

High order literacy for the 21st century – improving the quality of library engagement

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Abstract

It is not just universities that are changing rapidly in the 21st Century, but the very nature and fundamental techniques of research itself. In these circumstances there is a state of almost continual deficit in the skills and literacies needed to work with new data, new tools, and unprecedented volumes of raw material with which to work. To the extent that universities libraries have seen information literacy as central to their mission, there is a need to define what exactly those literacies encompass. This must be done in order to make the necessary innovations to improve the quality of the library's engagement with the academy in this internationally recognised challenge.

Introduction

As we approach the end of the first decade of the 21st Century, there are challenges for the way that libraries support research which are very absorbing. The first aspect of these is that the changing way that research is conducted is complex and in some cases elusive to describe. The second aspect of it is the task of figuring out just how far and how radically libraries should rethink their workforce skills to be part of the solution of better support. This paper considers these two main aspects of this challenge and suggests some possibilities for action.

Research in the 21st Century University

One of the deep consequences of the digital revolution has been to fundamentally alter the way that research goes about its essential business of discovery, investigation, analysis and presentation of findings. This deep change does not have a totally satisfactory vocabulary to describe it and there is plenty of room for different interpretations of terms such as eResearch, or eScience, or particularly "infrastructure".

National university systems in different countries have had to consider whether to make national responses to many of the issues thrown up by this change. And as they have done so the initiatives that get described are often described with rather different terminology. Thus we see the development of conversations about the Cyberinfrastructure in the United States, about eScience in the United Kingdom, the preferred term eResearch in Australia and other variations, (such as eresearch-infrastruktur).

But whatever the label, the set of activities is in common. It has evolved from the use of high performance computing and computation to analyse complex and highly specialised problems in a few disciplines (especially Computer Science), during the 1980s, to research in a number of fields which is strongly based on enormous arrays of collected evidence. Today it is commonplace to find widescale sensing and "instrumenting" of the relevant environment in order to process and manage the data which constitutes the evidence that that provides (whether in astronomy or marine science, climatology or human health). This is happening now to a degree where a coherent and concise survey of the overall development is challenging.

Institutions, disciplines, governments, and specialised vendors have come to recognise that some of this research cannot possibly be an activity supported from the confines of the resource reach of an individual discipline or institution, and what is needed is significant further investment in research infrastructure. Furthermore, the nature of much of the research, together with the nature of the infrastructure to support it, increasingly and automatically relies on a wider range of national and international collaborations. Indeed reviews of the factors involved in more productive innovation have generally supported the view that productive innovation is more likely to develop within the context of more diverse collaboration amongst scattered subject experts rather than arising from one or two research concentrations.

The phrase 'research infrastructure', as argued in a recent policy document for the Australian Government "includes more than just physical assets, and extends to enabling infrastructure such as

information and communication technologies and skilled support staff who maintain and operate research facilities” [Australia. Dept. of Innovation, Industry Science and Research, 2008, p, 3].

The challenge that is described in various policy and review documents that consider the state of research infrastructure in our different national jurisdictions is likely to be preoccupied with the correct response from Government, and the extent to which public funds need to be advanced to support the relevant facilities and skills to advance the interests of higher education, scientific research facilities, support available to industry, and indeed more generally national imperatives. But it is also true that such broad agendas are also reflected within institutional arrangements, so that there is a rising level of conversation about the capacity of institutions to adequately support the requirements of their own research populations in the context of these rapidly moving changes. Indeed, it is helpful to think about research infrastructure as a series of categories of which each is progressively apparently more resource demanding than the previous one, and which increasingly require more sophisticated thinking about the way in which collaboration is to be achieved. Thus we can think of categories of research infrastructure as comprising:

1.	Institutional, local level infrastructure
2.	Project infrastructure
3.	Integrated national facilities infrastructure
4.	Systemic or strategic infrastructure
5.	Landmark infrastructure

Lest these terms be unfamiliar, an example of landmark infrastructure might be the CERN facilities in Europe, or proposed Square Kilometre Array (telescope) for the Southern Hemisphere, and so on.

With each of these forms of research infrastructure comes the question of support. Quite often in the past the focus on that support has been a financial focus. Indeed computer scientists whose specialism was high performance computing in times past, were preoccupied with winning the argument in their various arenas for investment in computing which far outstripped any other kind of investment in their institutions or disciplines, often to the disbelief and puzzlement of others. But more recently, there has been a broader recognition of a long standing problem, namely, the need to make an increasing investment in a range of skills which will assist researchers to take up the tools becoming available in their field, and/or to change their behaviour in relation to the application of those tools, most particularly in the area of data and its management.

But I don't want to focus overly on the data deluge issue. That's been well canvassed in the library world at the moment, although being well canvassed does not necessarily mean being well catered for, and the extent of the challenge is a little more familiar to those who work in libraries to define. Instead, I would like to turn this brief discussion towards the issue of other tools and the extent to which they demand new literacies in research communities and those who support them.

