

The Cybrary – seamless for the customer, fine needlework for the staff

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Abstract:

The University of Queensland Cybrary delivers high quality customer focused innovative information resources, services and programs that are integrated with and central to the University's teaching, learning and research activities. The Cybrary website - www.cybrary.uq.edu.au - enables customers to access information more or less seamlessly anywhere anytime. This paper will go behind the seams to discuss some of the technologies that underpin service delivery and some of the implications for the Cybrary's human, physical and financial resources.

The Foundation Garment - The University of Queensland Cybrary

The University of Queensland is a leader among Australian universities and is recognized internationally as a premier research institution. It is the largest and oldest university in the state of Queensland. It offers programs in a wide range of disciplines and at all levels. The main university campus is at St Lucia in Brisbane. Other campuses include a medical school, a dental school, Ipswich, a new campus located 40 km from Brisbane and Gatton located 100km west of Brisbane. In addition to its main campuses the University also has staff and students located on several farms and islands. The University has 29,000 students of which 20% are postgraduate and 5000 academic and general staff. In 2001, 92% of graduates were in employment - the highest percentage in Queensland.

The University of Queensland Cybrary (<http://www.cybrary.uq.edu.au>) is one of the largest academic libraries in Australia and the largest in Queensland. Over 2 million printed volumes are held, 19,000 videos, 18,000 journal titles of which 8000 are electronic, over 125,000 e-books and 450 databases as well as microform, manuscripts and pictorial materials. Links to learning resources are provided from the Cybrary website as is access to the Virtual Reference Collection, digitised exam papers, theses and other locally held electronic resources. It has 13 branches, largely discipline based and delivers service from over 20 staffed service points up to 84 hours a week. There are over 1000 workstations all of which have Internet access and each branch has an electronic multi-media learning centre, which allows hands-on training in the use of the wide range of electronic resources and services offered by the Cybrary. The branches are located on the St Lucia, Ipswich and Gatton campuses and in teaching hospitals.

With the increasing availability and use of electronic resources, the University Library believed that the term 'Library' no longer effectively described the resources and services it offered. It had moved from the book business to the information business so in 1999 it sought to reflect its e-volving role by changing its name to the Cybrary. The metamorphosis of the Library into the Cybrary was a natural evolution of library services. The paradigm whereby libraries connected scholars, who came physically to the Library to access society's printed recorded knowledge has changed to incorporate access to both the printed and electronic knowledge. The term Cybrary represents the integration of physical space and cyberspace in the delivery of library and information services. The provision of customer-focused quality services continues to be the driving force as articulated in its mission statement: *We link people with information, enabling the University of Queensland to achieve excellence in teaching, learning and research.* As Australia's first virtual Library, the University of Queensland Library has been recognized by the Australian Award for University Teaching in 1998 for its cutting edge information services and again in 2000 for its innovative use of IT support to students through its AskIT service.

The Cybrary uses a single interface - the Cybrary's website - to provide integrated access to its printed and electronic resources and services. The website was designed 'from outside in' to ensure navigational ease using customer focus group studies (Frost 1998). Usage of the Cybrary's website has increased rapidly with the homepage

currently receiving an average of 25,000 requests per day during semester. A reasonable number of requests are received on public holidays; for example, on New Year's Day 2001 over 900 requests were received. Usage statistics reveal that the majority of web pages are accessed via the homepage. For example 63% of requests to the catalogue, 79% of requests for the database page, 88% of requests for the course materials page and 76% of requests to the opening hours page came via the homepage. The website statistics also give details of when the service is used and a surprising number of uses occur outside of the long opening hours of the branch libraries. A recent customer survey asked the question '*How often do you access electronic library services remotely (i.e. not on library premises)?*' 61% of respondents replied that they used the services extremely frequent (indicating daily or 2-4 days a week), with only 13% indicating their access of electronic resources as extremely infrequent.

Made to Measure Technologies

A significant amount of effort and infrastructure are required to deliver the ubiquitous access that is the Cybrary's goal and the application of appropriate technology is essential to its success. The Cybrary is in fact a very large and heterogenous collection of disparate networked information resources. Some, like the Cybrary website itself and the 300-odd database products served from its own servers, are managed completely locally. Others are managed completely remotely by a large number of vendors throughout the world. Regardless of the source the goal is the same – to facilitate effective access to the information resource for all customers irrespective of their point of access to the network. There are, of course, some limitations to this goal that are not related to technological constraints. Licensing and other contractual and intellectual property restrictions must be adhered to and any access delivery mechanisms must be able to accommodate these requirements. If, for example, access to an online resource is contractually limited to a specific physical location (as in the case of a e-journal only being licensed for access from the particular branch that holds the print subscription), then it would be in breach of the license if wider access was allowed to that resource, even though it is technically possible to do so.

