been proposed as one of the outcomes of the joint ITS/Library workshops.

⁴ UK Office for Science and Innovation. 2006. The vision for networks, data storage systems and compute capability. <http://www.nesc.ac.uk/documents/OSI/compute.pdf>.

⁵ Monash University Data Management Subcommittee of the eResearch Committee. 2007. Research Data Management Policy Development – Monash University. <http://www.monash.edu.au/staff/information-management/seminar/roger-clark.ppt>.

9. Support strategic initiatives to provide enhanced digital resources and open access platforms that support research.

The ways in which data (or information or knowledge) are published or delivered are also changing.

- In many disciplines, particularly in the arts and humanities, primary source materials – e.g. texts, photographs, museum objects – are still only available in analogue form.

Digitising these materials can make them available to more researchers, enabling new kinds of research (e.g. text mining), and potentially prompting shifts from the individual research common in the humanities to more collaborative, project-based work. VUW is well-placed in this regard, with the New Zealand Electronic Text Centre acknowledged as a leader in providing support to researchers in areas such as New Zealand history and literature.
- The availability of high speed networks is driving the development of repositories of digital content – both born-digital and digitised, and particularly rich media content that requires significant streaming/downloading bandwidth - for research and education purposes. Examples of VUW activity in this area include the use of MediaSite for recording lectures and delivering them over the web, and Library investigations into the KiwiImage collection of satellite images.
- Advanced networks may also enable consortial purchasing and mirroring of large-scale and aggregated resources, such as the BioMirror set of bioinformatics databases.
- As noted above, policy will increasingly dictate sharing and re-use of data (“open access”) as the norm. VUW’s open access Research Archive is a positive development, and will likely be the first step in meeting wider research data management requirements. VUW is also playing a key role in the Creative Commons New Zealand licensing initiative.

Continuing support for initiatives such as these ensures that the reputation of VUW and its research impact are maximised by research outputs reaching the widest possible audience. Researchers also benefit by developing new or improved tools and methodologies that take advantage of the attributes of digital resources (e.g. searchability).

E. Regional and National Leadership

10. Take a national leadership role in the development of e-research.

To achieve the goal of being one of the top two research universities in NZ, we recommend that VUW makes a strategic decision to play a national leadership role in the development of e-research. However there is much to be done nationally in the development of e-research: Victoria needs to think carefully what it means to take a leadership role.

We believe that it is largely an issue of the nature of our participation. Rather than waiting for others to complete initial work we should participate from the start in selected activities. Victoria should be aware of developments and opportunities that would benefit its researchers, and be amongst those institutions driving the uptake of those developments.

Examples of ways in which Victoria could take a position of leadership include the following:

- Victoria should continue to contribute to various committees and working groups that may be formed around the national development of e-Research. Located in the capital city we have an advantageous access to ministries and REANNZ.
- To ensure that Victoria is aware of international developments, trends and opportunities the University should continue to participate internationally through participation in forums such as the UK All Hands meeting, e-Research Australia and the Internet2 Member Meetings.
- VUW should identify its own research resources (data, instruments, etc.) that may be of benefit to other researchers and make them available through an appropriate on-line gateway.
- Through the research computing service VUW should identify, initiate and/or participate in the development of new e-Research services that will have a significant benefit for VUW researchers.
- Where VUW develops specific e-Research skills it should be prepared to contribute these to collaborations with other research institutions.
- Within Wellington, VUW can lead an initiative to capitalise on the connectivity offered by CityLink and the Wellington Loop. While the scope of opportunity here is greater than research, enhancement of research collaboration amongst Wellington's research institutions can be an initial or major focus.

Assuming a position of leadership will first require a commitment to the recommendations in this strategy.

Victoria should encourage and resource individual researchers to take strategic roles in e-research – both within their disciplines, and more broadly in terms of the development of national infrastructure and participation in groups with policy and strategy mandates. Having VUW staff in key roles will contribute to the Research Strategy's goal to develop research leadership at VUW, and can also be used to demonstrate VUW researchers' *contribution to the research environment* and *peer esteem*, as measured by the PBRF.

Victoria should also convene a series of meetings with Wellington-based research and education institutions to explore how Wellington's superior networking could be leveraged for the benefit of all.