

Evolution of the digital library: making access seamless

**Lucy Peachey, Leith B. Woodall
Dorothy Hill Physical Sciences and Engineering Library
University of Queensland**

Abstract

University libraries have a long tradition of cooperative liaison with engineering schools and faculties. Whilst continuing to provide university students and scholars with access to study spaces, textbooks and computers, libraries have been quick to adopt new technologies that enable digital access to information from anywhere at anytime. In response to user demands, traditional services are still being offered, but they are augmented by new services such as: SMS alerts and messaging to mobile phones; PDA information access for remote and clinical students; and online chat and email help services. Seamless access to electronic journals and books, as well as e-research has revolutionised information seeking and delivery.

As engineering education becomes more globalised, clients are no longer confined to offices on campus. Library clients can be found in different countries, on mine sites, in corporate offices or on home computers and emerging technologies such as open access initiatives, wikis and gateways are providing information resources to the client's desktop, anywhere at any time. Even for those based on campus, physically accessing the library is a fading tradition with a wealth of information resources accessible directly from their computers. The library has adapted to these changes, ensuring access to collections and services are available electronically where possible. This digital evolution and the current electronic innovations in service and information delivery are discussed in the following paper.

Introduction

The term digital library has been used extensively to describe anything from electronically delivered services to digitised collections. Some have attempted to define the digital library.

“Digital libraries are a set of electronic resources and associated technical capabilities for creating, searching and using information. They are constructed, collected and organized by (and for) a community of users and their functional capabilities support the information needs and users of that community.” [1]

“The term ‘digital library’ serves as a convenient and familiar shorthand to refer to electronic collections and conveys a sense of richer content and fuller capabilities than do terms such as ‘database’ or ‘information retrieval system’.” [1]

At the University of Queensland Library, digital services and resources have arisen in response to user needs and as the technology has developed. Our perception of the digital library is a combination of electronic resources and services, where services are readily accessible via the Internet [2]. This perception allows for the continuation of print resources, walk in access and face to face contact.

*Proceedings of the 2005 ASEE/AaeE 4th Global Colloquium on Engineering Education
Copyright © 2005, Australasian Association for Engineering Education*

“Vastly more information is used outside the library than in libraries” [3] and some universities around the world are working towards complete digitised collections. Drexel University has few print journals and University of California libraries, like many others worldwide, have begun cancelling print subscriptions when an electronic version exists [4].

All libraries have attempted to make the access to electronic services and resources as seamless as possible. Many users are not aware that the fulltext electronic information they have accessed through the Internet or via a database, is possible because of a paid subscription from the library to that resource.

Our Users and Environment

Academic staff members and students are no longer confined to the campus. Library users can be found in city offices, home offices, remote communities, mine sites and on overseas work experiences or sabbaticals. Queensland is a large state in Australia and, at the University of Queensland, the distribution of the staff and student population is not just limited to the state but extended to other parts of Australia and even overseas. There are medical students in remote communities and on rural placement (from Toowoomba to Rockhampton); there are research centres set up on various Queensland islands, for example, Moreton Bay Research Station and Heron Island Research Station; and students studying veterinary science can be located at Goondiwindi (a remote town in western Queensland).

The student and staff distribution of the UQ School of Engineering (SOE) reflects that of the overall university. The award winning Undergraduate Site Learning Program is “an innovative work-based learning program that enables final-year engineering students” [5] to be placed in professional jobs whilst simultaneously undertaking studies. The students can be located in Brisbane-based companies or spend weeks on remote location and mine sites. Many staff and researchers in the SOE are also located outside of Brisbane, working on mines, travelling interstate and working off-campus. The Centre for Hyersonics (<http://www.mech.uq.edu.au/hyper/>) is based on the main campus at UQ but the staff travel interstate, for example, to launch their scramjets. Many past and current students have liaised with the library whilst undertaking research or studying in, for example, France, Scotland and the USA.

Despite this varied distribution around the country and the world amongst university staff and students, the obvious trend amongst academic staff and researchers is their increased use of resources from their offices or laboratories. This situation has steadily risen with the introduction of digital services and resources. Clients no longer need to enter the physical library to use its services and information resources.