When customers access a resource through the Cybrary, there are three 'A's crucial to the success of the 'information transaction'. The first A is Authentication – the Cybrary must be able to determine who the customer is. Authentication refers to the process by which the user is assigned or claims an identity meaningful to the Cybrary's systems. This identity may be fairly coarse-grained; such that all that is known of the actual user is that they are using a machine whose network address is within a certain IP range (which may be then mapped to a specific geographic location, such as a particular branch library). Alternatively, the identity may be very fine-grained and correspond to an individual human identity, such as when the user is required to enter a username and password or other information that identifies them as a specific person. Once authenticated, the system knows something about who and where they are and is in a position to make some decisions about what they may be allowed to do. Then comes the second A – Authorisation. Once the user has been assigned or has claimed an identity, the system or systems can use the stored information about their identity and about the resources and services to determine whether that specific

identity has the right to use the particular resource or service that has been requested. If they do, the system can then attempt to give them the third A – Access.

The Cybrary can identify three main groups or categories of customer, based on their network location. The first group are those within the physical confines of any of the branches of the Cybrary. This group is attached to network segments directly under control of the Cybrary. The second group consists of all those at University of Queensland facilities outside the physical Cybrary. These include all the faculties, schools, departments, research units, residential colleges, staff and student dialup users, and any other affiliated groups and organisations attached directly to any of the University's other computer networks. The third group is everyone else. This group attaches to the network at points not controlled by the University – through commercial internet service providers, government, corporate, industrial or other networks, within Australia or international, with a link to the internet. It is of course quite possible, even likely, for a single human user to be a member of any and each of the three groups during the natural course of their day as they move between home, work and university environments. In the ideal information world of the Cybrary, this valid user should always be presented with the same seamless access to all the resources and services they are entitled to use – irrespective of which of the three network location groups they happen to be in at a given time.

Enabling seamless authentication, authorisation and access involves a great deal of invisible stitching by the staff as there are in fact a number of seams required to hold the Cybrary together and keep it working. There is much that is beyond its control. This was brought home most dramatically when the September 11, 2001 terrorist attack, which destroyed the New York World Trade Centre, took out some of Digital Island's network hardware. As a result, access was lost to some vendors sites (such as the major e-journal aggregator EBSCOhost) for some days. Other uncontrollable access interruptions can occur for much more prosaic reasons.

The Invisible Stitching

For the systems totally in its control the Cybrary seeks to provide a high degree of robustness. A good example of this is the Cybrary website itself. It is absolutely critical to its core business and therefore unacceptable that it should be susceptible to failure through any preventable means. Consequently, the website is served not from a single machine, but from a server cluster (of, at the moment, two machines), which provides for both load sharing and hot-failover. The load sharing is provided by DNS (Domain Name Service) round-robinning, whereby each successive request for the website to the University's DNS servers is resolved to the IP address of first one then the other server in the cluster. A heartbeat packet travels between the primary gigabit Ethernet interfaces every two seconds to facilitate hot-failover. If one machine goes down for any reason (which in itself would have to be fairly catastrophic, since each server has multiple UPS (Uninterruptible Power Supply)-protected redundant power supplies, network connections and RAID (Redundant Array of Inexpensive Disks)-protected storage), the other machine will detect the loss of heartbeat and perform what is colourfully described as a STOMITH (Shoot The Other Machine In The Head) manoeuvre. This means that it will take over the failed machine's IP address so that it can respond to requests on its behalf. This hot-failover capacity is useful not only in the essential robustness it provides to the Cybrary website, but it also allows

staff to easily take down each server in turn for any serious maintenance procedures that might be required - without interruption to service. The STOMITH manoeuvre is totally transparent to the end-user, who will not be aware that between one click on the Cybrary website and another they have actually been transferred to a different server. Updates and other editing of Cybrary pages take place on a third server, from which content is automatically synchronised to the cluster. This third staging machine can also serve as a backup web server in the very unlikely event of a total failure of the cluster. The Cybrary's servers are connected to the campus backbone (and from there the Internet) with three independently routed fibre connections to provide network redundancy.

