

User Experiences and a Usability Inspection of an Electronic Services Environment for Students

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Abstract

In 1997 the Information Technology Services section of the University of Southern Queensland introduced USQconnect, an integrated graphical computing environment that allowed students to access electronic mail, USENET newsgroups and the Internet. The system was based on the Netscape suite of products and replaced similar text-based UNIX utilities and software. As a consequence of the change, many students perceived that several vital services were lost and there was much debate about the imposed change. In this paper we examine the debate and conduct a simple usability inspection of the new service. Issues raised underpin the need for a user-centred approach, and consideration of usability and Web design principles for the development of new systems.

KEYWORDS: user-centred design, usability inspection

1. Introduction

For several years, the University of Southern Queensland (USQ) has made Internet access available to its students. On-campus students have been able to directly use a UNIX system, through dedicated terminals and networked personal computers, for text-based services including electronic mail (mail, elm, pine), USENET newsgroups (nn, pine), and the World Wide Web (lynx). Off-campus students, and on-campus students, could obtain similar access through dial-in facilities. In 1995, following a survey of 357 student-users of its laboratory facilities, Information Technology Services (ITS) reported a high satisfaction rate with AARNet access and the Campus Wide Information System that was then in place [3].

In August 1996, ITS began planning the development of a new project entitled 'Student Electronic Services and Sup-

port' which was later named USQconnect [6]. USQconnect provides the electronic services previously available through the UNIX software by using the Netscape suite of products. Thus, electronic mail, USENET newsgroups and the Internet (and USQ Intranet) are available via a 'single' Web browser.¹ Similar software and services are available to both on- and off-campus students, addressing the need for equitable access for these two groups. In addition the graphical nature of the software's interface is purported to be 'intuitive and consistent across services'.

A project plan described the project and the roles of ITS staff (up to 17 were involved) but did not mention involvement from the main client group (USQ students) nor the secondary client group (USQ academic staff).

USQ staff were 'officially' advised of the pending introduction of USQconnect in November 1996 [4] when a prototype of the system was first demonstrated and comments solicited. Prior to these demonstrations, the concept was discussed with representatives from the Library and Distance Education Centre in early October. A prototype was then presented by the Director of ITS to the Vice-Chancellor's Committee (VCC) and the Vice-Chancellor's Standing Committee on Flexible Delivery (which includes the Deans of the Faculties) in mid-October at which stage the concept was endorsed for further development. Student Administration and the Student Association were also informed about USQconnect through meetings with ITS staff, at this time and again in December and January. The VCC received a demonstration of USQconnect in late January. Also in January, six students participated in an informal testing procedure where the basic use of the system, including off-campus access, was examined (Mahoney, Personal communication). Further advice (mainly for staff but including some students) about USQconnect and more demonstrations were advised in February 1997 [5]. In ad-

¹Other browsers, such as Mosaic, may have also been suitable but ITS is not supporting these.

dition, the Academic Computing Advisory Committee was first given information about USQconnect at its meeting in February 1997 [2]. The committee's prior meeting was in mid-1996 when details of USQconnect were still being developed so this was the first time this committee had details of USQconnect. Both on- and off-campus students were first 'officially' informed about USQconnect when they received their HECS statement at the beginning of semester one in February 1997 (Mahoney, personal communication). The brochure [1] received in these packages included information on the nature of USQconnect, its availability, the costs (none), the method of connecting, computer platforms supported, dial-in services and how to obtain assistance with the system. Other methods of promoting the new service and advising of its availability included an article in the student newspaper *The Honk* [7], through training sessions held by ITS, and through the local USQ USENET newsgroups `usq.student` and `usq.general`.

It has been through this last medium, newsgroups, that the debate about the use of USQconnect has been most visible with both students and staff involved in the debate. The following section examines this debate. Section 3 provides a simple usability inspection of USQconnect considering both general usability principles [10] and Web design criteria [9]. Finally we discuss the debate and usability study findings.

2. The USQconnect Debate

In the three months after the announcement by ITS in the newsgroup `usq.general`, of the change to electronic services for students, there were 187 news items (comments, questions and suggestions) posted by students and staff, and 30 follow-up messages posted by ITS staff. Some news items and responses related to more than one concept too. The debate consumed the majority of the discussion in this newsgroup during this time.