All official communication with students is by email as “all students will be issued an official University of Queensland account. This email address will be used by The University of Queensland for the delivery of all official University email” [6]. This requires that students will have some computer literacy skills and have access to computers with email capacity. The Library at UQ acts as a safety net to those students who do not have a computer at home and by providing them with access to computers and software in the library sites.

Many students today are time poor. They undertake fulltime study whilst attempting to hold down part-time jobs. In engineering schools around the world, the students are renowned for having the most contact hours on campus. Most engineering students undergo continuous

assessment and have little reprieve at exam time. Digital access allows them to make use of library resources at times that suit them best.

Internet use in Australia continues to rise. The total number of Internet subscribers in 2004 was 5,741,000, this was an increase of over 10% from the previous year (5,211,000) [7]. The amount of data downloaded showed an increase of 72% between the September and March quarters of 2004 [7]. More Australians are relying on the Internet as a source of information.

Humble Beginnings

Locating and retrieving information has drastically changed over the ages. We have moved on from the days where collections were under lock and key and only the librarian could access the books. Users relied heavily on the knowledge of the librarian to know what information was held and where it could be located. With the introduction of the card catalogue and then microfiche catalogues, users could independently locate information for themselves, though by today's standards, with severe limitations. Searches were generally by subject, title or author and left little room for error – the user needed to be quite exact. Print indexes, containing citations and references to information sources, for example Engineering Index, also provided limited opportunities to retrieve vast quantities of results. At times they were too complex for novice users. Users often had more luck browsing the shelves.

Online catalogues were introduced in the eighties. A little more cumbersome than today's model, but nevertheless provided new opportunities of accessing information. Print indexes also became available electronically and continue to be updated and improved today. Improvements to these indexes have included fulltext availability of journal articles, cross-linking to library catalogues and other electronic resources, and access outside of the library.

The role of the reference librarian has changed in the digital environment. They have emerged from the shelves and when online databases were first evolving they became experts in online searching [8]. Librarians are redefining their role in the digital age, where to many users it appears that all information is easily sourced on the Internet. Librarians have become teachers – providing expert skills in sourcing information from subject databases and not just limiting the search to Google. Librarians now have become marketers and inventors – constantly developing new services in an environment where staff and research students work from their offices or laboratories. Marketing the resources and services has become essential.

Many feared the digitisation of library collections and information resources, whereas some thought that digital libraries would revolutionise the way we worked, researched or studied, and that a paperless office would be the result and many would lose their jobs. However, there has been no apparent decrease in the amount of paper being used. Users still like to print their articles and most libraries around the world can still boast about large print collections (even if only monographs).

Digital Developments

Depending on which definition of a digital library one uses, virtually all university libraries have become digital with access to electronic content and services. Aside from catalogues

and databases becoming available electronically there has been considerable development in the provision of services via the Internet.

More library services are now available electronically than not. Previously, staff and research students were required to physically enter the library to request document delivery services. At the UQ Library print requests are no longer accepted and all document delivery requests are submitted, processed, managed and stored electronically. Other electronic services include online help via email and through online chat capabilities, notification of overdue loans and recalls, book renewals and bookings (for rooms and information skills classes). Some university libraries have even adopted 24x7 (24 hours a day, seven days a week) help services in collaboration with partners around the world. QuestionPoint from OCLC (<http://www.oclc.org/questionpoint/about/default.htm>) and 24/7 Reference (<http://www.247ref.org/index.cfm>) have developed the software that enables 24x7, real time online chat, to provide answers to clients queries.

Client use and adoption of electronic services and resources is varied. Much depends on the previous computer and library use of the individual, their previous use of online services and the availability of non-electronic services. So acceptance of the digital library is mixed. Many students are searching Google as first choice and have been doing so through high school. Engineering students are generally technological savvy and computer literate, though this does not automatically translate into information literacy.

