

Engineering Information for Sustainability

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Abstract:

This paper introduces the newly formed University of Melbourne eScholarship Research Centre. It will introduce the rationale for the creation of the Centre and the role that it will play both within University and the wider community. One of the driving imperatives of the Centre is the need to establish the practical and pragmatic processes that must be in place to ensure long term information management and utility. A major focus of the paper will be an exploration of the notion of the 'steward' and the utilization of the archival practice of accessioning to manage that highly problematic interface between the researcher, their data and records and the preservation environment. As a background to the theme, it will be no surprise that examples will be presented from the world of radioactive waste information management. However, concrete examples will also be presented that relate these concepts to what this actually means in Universities here and now.

Introduction:

A threshold was crossed sometime in the last few years into a world in which it would be reasonable to argue that all academic pursuits now include at least some digital component and that many research, teaching and learning, and knowledge transfer activities use predominantly digital information management and communication technologies (ICT). We are now in the era of "eScholarship". But what are the challenges posed by digital technologies to scholarly practice, a practice that has its roots and traditions in paper-based technologies? How does scholarly practice need to change in light of these changes, and indeed, how should digital technologies be developed to meet the needs of sustainable scholarly practice?¹

The Australian Government has responded to this changing ICT landscape by establishing several national bodies and programs to look at the impacts these technologies have on research practice and the infrastructure needed to support research. A variety of issues around the changing skill and resource needs of researchers as well as the burden of the sustainable management of increasing quantities of research data are emerging. Preliminary findings of the Working Group on Data for Science for the Prime Minister's Science, Engineering and Innovation Council (PMSEIC) highlight two key areas that we must address both nationally and locally are:

- o the nature of cultural and institutional changes needed to encourage better data management practices, and

- the avenues for inculcating scientists [and researchers more generally] with the skills needed to work in the emerging information infrastructure.

The Research Quality and Research Accessibility Frameworks, and the Australian Code for the Responsible Conduct of Research are two significant government initiatives that are already having an impact on the management and documentation of research and research data. The costs associated with the dissemination of research findings and scholarly publications have also come under scrutiny and this process has further added to the evidence supporting the ‘phase change’ from print-based to digitally-based scholarly practice.²

The University of Melbourne has embarked upon an exciting reshaping of its approach to scholarship that has its basis in the complicit intersection of research, teaching and knowledge transfer activities – a vision elicited through the concept of a triple helix. To differentiate Melbourne through its use of ICT to underpin this vision it was proposed to explore how these technologies provide opportunities to build the cross-linkages within the triple helix. Rather than just narrowly focusing on eScience or eResearch, attention was drawn to a broader conceptualisation of the digital academy through the term ‘eScholarship’. Whilst many universities have embraced eLearning and more recently are engaged in developments concentrating on e-Research, it was noted that not only did the University of Melbourne have major research strengths but it also had archival and cultural collections assembled from both inside and outside the University. Putting these two together created an opportunity to study the question of sustainability of research data and related information collections to underpin scholarly practice, not just in the short term but for the research communities of the more distant future.

Developing Strengths

One of the collateral benefits of a University with an open and fluid network structure (as opposed to a centralised command and control hierarchy) is that it allowed two significant pockets of expertise to develop in the area of eScholarship; one in the Faculty of Arts and the other in Information Services. In the Faculty of Arts, the Australian Science and Technology Heritage Centre (Austehc), from its humble beginnings as the Australian Science Archives Project in 1985, had become a noted global player in developing archival systems, contextual information systems, humanities computing (eHumanities) and the utilization of archival materials to support research and community development. In Information Services complementary expertise and experience had also flourished including recent work in investigating digital repository needs, technologies and implementation and well developed expertise in information management, e-learning tools and technologies and grid and advanced computing.