The debate about USQconnect centred around four themes:

- loss of service in the transfer to the new environment
- difficulty of use
- access via on-campus and off-campus methods
- the role of ITS as a service provider

2.1. Loss of Service

In the project plan [6], ITS made it clear that USQ had limited resources to dedicate to student electronic services. One way of moderating costs was to examine 'core' and

'fringe' academic activities with a view to limiting the latter. Although the rationale for deciding on which services would (and consequently would not) be provided had not been given, access to telnet and internet relay chat servers (IRCs) was removed. However, exactly when it was removed seems unclear since even some ITS staff were unaware that it was not available. Some 22 news items discussed the loss of telnet and seven the loss of access to IRCs.

Telnet access was blocked by ITS for security reasons and because many students who were using telnet were doing so to play games such as multi-user dungeons and dragons, MUDDs. Such game playing does not put a heavy load on Internet resources since it is text-based but it does mean that one terminal, personal computer, or dial-in line is in use for other than academic purposes perhaps at a time when resources might be needed. We return to the issue of the timing of resource restrictions in section 2.3.

Clearly ITS considered telnet access a 'fringe' academic activity and curtailed its use for students. Unfortunately they neglected the needs of post-graduate students in this regard since some used telnet in their research, though the number of such users was very small. Several students used telnet to legitimately access other computers but suddenly found that access was no longer available. Solutions such as trying different telnet packages were suggested before ITS notified students (several days after the initial discussion concerning the inability of getting telnet to work) that telnet access had been blocked. ITS also notified that telnet access, for specific computers and at specific times, could be made available at the request of academic staff. Interestingly, new students reading this debate became curious and wondered what was this 'forbidden fruit' called telnet.

Most news items (65) concerned the loss of various USENET newsgroups and the suspicion by some users that the number of available messages within the viewable newsgroups was incorrect. In order to provide news services through USQconnect to both on- and off-campus students, an upgraded news server needed to be commissioned. According to ITS, initially, the range of newsgroups was limited to conserve space on this server. Missing news items were either the fault of the news server in that it was causing news to operate slowly or the fault of the user in not having the correct configuration. The latter mainly related to configuration and use of Netscape. At the time of writing, all newsgroups have been made available and the news server was operating at an acceptable speed but many students were still having difficulty with the news server configuration.

Other lost functionality mainly related to UNIX utilities that existed in conjunction with the previous services simply because those services were on a UNIX computer. In particular, commands such as `who` (to determine who is using the computer system at the moment) and `finger` (to find

the details of persons knowing some detail such as name or student number), were missed.

New services, such as access to lecture slides were also suggested (five news items). Clearly, as use of USQconnect expands, and early indications are that it is a well used service [12], many more such requests will emerge.

2.2. Difficulty of Use

There were 42 news items dealing with general and specific usability problems associated with USQconnect. Some other criticisms related to dial-in access to USQconnect and the amount of allowable access: access times, Internet quotas and disk space limitations, but these will be dealt with in the next section.

Clearly, explicitly negative views of the change (11) outnumbered similarly positive ones (3).² Electronic mail and news services were perceived as the hardest to use through USQconnect and caused the most problems early in the change-over. In addition, for an interim period of a few days, students still had access to the original UNIX-based services such as electronic mail. This caused some specific problems since mailboxes moved in the transfer to the new system and some mailers were unable to locate the user's new mailbox. The difficulty of using the electronic mail system is exemplified by the 'help' with it:

In Netscape Navigator, there is an option that allows you to leave your e-mail messages on the server or remove them from the server (Options, Mail and News Preferences, Servers tab). If you access your e-mail from the K block labs, you will find that your mail messages have been removed from the server and saved to your H: drive area. You cannot change this option. It means that you will not be able to view these messages if using another computer outside the K block labs. If you access your mail from more than one computer, it is suggested that you pick a specific one to be the master, ie use a particular computer to remove messages from the server; and all other computers should be used to only read mail from the server. It is also in your best interests to delete unwanted messages and keep saved messages to a minimum, as some messages may be deleted if the server runs out of storage space.