Defining the New Literacies

As the world of published information has become more complex, more diverse, libraries in our universities have sought to meet the challenge of explaining to the broader academic communities how the increasingly bewildering array of knowledge artefacts fit together. One term generally accepted and used frequently in the library world is “information literacy”.

But in many of our institutions there has been a triple challenge for some time, and I will give the example of my own place, the Queensland University of Technology (QUT) to illustrate this.

So as the use of ICT became more embedded in our teaching and research, and as our own students increasingly were affected by the digital revolution, we started to think of this triple challenge. One of these was to understand what our responsibility might be to provide technical literacy of different kinds. Thus, libraries found they were wrestling with this as they sought to consider the limits to, or the boundaries around, the extent to which they felt a new duty to explain the internet and its navigation to users, and therefore the extent to which that in turn requires some kind of technical understanding. But many colleagues also got involved in a challenge which computing and IT services departments found very difficult, which was the extent of general competence in terms of the use of basic tools in computing environments, and in particular the issue of the adequacy of standards, in an attempt to try

to manage the challenge of the education of those who needed to use these. The development of the Computer Driver's Licence approach was one manifestation of this.

So one of our challenges that generated a good bit of preoccupation in the 1990s was "technical literacy".

An existing challenge in addition to that described by information literacy, was the oldest of all, the question of academic literacy, for as our institutions grew and have gone through growth periods at different times, ie the so-called massification of higher education, the arrival of large numbers of people with surprising gaps in their capacity to understand some of the essential requirements of being a student, let alone go on to more sophisticated levels of scholarship, threw out new challenges in this area of "academic literacy".

This is not the place to go into the increasingly larger discourse involving these terms, these three literacies, technical, academic and information. The question that arises is the extent to which libraries and professional staff who work in them have a legitimate concern with any or all of them.

Indeed many libraries in our Universities have felt the burden of expectation relating to taking some part in the improvement of technical literacy.

In most cases libraries have some kind of much clearer commitment to the advancement of information literacy.

And in some further cases, the library has ended up being the natural repository of service and advice in the area of academic literacy also, with at least part of this attributable to their role as a service location in the university which can be approached by students wanting discrete and independent support. Indeed in my own case at QUT there has been a deliberate integration of effort between a teaching and learning support group of specialists and an existing information literacy support group in the library, and I can report that as of this year this service is now an integrated service within a library setting (more on this can be found at the QUT ePrints repository, for example, [Peacock, 2008].

A New Literacy, eResearch

The number of technologies available to assist the way research is carried out using the newly developing research infrastructure is proliferating. One of the issues in this space is the layering of the relevant skills and knowledge, such that the closer you get to the tools used in the specialist discipline, the more you would argue that the researchers themselves, or their research assistants are the ones in whom the relevant literacy should reside. In some disciplines this would simply be taken for granted, but in others it may not be the case, and in any case there may be a requirement for someone who is arriving rapidly in a new field (something which happens more as researchers find themselves taken down unplanned paths in their own careers), need this sort of support.

So for example as collaboration itself develops, it can be a requirement that staff involved in the relevant research area will need to become familiar with web based collaboration environments, real time collaboration tools and content management systems.

In some research fields, knowledge of the relevant compute tools is also important, whether in terms of a general trend such as virtualisation, or the availability of services from new hosts, as in cloud computing, or in developing familiarity with scientific workflows and workflow tools, or understanding the way that autonomous devices using sensors, cooperatively monitor various environments to feed research. For example the National Science Foundation has produced a particular report into what is called the "sensor resolution" [Waldrop, Lippel, 2008].

As researchers themselves need to collaborate, they will to some extent need to be familiar with federated access. Libraries involved in supporting such communities will need to have some degree of understanding of the way such access mechanisms work. This is a new field right now, and technically and in management terms not without its significant challenges.

And finally in the area probably most familiar to libraries engaged in this thinking is the issue of research data management, responsibility for digital repositories, the consideration of distributed and hierarchical storage management systems, ways of dealing with metadata, and the impact of the development of the semantic web.

Workforce Skills in the 21st Century University Library

We have a problem. That problem is that we have arrived at a place where the diversity and the sophistication of the knowledge required to provide the best possible advice on the use of these tools is almost beyond us.

It's not that policy makers and some university and government resource managers are unaware of the problem. But it can be the case that as with other aspects of ICT development in the last 20 years, it is very difficult to explain the importance of mastering the new requirements and its relevance to the solving of large scale environmental scientific and social problems and a sense that even when we do, it is not in a sufficiently timely way.

In some cases the relevant specialist knowledge comes from the rather narrow base of ICT professionals whose interest has been in the field classically described as calculation intensive computing. In other cases skills may develop in research assistants whose initial orientation is the discipline, but who must necessarily master new techniques in order to be usefully deployed in their roles.