'I found it on Google' is the catchcry of many university students. When marking some annotated bibliography assignments for 4th year engineering students, one of the authors found that many students used Google before any library resource to find suitable information for their theses. On the occasion when searching Google, students can be linked to fulltext information but only because the library has a current subscription. Many students are not aware of this seamless access to the electronic fulltext copy.

More information than ever before is available digitally. Conference papers can often be found on the web; subject gateways are available for easy location of valued websites; a digitised library of pictures from around Australia is available via PictureAustralia; and statistics can be easily sourced from databases including Ausstats [8]. Electronic journals though at first not accepted as scholarly resources are now the preferred format by many academics. Some university libraries are now shifting to all electronic journal collections, for example, Drexel University, University of California and Oxford University [4]. Cancelling print subscriptions should always be done in consultation with their clients. It can be detrimental to the ongoing relationship with the community of users if they are not consulted.

Present Reality

The present reality of the digital library is a combination of electronic and physical collections and services. Over the last few years several academic libraries have undertaken new projects to trial and implement products and services in response to the available technology.

One recent technological achievement in libraries that has been successfully introduced is e-print archives and journals, using open access initiatives. The archives provide a searchable database of research output (electronic versions of papers) from a particular institution or from a particular organisation. Great success has been achieved with professional groups

Proceedings of the 2005 ASEE/AaeE 4th Global Colloquium on Engineering Education
Copyright © 2005, Australasian Association for Engineering Education

such as Los Alamos Physics and their arXiv e-Print archive (<http://arxiv.org/>). The collection of e-prints varies from archive to archive and can include peer reviewed, preprints, unpublished, full articles, book chapters and more. Some variations are dependant on the copyright and licensing requirements from particular publishers. Some publishers will only allow pre-print versions of papers to be deposited and some will allow post-print as long as it is not the publishers version. However, one thing that is in common is “the aim of the archive is to make research freely available in full text, for anyone to use” [9]. Though many archives faced limitations when they were first introduced because of copyright and publisher restrictions, over the last few years many publishers have changed their policies on what is permissible.

At the University of Queensland, a well developed and operational archive is in place and was part of a Group of Eight (<http://www.go8.edu.au>) initiative. ePrints@UQ (<http://eprint.uq.edu.au/>) has been warmly adopted by many academics around the university. It has been a model that many other Australian universities have followed. The success of such archives has also been possible because the archives are Open Access Initiatives (OAI) compliant (<http://www.openarchives.org/>) and can be harvested by search engines such as Google, making the e-prints more visible. Currently there are nearly 1800 papers archived and more than 1600 academics and researchers are indexed in ePrints@UQ.

Similarly, digital thesis collections have also been universally adopted. In Australia the program is called ADT (Australian Digital Thesis) <http://adt.caul.edu.au/>. Nearly every Australian university has deposited theses in this digital collection. Some institutions have made it compulsory for all new graduates to submit an electronic version of their research and higher degree thesis and deposit it into the ADT. ADT utilises the deposit process software first developed at Virginia Polytechnic Institute <http://etd.vt.edu/>.

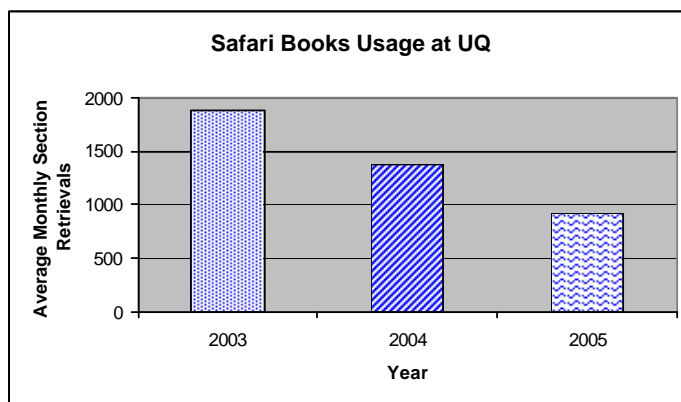
There is no argument that university students love their mobile phones and especially using SMS, so finding ways to utilise this communication tool has been an interesting challenge. At Curtin University Library (<http://library.curtin.edu.au/>) in Perth, Western Australia, SMS messaging is being used for library queries (<http://library.curtin.edu.au/contact/sms.html>). Students can send a query to the library and will receive the answer on their mobile phone. At the University of Queensland Library a recent trial of SMS messaging was undertaken. SMS messages were sent to a pilot group of 100 staff and students about overdue, recalled and hold items. The trial was successful and await full implementation once a university-wide communication strategy is finalised.