In the early stages of using USQconnect, some students could not post news items and some could not read newsgroups at all. UNIX system accounts were closed prior to

²One positive view was eliminated from the possibles because of the person's association with ITS.

some students downloading their saved electronic mail files and it was unclear whether backup copies were available and, even if they were, whether ITS was willing to upload them. The system change brought incompatibilities too. Students queried how to incorporate their address books and mailing address alias files from the old into the new system.

Error messages suggesting Internet access was 'forbidden' were received by some students but there was no reason given as to why the access was being denied until it became clear that ITS had restricted access times (and not sites *per se*). Some of these access problems were solved by configuring a proxy server but this was not advised until later. Configuring the correct proxy server (correct for students) proved to be problematic too since the standard software did not always have the correct one by default.

Netscape, the Web browser used by USQconnect, was seen as a memory 'hog' and slow to launch and make connection. This was in complete contrast to the text-based UNIX software previously available. Students questioned the need for the graphically-based software in light of the hardware configurations available. This was particularly problematic for off-campus students some of whom used very simple computers to access the original text-based facilities efficiently and effectively.

2.3. Access via On-campus and Off-campus Methods

Off-campus students had concerns that their needs would not be met but, according to Mahoney [6], ITS specifically considered these students when developing USQconnect. Nevertheless, many students (13 news items) reported difficulties accessing USQconnect whether by direct dial-in to USQ or an available Brisbane site, an Internet Service Provider (ISP) or through the Internet from another site. The problems included questions of the software required, the telephone numbers, prematurely closed connections, and option configurations needed. ITS or others offered an almost equal number of responses (12) to solve these problems.

Internet access times and availability were questioned and criticised (12 news items) while ITS provide four separate responses. Prior to USQconnect, students had access to the Internet 24 hour a day using a text-based Web browser. At the time of writing this paper, the Internet is accessible for on-campus students daily from 6pm to 8am from three laboratories (two laboratories of 20 computers and one of 5) and from another laboratory (of 6 computers) during the opening hours of the USQ library. When access to USQconnect originally started, the Internet was available daily from 6pm to 12am in only one general laboratory of 20 computers but the library laboratory had access at library opening times. Off-campus students could access the Internet 24

hours a day through dial-in access.

The principle of imposing quotas to restrict access to computing resources at USQ is not new and Internet access is no exception, though just what fell inside (and outside) quota considerations was perplexing to students for some time after their introduction. Discussion of quotas generated ten news items. Some wondered whether reading news and using electronic mail affected their allotted quota but this was not the case. Each student's Internet quota is set at one megabyte per day with a maximum of 10 megabytes per week (which indicates some flexibility in the calculation). Few students criticised the quota at this stage although both the complexity of its calculation and actual calculation were queried.

1Mb a day sounds right, but there are many variations. There is a buffer zone (dunno how big), and something happens once you use this buffer zone which then affects how the planets align, etc, etc.

According to the Internet Quota I am 4Mb over but I can still access the net. I would also like to know how this ridiculous figure came about as my estimates leave me with about 5Mb left.

Internet quotas are explained within USQconnect and in training sessions held by ITS but were not explained in the original documentation sent to students. A quota of 1Mb also existed on student home pages, but this was not an issue as yet, and would not become an issue until students became familiar with developing their own Web pages.

2.4. The Role of ITS as a Service Provider

Two weeks after the introduction of USQconnect, and following an announcement by ITS that UNIX system accounts were to be closed, direct criticisms of the role of ITS began to emerge (10 news items). One criticism concerned how ITS decided on the network requirements of post-graduate students since neither academic staff nor students were involved in the decision. Other news items criticised the level of service provided by ITS and the lack of response by ITS to user concerns.

At this point part of the debate moved to rumours that ITS would be charging students for services on a cost-recovery basis. Some students discussed the situation at other campuses and with 'commercial' service providers and indicated that they would be willing to pay for better service but they, nevertheless, thought ITS could still provide more service. Staff are already charged for dial-in access so there was some concern that this would be extended to students too. ITS have remained silent on this.