Probably most people here will have encountered staff who have had to engage with the requirement to develop new knowledge in the context of new ways of doing research.

The issue that this paper intends to flag is the extent to which library directors and their immediate lieutenants are aware of the possible new and emerging vacuum which libraries might assist to fill.

This is not to argue for one moment that solving this extensive skills deficit issue should fall on the shoulders of libraries more substantially than anywhere else. Indeed if there is a standard portfolio within the university where one might point the finger, it would be those areas that are responsible for the research management function within universities. But, generally speaking, our libraries have responded over the last two decades to a variety of challenges, (some of them exaggeratedly and repeatedly involving the claim that the condition of libraries was terminal). It has been demonstrated again and again in different jurisdictions that the requirement for a service that knits together resources and skills to help improve the experience of teaching and research has been repeatedly supported and demonstrated by libraries as they have evolved.

The question for now is - to what extent do libraries deliberately identify and embrace the possibility that they should employ in their workforce those who are best able to support at least to some level of specialism the rapidly developing suite of online tools needed to support the advancement of research.

Probably the area where there is the greatest agreement that libraries have a distinct role to play, is in the issue of data management and curation as this develops as a set of issues at the institutional, regional and national collaborative levels. Indeed in many countries this has been recognised to the extent that there are initiatives that span institutions that are designed to advance thinking and good practice in this regard.

But I argue that to think about data and its management from the point of view of a traditional conception of libraries and their role in our universities is not much of a stretch. Conceptually it fits easily. In conversations in my own institution we have been quite ready to see that this is a natural thing to do.

What, further than the challenge of data and its management might libraries contemplate for their future role in this? Should library staff roles be specifically and explicitly nominated to be research facilitators, and in doing so acquire and be trained in skills that are much more aligned with IT capabilities and knowledge? How "surface" should these skills be? Furthermore, does this become an issue for schools of library and information science (ie the educators), at both undergraduate and postgraduate levels?

I think the answer to these questions is yes, although there will be variations in different institutional settings. In some universities relationships that are forged between research support groups in IT, especially central IT, and libraries are already quite healthy, but in others they are non-existent. So if there is a prescription for action arising from the thoughts in this paper it would be that university libraries should consider the following points of action:

- Opening dialogue with IT support groups about meeting skills deficits amongst researchers within discipline areas.

- Defining and considering a range of skills and knowledge in supporting research collaboration and computationally intensive research, and agreeing which of these should be addressed. (There are too many to attempt them all).
- Arising from the above, considering the recruitment of new forms of skills, or the extent to which existing staff may be able to adapt. The answer to this will be highly localised, and depend on the range of existing skills and the capability of the library to move into new recruitment.
- Above all, maintaining broad and active channels of communication with the area of university responsible for research support, as a partnership with this area is essential for everything else.

These are not easy topics or problems to solve. There will not necessarily be agreement within institutions about the order of challenge in the first place, let alone who should meet it. In some institutions the library will already be in a healthy position to support such research, in others it may not be. But the issue which library professionals should discuss together, with some urgency, and the one that needs to be met as a higher order challenge, is the extent to which the library workforce might need to demonstrate an ability to absorb, (and resource), the skills needed for other forms of proactive engagement with research teams and partners in the provision of research infrastructure into the next decade of the 21st Century.

No doubt we will look at that differently in our different institutions, and a lot of the answer will depend on the extent to which the library is already regarded as leading the way in new thinking about how our academies function. I would argue that just as libraries have got a surprisingly sufficient role to play in changing the way that research findings are accessible and sharable, (ie in the open access arena), so too can they make contributions in this area which will stand them in continuing good stead.

In general terms libraries within universities have succeeded over the last two decades in being recognised as innovators, and both supporters and leaders of greater productivity in the academic enterprise. The challenge that this paper has briefly described is, in the twenty-first century, the same as the development of electronic publishing in the 1990's. That is, there is confusion and uncertainty about what exactly it will mean and how we might change, but a conviction that knowledge and skills must develop to meet it.

References

Australia. Dept. of Innovation, Industry Science and Research (2008) *Strategic roadmap for Australian research infrastructure* Retrieved March 5, 2009 from

<http://www.innovation.gov.au/ScienceAndResearch/Documents/Strategic%20Roadmap%20Aug%202008.pdf>

Peacock, Judith A. (2008) *Not yours, not mine but ours: integrating learning skills for integrated learning*. Proceedings "Dreaming 08", Australian Library and Information Association (ALIA) Biennial Conference, Alice Springs.

<http://eprints.qut.edu.au/14427/>

Waldrop, M.Mitchell, Lippel, Philip (2008) *The Sensor revolution: overview* Retrieved March 5, 2009 from http://www.nsf.gov/news/special_reports/sensor/overview.jsp