The technology supporting the Cybrary is much more than just the website. Staff need to implement and maintain the systems that provide the authentication, authorisation and access requirements that will link the customer with the information they require irrespective of their network location. This, as can be expected, is easiest for that group of users located physically within the Cybrary as they are accessing the Cybrary from a machine on a Cybrary subnet. The Cybrary knows exactly where they are physically located, since all machines are allocated a specific IP address at boot time using reserved addressing on the DHCP (Dynamic Host Configuration Protocol) server. The Cybrary can therefore require them to use specific proxy servers and other gateways to access the Internet or other networks. This has many benefits – it means that the Cybrary can filter, block or provide access to specific resources or services as required on a per machine or per subnet basis. The use of local caches and cache hierarchies can be enforced to minimise traffic volume costs. Most importantly, because staff can control the IP addresses that are presented to remote vendors in the network requests for their services, the Cybrary can ensure that these customers can successfully access all the resources they are entitled to access - barring misconfigurations or other failures of remote vendors' sites or intervening networks. In this case, Cybrary technical staff will attempt to locate the problem and liaise with external technical staff to have it resolved as soon as possible.

The Cybrary can also ensure that these machines within the Cybrary are correctly configured with all the helper applications, browser plugins and other software required to use the online resources. Remote access software and the ability to reimage or rebuild these machines across the network help minimise the time required by workstation support staff to troubleshoot and resolve problems. A problem reporting and tracking database allows staff to prioritise problems and monitor service levels across all branches. An asset-tracking database provides management information on all facets of the hardware involved. These internal machines can also be connected to the internal network's application, file and print servers and can therefore access all the locally mounted resources made available through those servers.

The second group of users – those connected to non-Cybrary UQ networks can prove more problematic. Cybrary staff liaise constantly with customers (and particularly IT staff) throughout the University community to ensure that browser settings, firewall rulesets, proxy peering relationships, bypass lists and other network configuration issues are set and maintained correctly. Since this customer group (and the third one) are not able to connect directly to our internal network, any applications or other resources made available internally through that network must be made available to

these users through alternate means. In this case thin-client technology has been employed using Citrix Metaframe servers, which can provide this access to any authorised web browser which has the requisite plugin installed. This effectively integrates access to non-web-based online resources into the web-accessible Cybrary.

The third customer group – those using non-UQ network connections are the most difficult in terms of providing seamless access to resources and services. Since their IP addresses are not associated with the University - often being dynamically assigned and varying from connection to connection - other means have to be provided so they can access Cybrary resources. A URL rewriting proxy server product (Ezproxy) is used for this purpose. When a customer follows a link to the resource on the Cybrary website, the request is first sent to the Cybrary's Ezproxy server. If the customer's IP address is a known UQ address that should be able to access the resource directly, the request is passed on to the remote server and Ezproxy removes itself from the loop. If not, the customer is prompted to authenticate themselves to the Cybrary's authentication server. If they are successfully authenticated and are authorised to access the resource, the Ezproxy server will intercede with the remote server on the customer's behalf to facilitate access. For the rest of the customer's interaction with the online resource, their browser will appear to be communicating with the Ezproxy server. As far as the remote server is concerned, it is communicating with the Ezproxy server (which of course has a valid IP address authorised for access). The Ezproxy server handles any session cookies or other requirements of the communication on the customer's behalf. Ezproxy works by parsing all the web pages coming back from the remote server and rewriting any URLs it finds to prepend its own special access string before sending the page on to the client – hence the name 'URL rewriting proxy'. Other proxies provide similar services for online resources using non-web protocols. A Socks proxy server, for example, is used to enable access to online resources such as Scifinder Scholar, which use the Socks protocol for network communications. Customers in this group can also download and install the Citrix plugin, which will enable them, once sufficiently authenticated, to access those resources made available to them via the Metaframe thin-client servers

For those online resources that require a logon using some combination of username and password (sometimes in addition to IP-based authentication), the required username and password is wherever possible made available via the Cybrary website itself. Usually a link to the password appears next to the link to the actual resource. If the customer can successfully authenticate to the Cybrary's authentication server when prompted (or if they have previously authenticated during the current browser session), they will be presented with the required login credentials. Although the ideal of a single signon which allows access to all resources is still in the future, the Cybrary ensures that its customers only have to remember one set of credentials – the ones they use to authenticate to the Cybrary's authentication server.

Currently, the Cybrary's Innopac system is used as the authentication server. PERL or PHP scripts are used to prompt the user for their credentials, which are then used to access their patron record via the Innopac's client API (Application Programming Interface) to authenticate the user and check for the appropriate authorisation. All such scripts are written with a modular or 'black-box' approach to the authentication server, so that any other authentication system can be plugged in as required. The University of Queensland has recently deployed an organisation-wide Kerberos and

LDAP (Lightweight Directory Access Protocol) based authentication and authorisation system. Cybrary staff are currently developing a system whereby a data feed from the Innopac system can be used to populate the LDAP directory so that this can be the 'black-box' handling the authentication requirements. Naturally, like much of the work behind the seams, this will all be totally transparent to the user, who will just see the same kind of authentication prompts with which they are already familiar.