However, the University had not been able to successfully develop a coordinated and enterprise-wide means by which it could address the strategically critical challenges facing contemporary academia that are embodied in such terms as eResearch, eScience, eHumanities. Consequently, a strategically coordinated and supported eScholarship unit was established with an enterprise-wide remit to act as a catalyst for linking the triple helix and furthering the eResearch agenda. However, the University recognised that this was not just a question of service development and delivery. This

area was contentious, problematic and worth of academic study in its own right and thus was formed the eScholarship Research Centre.

Old Structures, New Needs

It was also recognised that the eScholarship Research Centre (ESRC) would be multidisciplinary by its very nature and that housing it within any particular faculty created issues of funding and governance that would tend to inhibit that multidisciplinary. It was decided that the new centre would be created within Information Services and although the location of an academically-based centre outside of the faculty framework created challenges, there appears to be sufficient goodwill to make this work.

It was felt that the Centre would make its significant contributions to the University through innovation, collaboration, applied research and knowledge transfer activities as these were already major strengths of the precursor entities. It would contribute directly to the student experience through developing technology-enabled opportunities for research and knowledge transfer within the new generation degrees being developed at the University of Melbourne. In part this would be achieved by building on the existing eLearning capabilities within the University.

To support its academic strengths the research staff of the ESRC would have adjunct appointments in appropriate Faculties. This would enable them to apply for and/or participate in competitive grant applications and projects including the Australian Research Council schemes. Existing academic staff would thus be able to utilize and develop their existing research track records both through research publications and grants.

The Centre has been placed fairly and squarely in that contentious problem-space that exists between the academic community and the service and administrative community within the University. Even in times of greater stability, in particular in the pre-digital era, this divide was identified and at times fraught. By working directly with the academic community on specified projects and critically observing others from the perspective of sustainable scholarly practice it is anticipated that the Centre will be able to guide the University in the development of efficient and effective enterprise wide services. The development of the infrastructure to support sustainable digital scholarly practice will occur through an evolutionary process that is hope will be agile and adaptive to the changes in the ICT landscape.

As a place where ideas and concepts can be developed and tested, where expertise can be nurtured and extended, where knowledge itself can be gained and sustained, it is hoped that the Centre helps find a pathway that will lead to an information infrastructure that will sustain the knowledge generated by the fragile, short-term, competitive, collaborative, uncertain, dispiriting, enlightening, entertaining, contradictory, project-based foundations of research that relies so much on the vision and persistence of individuals.

Mission:

The eScholarship Research Centre is committed to furthering the development of the University of Melbourne as a major contributor to an open and equitable world of useful knowledge.

Objectives:

1. To ensure the University of Melbourne eScholarship Research Centre is recognized as a world-leading centre of excellence in the field of digital scholarly and research practice by:
 - contributing to the development of international standards in the fields of expertise within the Centre, currently humanities computing and cultural informatics;
 - working with national and international organizations (for example the National Library of Australia and the International Atomic Energy Agency) on projects and activities which rely on the effective and efficient use of knowledge;
 - developing collaborative partnerships with other university organizations (both in Australia and overseas) to work on projects of common interest; and
 - publishing academic papers, reports and other materials that express the new knowledge gained through the activities of the Centre
2. To ensure the University of Melbourne and its scholars and researchers are able to exploit emerging areas of digital scholarly and research practice by:
 - studying, researching and reflecting on the fundamental changes that the digital world is bringing to scholarly practice and research;
 - remaining at the forefront of technological change in the digital environment so as to anticipate and plan for future developments;
 - working as collaborative partners on research projects, thereby transferring knowledge and expertise directly into the faculties;
 - assisting with the development of new services, systems and infrastructure of relevance to digital scholarship and research including a research data management service and a sustainable digital repository strategy that will enable the effective preservation of digital materials of enduring value; and
 - assisting with the development of competitive grants.
3. To contribute to the development of an open and equitable world of useful knowledge through publishing, predominantly via the web, guides, registers, databases, exhibitions and other materials that enable scholars, researchers and the general public to discover, access and understand academic materials;
4. To undertake activities which promote and enable the network interconnection of scholarly, cultural and scientific knowledge.