The use of Personal Digital Assistants (PDAs) for information access was successfully trialled with medical students. The trial was run by the Rural Clinical Division, School of Medicine and the University of Queensland Library. Nearly 100 PDAs were given to students on rural placement (medical students in remote locations). At the end of the pilot phase the students were surveyed and found “that the PDAs were most used accessing a wide range of resources, including academic timetables, contact details, clinical facts and drug data” [10]. The School of Medicine and the Library continue to work with students to develop more services and resources that can be used on the PDA.

Despite the advantages of using such Internet search engines as Google, students need to be aware that the information they find is not always scholarly. Google Scholar has somewhat changed this but still many students are information illiterate and have difficulties in

distinguishing the source and quality of the information. Librarians and teachers still fight an uphill battle in training students to authoritatively evaluate what they find on the Internet [8].

E-books have not revolutionised the way we read. Many libraries have collections of e-books but the number of print titles still far out weighs those in electronic format. Though the number of e-books might increase each year, their use has declined. At the University of Queensland, the use of the Safari collection of approximately 100 e-books has steadily decreased since the initial subscription (though the average for 2005 is only based of the first quarter of the year). One could speculate on the reasons for the decline but without quantitative analysis the answers are not clear.



Where to now?

Libraries and librarians continue to seek new opportunities to utilise technology as it advances and improves. As noted before students love mobile phones. The new generation of mobile phones will continue to have ever more connectivity. Students will be able to plug their mobile phone into a computer and download files to use elsewhere, as can currently be done with memory sticks (or USBs).

Many universities and libraries have already deployed wireless access on campus. Some have only introduced it within the library. iPods will be the next generation Personal Digital Assistants (PDAs). Several universities have already started to trial the use of iPods. For example, at Drexel University 30 students from the School of Education will be able to download information on orientation and courses from an iPod [11]. Other uses for the iPods within the university and library environment include distribution of music scores, audio copies of lectures, instruction on database use, distribution of audio books and countless other innovative ideas [12].

“The lack of interoperability is one of the significant problems facing digital libraries. One major objective of digital library interoperability is to provide a unified search interface.” [13] Federated searching, is the ability to search across different electronic collections of information resources from a single search engine. This saves the user time as they do not have to consult several different databases or catalogues. The Networked Digital Library of Theses and Dissertations (NDLTD) uses a Federated Searcher to enable users to search several different collections of electronic theses [14]. It is hoped that similar tools can be

*Proceedings of the 2005 ASEE/AaeE 4th Global Colloquium on Engineering Education
Copyright © 2005, Australasian Association for Engineering Education*

used to search across the varied digital collections that an institution subscribes too, including the library catalogue, countless databases and digital archives.

Students continue to search Google as their first port of call. Google Scholar is paving the way for more scholarly retrieval of information and even in researching this paper the authors used this search engine with success. The next wave is the connectivity between union catalogues like Online Computer Library Center's WorldCat (OCLC <http://www.oclc.org/>) and Google. WorldCat is a worldwide catalogue of over 9,000 members and over 58 million records. After performing a search on Google, users will soon be directed to their own library resources.

Weblogs (or blogs) and RSS (RDF Site Summary) newsfeeds are relatively new technologies that libraries and information providers can adopt to deliver news and information to their clients. A blog is a webpage, in chronological order, updated regularly with topical content [15]. Their use in libraries is limited but can include lists of journal articles with annotations; information and directions to new and interesting resources; updates on the latest developments in IT and the library and information industries; feedback and comments service; and a news update service from the library [15]. RSS feeds are "content or headlines of weblogs or other news sites" [15] that are automatically loaded into webpages or emails. This enables the user to monitor a particular blog more efficiently. The potential use of RSS has yet to be truly uncovered.