Two examples of innovative uses of technology that are visible to the customers are in the e-learning and management reporting environments. The first is an example of how course material is presented and integrated with the electronic information resources. Cybrary staff developed a web page for a sports medicine module offered by the University's School of Human Movement Studies. The module is on sports injuries and the page presents the user with images of the human body. These images are basically image maps which can be clicked on to link to online resources related to injuries of the body part selected. For example, clicking on the elbow of the figure may link to online resources such as slideshows, other lecture materials or to a PURL (Persistent URL), which is actually a canned search of Infotrac's Expanded Academic ASAP that links to full text materials related to elbow injuries.

The second example is one related to the gathering and processing of ERL (Electronic Reference Library) usage statistics into useful, easily accessed information that can assist in collection management and other processes. The Cybrary manages two local ERL servers (both on Sun machines running the Solaris operating system), which between them serve some 195 databases to Cybrary users. Every night automated scripts are executed to extract the usage statistics from each server for each database and each ERL username. These raw statistics files are moved across the network to a Linux machine where they are reformatted and pumped into a MySQL database. This is a completely automated process. A web interface, written in PERL, is available to all Cybrary staff through the intranet web server. This allows them to query the ERL statistics database for such usage data as the number of successful or unsuccessful login attempts, maximum concurrent and peak use, number of queries, number of records transferred and other statistics for a specified ERL database or username in a specified period. The usage data in the database is current to the previous day at any time. Graphs in the form of PNG (Portable Network Graphic) images are generated on the fly to present the statistics in an attractive, easily interpretable form which can then be used for any purpose – both internally in, for example, making collection development decisions, and externally in, for example, liaison librarians' reports to their faculties detailing the use of (and at the same time marketing) Cybrary services.

Tailored to their world - Customer support

A PC opened anywhere anytime at www.cybrary.uq.edu.au and attached to even the best of 'made to measure' technologies will not necessarily ensure seamless and efficient and effective access to quality information resources and services. In the Cybrary it is also the highly skilled and knowledgeable staff as 'IT trouble shooters' and 'quality information filterers and trainers' who facilitate the ongoing excellence in service delivery to customers by ensuring that they are able to maximise the benefits of the many technologies and resources. At a time when 'disintermediation' appears to be more than just a 'buzz word' (banking, travel industries being just two examples) the human mediator is ever more critical in quality library and information

service delivery. Clare Gaudiani, President Connecticut College recently capped her closing keynote speech at the ACRL (American College of Research Libraries) national meeting in the US commenting that “people in libraries are the most important people in higher education right now: you are providing the ‘connections’ and ‘web of relations’” (Albanese, Bryant et al. 2001)

The Visible Stitching

The Cybrary has over 220 people on staff who all make a valuable contribution to creating and maintaining links to information for their customers. It is the customer support staff, however, and more particularly those who are involved at the frontline on a day-to-day level with the computer (technology) help and training and the information /reference (content) help and training that provide a human (personal) face to the customer who are critical in maximizing the Cybrary mission, that will be highlighted in this paper. This personal accessibility is acknowledged repeatedly by students in library, and more recently university wide surveys as a 'must-have' in today's increasingly complex and ever e-changing information abundant environment. The 'personal' does make a difference.

Computer (Technology) Help and Training

As the Library had demonstrated an ongoing commitment to equitable access and provided services focused on customers needs and was a major focus of student life on campus, it was asked to take over the University's internet helpdesk for students in late 1999. The Library completely remodelled the service, renamed it *AskIT* and launched it in early 2000 under the management of the Library Technology Services section with service points on the three campuses. Students were now able to contact the service by phone, email or face-to-face or access a range of help information via the *AskIT* website (<http://askit.uq.edu.au/>) which is linked from the Cybrary homepage. To successfully undertake their studies UQ students need to possess a wide range of IT knowledge and skills. A number of core student IT competencies were identified, these include basic computer skills (including use of computer peripherals and the operating environment), keyboard skills, file management, accessing/ browsing the Internet (including email and My.UQ) and using a range of software programs.