3. A Usability Inspection of USQconnect

ITS conducted a 'informal' testing of USQconnect prior to its release. The testing involved six ITS employees who had been or still were USQ students and concentrated on the issues of accessibility (could the system be accessed by direct dialling, an ISP or on campus) and completeness (were all links available). The testing was not rigorous and did not involve usability aspects *per se*. Staff were not involved in the testing process although demonstrations were conducted and comments were requested from staff. Informal commenting in this way does not constitute usability testing, however.

It may be that ITS assumed that since USQconnect used the Netscape suite of software there was no requirement to undertake usability tests. According to ITS, this software provided an 'intuitive and consistent' interface to all services, unlike the UNIX software used previously, so the assumption may have been that the system would therefore be more usable. The debate discussed above makes it clear that usability was a problem both for experienced users and inexperienced users of electronic services at USQ.

Usability inspections [11] provide a relatively inexpensive method of user interface evaluation and they can be conducted at a very early stage in the design of software. The various methods available should be applicable to all types of software and services, including USQconnect. In this section we report a modified heuristic evaluation that was undertaken of USQconnect. Usually such evaluations are conducted with three to five expert evaluators using heuristics such as those of Nielsen [8]. In this case only one evaluator (the first named author) undertook the evaluation by considering Nielsen's ten usability heuristics and his 'Top Ten Mistakes in Web Design' [9].

Figure 1 shows the basic layout and structure of the USQconnect user interface. There are two navigational menus: a vertical menu on the left that changes depending on what is selected from a horizontal menu at the top (that does not change). The horizontal menu items and the navigation links they display in the left vertical menu are:

- USQconnect homepage – the initial vertical menu with links to: 'What's New', newsgroups, notices, Code of Practice and help
- Study Desk – links to unit homepages, library services and help
- Personal – links to electronic mail, contact details, change password, quotas, enrolment history, changes to enrolment, tutorial placement and help
- Web Builder – allows a student to build their own web pages, including: upload files, edit files, create files,



Figure 1. USQconnect screen layout showing frame and menu structure

list files, delete files, HTML reference, Code of Practice and help

- References – links to USQ service areas, the Internet, Library, 'Frequently Asked Questions', gradlink and help
- Contacts – links to specific usq newsgroups including general, student and forsale, 'Frequently Asked Questions' and support requests
- Search – links to search engines for the USQ web site, AARNets FTP archive, Internet search engines and help.

The rest of this section summarises the evaluation by noting some of the more significant usability problems. Nielsen's ten usability heuristics are dealt with first.

1. Visibility of system status

On some USQ computers, options in the horizontal menu were partly hidden from view when a subsequent vertical menu item was selected (for example Personal and then Enrolment Details). This appeared to be related to font size selection at the system level for these particular machines. In addition the screen colour changed from blue to red when help was selected and on some machines this was not reversed once the user exited help. In fact the user needed to reload the web page to eliminate the colour corruption.

2. Match between system and the real world

In the main the menu selections match commonly used terms for those processes or entities at USQ. The 'Tutorial System' option within 'Personal' is perhaps one exception. It enables a student to register for specific

tutorials and practicals and may be confused by new users with a tutorial in the use of this USQconnect system.

3. **User control and freedom**
Navigation is via hypertext links. The user must use the system as is, there is no customisation available.
4. **Consistency and standards**
Platform conventions are followed.
5. **Error Prevention**
Few errors are actually encountered due to the menu structure limiting user response.
6. **Recognition rather than recall**
The use of menus promotes recognition rather than recall.
7. **Flexibility and efficiency of use**
To initiate a USQconnect session, students must provide their user name and password. Unnecessarily, this needs to be repeated when the student wishes to deal with electronic mail or newsgroups and update their own web pages. Surprisingly, such repetition is not required when students wish to view or change important information such as personal and enrolment details.
8. **Aesthetic and minimalist design**
If a window obscures part of a USQconnect session, then on returning to the USQconnect session, background and foreground colour changes are noted. This is annoying (to say the least) but partly blamed on Netscape and the use of frames (see below).
9. **Help users recognise, diagnose, and recover from errors**
Few errors are actually encountered due to the browsing nature of the interaction.
10. **Help and documentation**
Help is available within each of the vertical menus once they are displayed. The assistance available relates to the menu options displayed but it is terse and often relatively obvious.