Conclusion

Academic staff, postgraduate students and researchers have had access to the world's knowledge, for some time, through such services as document delivery and interlibrary loans. In the last few decades, libraries have increasingly provided their clients with a world of information through increased access to digital and online information resources and via access to the internet. The role of the library will essentially remain the same in the digital environment – "to identify, acquire, process, arrange and make available information" [8] however the format of the information and the services has changed.

Technology is not without its pitfalls, but it will continue to change the way we use and deliver information and library services. Copyright will continue to pose a problem as will internet use and regulation. However, libraries will continue to adapt to the changes in the technological environment and overcome limitations that they are faced with. As technology improves and changes so will the seamless delivery of library services and resources.

Bibliography

1. Borgman, C. L. What are digital libraries? Competing visions. *Information Processing and Management*. 35 1999: 227-43.
2. Moloney, K., Missingham, R. & MacKenzie, C. Portal for the people: a new access paradigm. *Australasian Public Libraries and Information Services*. 17 (2). 2004: 63-70.
3. Abram, S. The Google opportunity. *Library Journal*. 130 (2). 2005: 34 -5.

Proceedings of the 2005 ASEE/AaeE 4th Global Colloquium on Engineering Education
Copyright © 2005, Australasian Association for Engineering Education

4. Blitstein, J. Libraries cut many print publications. *The Daily Bruin Online*. (6/5/2005). 2005, viewed 17 May, 2005, <<http://www.dailybruin.ucla.edu/news/articles.asp?ID=33208>>.
5. University of Queensland. *Undergraduate Site Learning Project*, viewed 25 May, 2005, <<http://www.uslp.uq.edu.au/>>.
6. ---. 6.10.5 Email for Staff and Students. *In Handbook of University Policies and Procedures*. 2002.
7. Australian Bureau of Statistics. *Internet Activity 8153.0*. Canberra: ABS. 2004.
8. Limb, P. *Digital dilemmas and solutions*. Oxford, England: Chandos Publishing, 2004.
9. Weaver, B. Eprint archive - reaching critical mass. *Online Currents*. 17 (9). 2002: 4-8.
10. Heath, A. P., Kruesi, L. M., Lasserre, K. & Thorning, S. *Rural but not remote! Access in outback Australia. Report on the Implementation of Personal Digital Assistants (PDAs) for Medical Students*. Clinical Teaching Staff and Health Librarians at the Rural Clinical Division, School of Medicine, University of Queensland, Australia. 2004.
11. Read, B. Seriously, iPods are educational. *The Chronicle of Higher Education*. 51 (28). 2005: A30.
12. Stephens, M. The iPod experiments. *The Library Journal*. 2005, viewed 21 May, 2005, <<http://www.libraryjournal.com/article/CA515808#LibrariesGetPodcasting>>.
13. Liu, X., Maly, K., Zubair, M., Hong, Q., Nelson, M. L., Knudson, F. & Holtkamp, I. Federated searching interface techniques for heterogeneous OAI repositories. *Journal of Digital Information*. 2 (4). 2002.
14. Powell, J. & Fox, E. A. Multilingual federated searching across heterogeneous collections. *D-Lib Magazine*. (September). 1998, viewed 22 May, 2005, <<http://www.dlib.org/dlib/september98/powell/09powell.html>>.
15. Weblogs and RSS in information work. *Update*. (May). 2004, viewed 19 May, 2005, <http://www.cilip.org.uk/cgi-bin/MsmGo.exe?grab_id=233&page_id=12256512&query=weblogs&hiword=WEBLOG+weblogs+>>.

Biography

LUCY PEACHEY is a Liaison Librarian for the School of Engineering at the University of Queensland. She has worked in several different academic libraries throughout her career, at the University of Western Australian, Edith Cowan University and now the University of Queensland.

LEITH WOODALL is the Liaison Librarian for the School of Physical Sciences at the University of Queensland. She has previously worked in other academic libraries including the Radcliffe Science Library, Oxford and Griffith University, Brisbane.