A teaching and learning program was created to develop these competencies and includes: -Working with Windows; Computing at UQ; Microsoft Office –Word, Excel, PowerPoint. Details of these programs are available from the *AskIT* website (<http://askit.uq.edu.au/ittraining/index.html>). More recently ASK *AskIT* drop-in clinics have been established for personalized point-of-need help and training. An interactive online package - Easy Tutor is also available via the *AskIT* site for self-paced learning and individual problem solving. An interactive program, QuikIT was designed to provide training on the Internet and the World Wide Web, including browsers, e-mail, newsgroups, chat, web programming and design.

The *AskIT* service has proved to be very popular, answering around 40,000 queries in 2000 (780 telephone, 1712 email, 37,518 face-to-face) and conducted 308 classes with 1,719 participants. The enquiries have ranged from software usage, disk and printing problems, email, my.UQ, mySi-NET and other network issues. Self help/reference materials – including FAQ's (both in print and on the Web) are

generated following regular analysis of the queries. AskIT's success was acknowledged by becoming a joint winner of the 2000 Australian Award for University Teaching (Institutional category) for its "innovative and practical approach to the provision of support services that assists the learning of students".

AskIT also offers a range of tailored programs in collaboration with individual departmental/school liaison librarians and their integrated information literacy skills training. This inter-connectivity is essential to reinforce to customers the critical differences between Information Technology and Information Literacy but also their very complementary nature.

In addition to providing support through the AskIT service the Library Technology Service (LTS) also manages the Library Information Technology Liaison Officer (LITLO) program, which provides a network of decentralized basic workstation support to all branches of the Library. This assists in overcoming many of the difficulties associated with a multi-campus university. Nominated branch staff (LITLOs) undertake a comprehensive and ongoing training program, which equips them with a basic understanding of workstation software and hardware, the network environment and trouble shooting techniques. The LITLOs provide first line support for IT related problems and communicate problems beyond their level of expertise to Library Technology Service (LTS). The range of problems is almost infinite - faulty network cables, incorrect printer devices, lost files, wrong proxies and so on.

Information/Reference Help and Training

Despite many discussions in the professional literature concerning the demise of the human factor in favour of the search engine in reference service, Lipow and others believe that the need for the human reference service -real time, interactive and personal help - is greater now than ever. (Lipow, 1999) Nardi in her keynote speech (June 1998) at The Library of Congress Institute "Reference Service in a Digital age" commented that much of what reference librarians do is 'information therapy' - helping information seekers figure out what they really need to know. This process she sees as an example of human intelligence, that when applied to a search/research problem cannot be replaced by a computer however smart, well thus far anyway (Lipow, 1999). This is well supported by statistics from the Cybrary information/reference service, which continues to be popular with 344,359 enquiries for the year 2000 (compared to 278,647 for 1998). These questions ranged from IT trouble shooting of 'fatal errors' and 'broken links' to complex and extensive research assistance.

The Cybrary ensures that highly skilled and knowledgeable liaison librarians (now often thought of as information navigators, cybrarians, knowledge consultants and advisers) offer face-to-face assistance at the Information desks in all branches across all campuses as well as by phone whenever the branches are open. This is supplemented with the email based 'Ask a Cybrarian' service and its extensive information skills training programs.

These liaison librarians also assist in the creation of, and ongoing maintenance of a significant range and number of help guides (both printed and web). Find Its are gateways to resources in particular subject areas (eg. Native Title) which direct the customer to getting started with relevant subject specific dictionaries /encyclopaedias,

how to find relevant books, journal articles using databases, Internet resources and specialised information. Further information on how to use some of the many resources is available in Use Its. Each Use It (eg. Web of Science) contains - a short basic "recipe" to get the customer started and step-by-step instructions. Increasingly to ease the customers navigational path amidst what increasingly is 'a hypertext maze' in Internet research, gateways or portals of quality evaluated Web resources are being created and continually updated. Examples of such gateways are the generic Virtual Reference gateway on the Cybrary homepage and collaborative efforts such as Australian Virtual Engineering Gateway (AVEL), AGRIGATE and WebLaw. A very recent example of value added human filtering was the identification of and linking to an information gateway on the US terrorism attack. This site linked from the Cybrary homepage was particularly useful as it provided links from a single interface to not only news and background information but links to terrorist legislation. This service was appreciated by both domestic and international students and served as an easily accessible one-stop information source amidst the subsequent media information overload.

