

## **The Science of Information Management in a Converging Information Environment**

by Norman Wiseman, University of Nottingham

### **Introduction**

- 1 There is growing convergence in the nature of the resources required to support e-science and e-learning in universities. 'Traditional' resources are still needed to support learners and researchers, though many of these are now being created in or converted to digital form.
- 2 Universities and research organisations themselves are increasingly becoming e-businesses. The expertise in information management already available in the sector to support research and teaching can be leveraged to support institutional information.
- 3 The development of information management as a science must be cognisant of all these developments and must work with initiatives that are exploring e-science, e-learning and e-business towards a common, interoperable set of systems and architectures that is as ubiquitous, pervasive and therefore as successful in driving forward the knowledge environment as the web was in providing access to information.
- 4 The challenge for the science then is to develop a more holistic view of the way in which the role of the digital library will develop over the coming decade. Where earlier digital library initiatives have, quite reasonably, sought to understand and utilise technological advances to extend existing practices or offer access to new media, future initiatives must explore how to develop new paradigms and new approaches that are inclusive and comprehensive for all manner of digital resources.

### **The Current Position**

- 5 There are four key areas where activities need to be focussed to achieve this:
  - Infrastructure – the networks and services required to provide access to resources with appropriate levels of security and privacy
  - Data Custody – the long term curation of 'traditional' and born-digital resources
  - Research into presentation, description, identification, access, retrieval and use of data resources and the scholarly publishing process
  - Support for the researchers, students (and possibly the general public) in obtaining the skills, advice and visualisation tools needed to use the data and advice on the legal and cultural issues associated with using digital resources.
- 6 At the present time there is a substantial body of work taking place in the development of the underlying infrastructure that is needed to support access for delivery of resources. There is a need for consistent, interoperable systems and applications at this level that the other three areas of work can rely on. Internet2, TERENA in Europe, SURF in the Netherlands and the JISC in the UK all have programmes in these areas and there is considerable cooperation between them. New requirements identified from the other three areas need to be fed into these organisations to ensure that their activities support or complement the needs of information management.
- 7 There are many separate programmes investigating the issues of long-term access to digital resources but there are also developing requirements that will have to be addressed. The Atkins report, for example, pointed out the need for trusted repositories that will have the ability to preserve data over long periods, and also a role in educating scientists, engineers and others in identifying and preparing material for preservation. The current DLI is funding research into digital preservation, as is the JISC and the UK-

- based Digital Preservation Coalition. The JISC has also recently commissioned research into digital curation and is setting up a centre for the UK. However there needs to be greater emphasis on this area in future as an essential aspect of information management. The reluctance of those funding or carrying out research to divert funds into this activity is freely acknowledged but attitudes are unlikely to change without a better understanding of why it is necessary, how such curation can be carried out and the economic models to support it for the long term.
- 8 The information management profession has centuries of experience in dealing with the curation and management of resources of all kinds. This experience needs to be harnessed and evolved to support universities in dealing with the new issues that will arise as a result of advances in technology, in new legislation and in cultural changes. Copyright, intellectual property rights, archiving, records management, increasing trends to freedom of information are affecting all aspects of research, teaching and administration of institutions. Ensuring that these issues are addressed, sharing experience and expertise, and leveraging the skills in the profession to meet the challenges is an important issue.
  - 9 The current digital libraries programmes around the world have been successful in driving forward the development of digital libraries, and an understanding and appreciation of the issues involved in their management within the library community. There are still many problems to be resolved over the cost of resources, the scholarly publishing process, intellectual property rights, copyright and the creation of digital resources. There is growing understanding of the issues associated with new types of digital resource – still and moving images, audio and 3D representations – and more research is needed into searching, delivery and use of these resources. An important area of research is cross searching of multiple resources to identify useful resources that are not obviously inter-related.
  - 10 The real challenge here is to develop an appreciation of the common issues that will enable effective management of both traditional library resources and digital resources to provide for the needs of the next generation of researchers, teachers and students. The recent Research Support Libraries Group study into the needs of research libraries in the UK ([www.rslg.ac.uk](http://www.rslg.ac.uk)), for example, seemingly failed to appreciate the profound changes that E-Science developments will bring to the needs of scientific researchers. Research into more imaginative roles for librarians and information managers in the digital library of the future will stimulate common approaches to developing and disseminating appropriate procedures and practices for the new environment.
  - 11 An area that is perennially overlooked in research and development programmes is how to maximise their impact on potential users and stimulate take-up of the opportunities that they offer. Research is needed into the skills needed by researchers, teachers and students to make best use of resources available. Techniques for embedding information seeking skills in students, through e-learning where appropriate, have to be identified and understood. New tools for visualising the information that will become available in the new environment area also needed. All of this is especially true for disciplines that currently don't, but potentially could, use the new techniques. For example, the JISC is about to launch a service in the UK to provide education and stimulate the use of the new e-science opportunities in social science. A key part of any new initiative should involve exploration of other disciplines that have the potential to benefit from the new advances and to encourage them to exploit the opportunities.

## **The Outcomes**

- 12 An integrated approach to all of these activities, linking information management initiatives in digital libraries with e-science, e-learning and e-business is needed in order

to maximise the benefits that the developments can bring to all areas of university business and to minimise duplication or, more seriously, the development of different approaches in different disciplines, or between education and research activities in universities. However some investigation is also required into how strategies for information management can be united across the various interest groups within institutions.

- 13 If such an approach can be made to work then the benefits will be substantial. Students will graduate with a sound understanding of the principles and techniques of searching, assimilating and using resources in research. Teachers will be able to re-create interest in science and engineering in students through innovative and exciting learning programmes that can utilise resources and present them in new and challenging ways. Researchers can access resources efficiently and effectively, keep up to date with work in their fields, communicate with colleagues and peers and make their published results available widely. Many disciplines that currently have little interest in the grid or digital resources will identify new opportunities and be able to use the new techniques in novel and innovative ways.

### **The Vision**

- 14 At the centre of all this will be the evolving science of information management, creating and managing collections of resources that are a hybrid of traditional, digitised and multi-media material, curating them indefinitely and providing essential advice on storing, searching and retrieving information to scientific, engineering and other disciplines.
- 15 Many technologies, especially the web, developed by education are later adopted by commerce and then by the general public. A common environment for accessing information more effectively and in new ways can be expected, in several years time, to have a similar impact to the widespread adoption of the Internet has had recently, but with the added benefit that it will enable users to have more knowledge and understanding, not just more information. However the principle threat to this vision is the absence of a single, universal model, as with the Internet. Only through intensive collaboration with all the other areas that have an interest in accessing electronic resources, on a global basis, will the goal be achievable. Universities have a unique role in being able to realise such a vision first and setting an example that others will follow.
- 16 Such a ubiquitous environment, built on a solid base of information management science has the opportunity to benefit more than just the industrialised nations. Access to resources, participation in e-science and e-learning and the ability to benefit from the research and experience of the pioneers will be a significant lever to developing nations moving into the digital age. The ability to transfer a single, consistent environment into those areas of the world that can least afford their own development programmes must be a major long term goal for any new, global initiative.

Norman Wiseman  
JISC  
UK