Conceptualising the worst case scenario

In 2001 the author was contacted by the International Atomic Energy Agency to participate with just three others in a week-long consultants meeting to brainstorm ideas that might assist the Agency in coming up with reasonable and plausible strategies to cope with the intensely problematic question of very long term preservation and utilisation of information relating to radioactive waste. Without much further consideration it was clear that this was indeed a worst case scenario. Even in the conservative time frames of 1000's to 10's of 1,000's of years the expected changes in technology, the environment, societal structure, culture, language and nation states, combined with the fact that no information medium has a life approaching those time-scales, meant that simplistic strategies based solely on finding a long lasting medium were doomed from the outset.

The meeting, held in early 2002, realised that there was a complicit interaction between change in the socio-technical environment and the needs of users at anytime for additional information to help explain the meaning of the primary records and information relating to the waste. This necessitated the utilisation of reflexive but persistent information that documented not just the broad context in which the waste was created, packaged and stored but also the changing contexts that would evolve over the whole time that the waste would remain a safety concern to both people and the environment. Subsequent meetings worked on this conceptualisation of the problem and developed a strategic approach based on the notion of an open network of information sources interconnected by a contextual information framework. It was also acknowledged that although the records, data and related information were now in multiple media and would remain so for the foreseeable future, the successful strategy would have to be based around digital information technologies. However, and without going into detail, the three persistent elements in the system were the waste itself, human beings, and information about the waste.³

Interestingly, but not unexpectedly, the problems facing information management in the contemporary scholarly environment are entirely similar. Indeed, my hypothesis is that they must by necessity be recursively self-similar if the strategies conceptualised for the worst-case scenario are sound. So for example, in terms of academic research, the systems for managing knowledge generated by that research must include the information sources themselves (both data and outputs), information about the people undertaking the research, and information about the other entities associated with the research process (in the widest possible sense). Extending the thinking a bit further, the contextual information framework that binds the research process together now and enables it to work now (as poorly or as well as it does), is the key set of relationships that need to be documented and managed.

Conclusion

The problem-space that exists at the intersection of academic practice, information infrastructure and fast-developing digital technologies is the frontier where the Universities of the 21st century are being built. The University of Melbourne eScholarship Research Centre has been created to work directly in this problem-space. It will challenge and influence academic practice, the provision of infrastructure and the direction of technological development. As a research centre not aligned to any particular faculty it will be able to work in an interdisciplinary manner without challenging budgets and structures governed by the faculty structure or the boundaries erected by the disciplines themselves. The Centre, through the expertise of its foundation staff, will have major strengths in humanities, social sciences and the arts but it will also work directly with the sciences and engineering to ensure that transfers of technologies and expertise flow between these sectors.

The challenges to scholarly practice from digital technologies are more profound than may be evident from this brief introduction. The past 10 years have been notable for the false starts and blind alleys taken in the development and provision of information and communication technologies to support research and scholarly practice. A centre based on grounded-research - that gains understanding and insights through doing rather than merely reflecting - will greatly assist the University and its community of

scholars find sustainable ways of creating and preserving new knowledge, insights and understandings in a world of information excess and hyper-accessibility.

¹ P. W. Genoni, H. Merrick, M. A. Willson, 'Community, communication, collaboration: scholarly practice in transformation', in *The Next Wave of Collaboration: Educause Australasia 2005*, Auckland, New Zealand., April 5-8, 2005. Online at: <http://espace.lis.curtin.edu.au/archive/00000492/>

² John Houghton, Colin Steele and Peter Sheehen, *Research Communication Costs in Australia: Emerging Opportunities and Benefits. A report to the Department of Science, Education and Training*, Australian Government, Department of Science, Education and Training, September 2006. Online at: <http://hdl.handle.net/1885/44485>

³ Gavan McCarthy and Ian Upshall, *Radioactive Waste Information: Meeting our Obligations to Future Generations with Regard to the Safety of Waste Disposal Facilities (ICA Study 18)*, International Council on Archives, May 2006. Online at: <http://www.ica.org/biblio.php?pdocid=454>