Alan Bundy in his VALA 2000 paper "Drowning in Information, starved for knowledge, information literacy not technology is the issue" commented that fundamentally users are often lacking the understandings and skills to identify, locate, access, evaluate and use the needed information. (Bundy, 2000) Often users find 'something' and make do with that - convenience over quality. However, this mediocrity isn't good enough in an educational and research-intensive environment that embraces 'excellence' and a global knowledge economy that values 'information' that is the 'best information' as a highly prized commodity. Information literacy - that ability to access and use information effectively is highly valued by librarians (and by their profession) but with the growth of student-centred, resource-based, on-line, open, flexible, independent and lifelong learning, its value is increasingly being heralded by other educational professionals across many sectors, as well as community and workplace contexts with librarians being recognized as playing a very significant and essential role. In higher education particularly, the value of information literacy has been endorsed within many institutions both on a national and international scale as an essential 'graduate attribute' and enabler of essential lifelong learning. Promulgation of the Association of College and Research Libraries (ACRL) standards " Information Literacy Competency Standards for Higher Education" internationally with the Council of Australian University Librarians (CAUL) endorsed Australian adaptation; "Information Literacy Standards" has also given significant impetus to this very important educational and societal issue. The UQ Library Committee of the Academic Board endorsed these standards in 2000 as supporting the UQ graduate attributes.

For many years the Cybrary has developed and continually revises a range of information skills (literacy) training programs (face to face and online) for the changing and very diverse needs of its customers. These programs fall into 3 broad categories - generic, integrated tailored subject specific and discipline based. In 2000, 2475 classes were conducted for 40,355 participants. This was almost double the figure for 1998 and well up on 1999.

The generic program currently on offer throughout the year across all campuses covers:

- Orientation overviews with Tours and Surfing the Cybrary presentations;
- Getting started in the Cybrary – using the Library’s website including the catalogue;
- Going further in the Cybrary –using databases for finding information for your assignments; and
- Going further still - Using the Net for research - effectively identifying and using relevant Web resources

In collaboration with the Office of Postgraduate Studies an ongoing (and very popular) workshop series is offered called *Information Skills for Researchers and Postgraduates*. Extensive *Endnote* training sessions (including free software) are also provided for academic, researchers and postgraduates.

Classes are continually evaluated and reviewed for customer ‘relevancy’ with current developments for online modules to reflect and be complementary to the predominant face-to-face delivery.

Tailored integrated information literacy skills training opportunities are offered across all academic disciplines and increasingly so with the acceptance of the Cybrary as a true 'partner in learning'. It occupies a more integral rather than just a support role in the 21st century educational and research-intensive environment. Classes currently range from one session to structured sequential sessions in flexible delivery modes. Examples include:

- CERD1001 - Information Access and Communication - a compulsory first year course for all internal and external NRAVS (Natural Resources, Agriculture and Veterinary Science) students - the information skills component is presented in WEBCT with assessable quiz and supplemented by hands-on tutorials.
- ENGG1000 - Introduction to Professional Engineering- information skills component in compulsory first year problem based learning course for Engineering students. It is run in first semester, presented in WebCT, supplemented by face-to-face classes.
- Graduate Medical Course - information skills component integrated into GMC years 1, 2 & 3 closely linked to clinical problems students are addressing in their problem based learning course. Assessable with exam and literature reviews.
- LAWS1000 - Torts A and Legal Method - Legal research skills integrated into a compulsory first year course for all Law students. Face-to-face classes delivered in first semester and assessable with research assignment.
- Social Work and Social Policy - information skills component offered as a series of workshops delivered in WEBCT and face-to-face to students in years 1 to 4. Intensive information skills workshops are tied to 2nd year subjects and students are required to complete assessments to demonstrate skills learnt.

Discipline based sessions are offered (often as lunchtime sessions) throughout the year, for example -

- Evidence-based Nursing: Using the Cybrary to Find the Evidence: Discover the broad range of evidence-based practice resources (print & electronic) available through the library.
- Keeping Current: Using alerting services and other methods to find the most recent research on your topic.
- Statistics on life, love, death and taxes: Finding Australian statistics on nearly everything.
- What's that Product? Finding product information for engineers and chemists.

With the recent endorsement of the Information Literacy Standards by the UQ Library Committee of Academic Board and a policy initiative of the Teaching and Learning Enhancement Plan (2000-2002) that courses and programs be required to show how they address the graduate attributes, it is imperative the Cybrary has a strong theoretical information literacy framework with learning outcomes, best practice teaching strategies and assessment methods to act as guidelines for the academic and librarian to collaborate further together in providing coherent and consistent information literacy skills programs. It is important that these programs aren't seen as just an add-on and yet 'more content and skills' but a seamless integration so it is in effect just students learning through the process of effective information use. (Bruce, 2001) A coherent approach is somewhat easier in fixed degree courses like Engineering but presents as a very real challenge in multi-degree cross-disciplinary areas which are increasingly the student preferred choice of enrolment.