Students have the facility to build their own web pages but there is no or little guidance for them in this process. Examination of student homepages clearly shows that students are not aware of some very fundamental issues such as the need for a file called `index.htm` to guide the reader of their web documents. In general, user assistance for building web pages is minimal.

Good design for web use is non-trivial. Nielsen [9] has enumerated his top ten mistakes of web design. Below we note where USQconnect succumbs to these.

1. **Using frames**
USQconnect uses frames to split the navigational aspects of the system from the contents. Using frames breaks the fundamental user model of the 'web page' since it cannot be bookmarked for return, URLs stop working and printing is problematic.
2. **Gratuitous Use of Bleeding-Edge Technology**
So far USQconnect avoids this mistake.
3. **Scrolling Text, Marquees, and Constantly Running Animations**
Most web pages within USQconnect are single pages displayable without scrolling. The exceptions are help pages.
4. **Complex URLs**
Not applicable in USQconnect.
5. **Orphan Pages**
Only authorised users are able to use USQconnect so the pages are not accessible to outside users. However, once a student is using USQconnect they can venture to pages outside USQconnect's pages. On return they are only able to discern their exact location within the USQconnect system by examining the contents of the left vertical menu.
6. **Long Scrolling Pages**
As mentioned already, the only real problem here is with USQconnect help.
7. **Lack of Navigation Support**
Exiting menus requires the user to choose a new horizontal menu item or use the in-built navigational features of the web browser. Menu groupings seem to have been intuitively developed with no reference to the end-user students. The simplicity of the menus is such that this appears non-problematic although there are multiple instances of the same or similar menu items that do cause confusion.
8. **Non-Standard Link Colours**
Horizontal navigational links are white while vertical navigational links are blue. Within USQconnect pages use blue for links. More problematic is the way background and foreground colours change when other windows are displayed over USQconnect pages.
9. **Outdated Information**
Not a problem in USQconnect.
10. **Overly long Download Times**
Not a problem in USQconnect.

4. Discussion

Reaction to imposed change is often negative. Students at USQ have recently had to change from a predominantly text-based system for their Internet access to a graphical version with reduced functionality. The students lost general access to telnet and their access times to the Internet were reduced, though it might be argued the access quality, with a graphical rather than text-based interface, increased. Interestingly, only two students of the 357 surveyed in 1995 considered access to a graphical environment important enough to make a comment about it, and moving to a graphical environment was not one of the recommendations from the survey. The extent to which this reduction in functionality (and increase in quality) affected students was not clear and certainly had not been evaluated prior to the release of USQconnect for general student use. If the debate within the newsgroup `usq.general` was any basis for deliberation (over 200 postings) their reaction was, in the main, negative. The initial reaction of many continuing students was simply that they wanted the old system back since USQconnect was a problem to use and lacked the services of the original system. As one student put it:

Oh well, at least USQconnect lives up to its name. I mean, the service isn't called WWWconnect or NETconnect, is it? No. The only place we can connect to is USQ.

Academic staff do not have ready access to USQconnect, so it is difficult for them to appreciate the problems that students have encountered in its use. ITS claims to have 'received many complementary electronic mail messages regarding the service and very little criticism' [12] although the veracity of this claim may be questionable given the volume and nature of the debate within `usq.general`. It is important that service providers consider their clients' views and part of the problem here was that ITS did not consult adequately with the users about which services to provide, and which not to provide. ITS did consult widely, but the timeliness of the consultation was such that the system was effectively completed before being demonstrated. Early prototyping and discussions with staff about the services required would have been useful as would involvement by staff in usability testing of the system. A small amount of usability testing (using six students) of the system was undertaken prior to its release but it has been acknowledged by ITS that this provided little by way of feedback on the system. Informal testing and demonstrations do not constitute usability testing. A number of usability issues have been encountered and most could have been eliminated before release of the system.

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