To ensure the success of this collaboration between the teaching and library staff UQ librarians proactively liaise with academic staff within all faculties to customize and market the collections and other services to support their teaching, learning and research. With rapid technological change librarians have had to become good at not only adapting to change but also facilitating and guiding it within the changing educational environment. A recent initiative has been for the liaison librarians to move out of the Cybrary for some of the time to the academics workspace and to be visibly there 'in their face' and 'suggest the solutions before the questions are asked'!

Peter Drucker, social analyst and management philosopher predicted that the most important profession for this new century will be 'knowledge workers' and these knowledge workers are not the same as computer system specialists. White suggests that the most competent ones are most likely to be reference librarians using sophisticated hardware and software tools that the end user or information seeking customer does not know, or does not have the time to learn how to use (White 1999). UQ librarians may well feel they have earned that important status already as their staff development regularly includes updates on information technologies, scholarly publishing, specific database and software training (eg Endnote and WebCT), writing web pages, conference & committee participation, customer service courses and Train the Trainer. Future opportunities exist for librarians to take advantage of participating in the new UQ Graduate Certificate of Education (University Teaching).

Financial 'Pinnings'

Adequate funding is essential to the success of the Cybrary in providing the necessary infrastructures behind the many seams. The University of Queensland is a publicly funded institution, as are most universities in Australia. In the last few years, reductions in government funding have begun to impact on the higher education sector. The Cybrary is given a one-line budget from the University and has managed to supplement its budget by gaining strategic initiatives funds; capital works funds in addition to grants from national and state funding bodies. Over the last few years the Cybrary has received only small increases in funding, therefore all increases either in salaries, materials or equipment and currency fluctuations have to be absorbed from the annual budget.

To ensure maximum utilization of the staffing budget the Cybrary has embraced quality management processes. It has made a range of improvements by analysing and improving its processes on a regular basis. The Cybrary has employed a range of solutions, such as benchmarking and flowcharting to streamline or eliminate manual work procedures. One example is the Information and Access and Delivery Service that has reduced its staff in the last few years by constantly evaluating and using information technology in its processes. Another example is the implementation of auto loan machines in several branches. These machines process approximately 50% of the loans. This together with customers doing their own renewals has allowed staff to spend time on tasks such as providing increased personal customer assistance, supporting workstations and creating links to course materials.

While the Cybrary offers seamless services to its core customers –UQ staff and students - it is important to ensure that its internal customers –Cybrary staff – all benefit from the Cybrary's technologies and staff expertise. One way this is being achieved is through a knowledge management approach. The staff intranet is used increasingly in this way with as much information as possible being assessable from a single interface. Information such as strategic plans, global policies and procedures, training programs (including course notes), minutes of meetings, staffing information and statistics are available to all staff. The culture of the organization has e-evolved to that of a customer-focused culture where staff now automatically think about *all* customer needs and expectations as well as how to work smarter.

Central to maintaining the staffing budget is the investments in appropriate staff development and training to ensure that staff are equipped with the latest skills and knowledge. The creation and ongoing maintenance of the website is an area that requires specialised skills. Currently staff in each area have been trained internally in the use of HTML, JavaScript and other skills and designated as web writers for specific content areas. However, as the amount of content on the Cybrary website continues to grow, it has become necessary to move more towards using dynamically generated, database-backed web pages to maintain it to the high standard required. Some Cybrary technical staff have recently been developing database-driven content management systems that will allow content to be developed and updated by staff with no such special training. This will enable the Cybrary's liaison librarians and other content specialists to continue to add value to the site while concentrating on their primary areas of expertise. A much smaller group of specialists in the areas of

web design and database integration can provide the backend programming, templates, badging and other design infrastructure required.

To maintain and develop all its services the Cybrary has had to continually invest heavily in rapidly changing information technology hardware and software infrastructure. In 1998 the Library negotiated a very good 'deal' for several hundred high quality and reputable workstations. The 'deal' was regarded so highly in the University community that many departments and schools used the same 'deal' for their equipment. This experience coupled with other factors led to the University establishing a number of preferred supplier agreements. In 2001 the Cybrary was able to make considerable savings in both staff and financial terms by purchasing a considerable number of workstations using these agreements.

A major financial commitment is of course, to ensure that the collections are maintained and enhanced by providing access to the ever-increasing number of electronic journals and e-books. The University Librarian is a member of CAUL - Committee of Australian University Librarians – that has formed a consortia to negotiate the best price for electronic resources. A range of services has been purchased through these consortia arrangements and usage statistics show that the Cybrary users have voted with their fingertips. In some cases the Cybrary has been able to acquire additional funds to assist in the purchase of major products. This was the case when it became the first academic library in Australia to provide access to the ISI product Web of Science and the first Australian customer to subscribe to a large collection of e-books – Early English Books Online. In one instance the Cybrary recently received a substantial five-year grant from the Vice Chancellors Strategic Initiatives Fund to improve both the print and electronic collections for the Gatton Library. In addition funds were supplied from the University to upgrade the physical building including the installation of two state of the art multimedia-training rooms. These training rooms together with group study rooms, a postgraduate study area, group and individual seating areas comprises the Gatton Cybrary and Centenary Learning Centre which has become a major student learning space on the Gatton campus.

Shop floor spaces

Just as the Cybrary website is a key resource for customers so are all the physical spaces. The physical spaces continue to be used and each year the 'turnstile' count increases. In 1999 the turnstiles recorded 2.95 million visits to the branch libraries, in 2001 it is estimated that this number will increase to 3.3 million. The Cybrary has designed its physical spaces around customer needs rather than the traditional library design that is based on the physical collections and quiet reading areas with new technology fitting where it can. Physical changes need to reflect the changing technologies and services as well as the changing teaching and learning paradigms. The 'library' is and will remain an important learning and social focus for student life on university campuses.

The Cybrary began its refurbishment program in the mid 1990s and undertook a major project in 1997/98 when it combined two libraries into one – the Social Sciences and Humanities Library. It received \$9 million dollars for the upgrade from the University Capital Management Committee. The Cybrary developed a

design template that has been applied in each branch so that they all have a similar 'look and feel'. Its customers are sophisticated and discerning information consumers who use the services and facilities in a variety of ways. To reflect this variety analogies from the food service industry have been used to describe how its customers use its services and facilities - eat in, take away, home delivery or order in. Some students choose to just take one option others use a range; some research staff and external students only use home delivery in that they use all of our services from their home or office, and communication to the Cybrary can be done by email or via the range of e-forms. Others like the personal interaction and visit their branch Cybrary on a regular basis.

The colour scheme, signage, facilities, brochures and guides all reflect this design to ensure a uniform customer service. Many of the features of the Cybrary are similar to features in other customer service organizations - reception/welcoming areas, display/exhibition spaces, queue management systems, a range of seating areas and seating, counters designed for privacy, and well thought out, consistent and professionally designed lighting and signage. The Social Sciences and Humanities Library has very successfully incorporated a café in its space with café patrons allowed to eat and drink in adjacent Cybrary space. Examples of changes that have had to be made to accommodate technology include lending areas that now house auto loan machines, study areas include plug-in ports for laptops and all training rooms have state-of-the art multimedia equipment. Changes in staff areas include ergonomic furniture, up-to-date workstations, express check in machines, ergonomic return shutes, printers, scanners, servers and IT equipment maintenance areas.

Planning is currently underway for a new Library and Resource Centre at the new campus at Ipswich. UQ Ipswich is a state-of-the-art campus with an educational emphasis on flexible learning using the latest information technology, where students can pace themselves and utilize different ways to learn. The new Library and Resource Centre will represent a leap into this century for the University and will provide an opportunity to link the campus with the community and the virtual environment. As teaching and learning become more flexible so must the Library and Resource Centre. It will combine all of the university's non-teaching functions in a combined one-stop shop front that will be a 'supermarket' for information and student services reflecting the changing lifestyles of students with the Cybrary being the major shop offering a diverse range of services.

In summary - The continuous alterations

There isn't the space in this paper to discuss or even mention all of the systems and technologies, the human, physical and financial resources employed to provide all of the functionality of the Cybrary. Most of these, such as the integration of multimedia content housed in backend databases with the Cybrary website or the automated usage statistics gathering and processing systems, are undergoing constant in-house development and customisation. In reality, it is not the specific systems or technologies employed and human responses to them, nor the shop floor spaces and financial underpinnings that are critical to the success of the Cybrary. It is the strong focus on meeting customers' constantly e-volving requirements and the responsive commitment and innovative work of people – the fine needlework of the staff – that ensure the ongoing excellence in Cybrary and information service delivery. As Roy

Tennant, a keynote speaker at VALA 2000 asserted 'In a world that is forever changing...strategies for building 21st century libraries and librarians must focus on the ability of libraries and librarians to not only adapt to change but to prepare for it, facilitate and shape it (Tennant 2000). Within the current budget restrictive, information abundant and IT e-volving “environments” UQ Cybrary and its staff continue to adapt and respond to new ways in shaping its future to ensure that its customers receive the best possible seamless services.

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