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Abstract
Advances in computing and communications technologies create new opportunities for educational institutions to improve the gathering and dissemination of information and ideas. The challenge is to move beyond the old ways of doing things and create new ways of working with information.

The Internet will without doubt result in some efficiencies for educational institutions. But the focus of the case detailed in this paper is on technologies that underpin the teaching and learning environment and deliver effectiveness gains not simply efficiency gains. Creative use of the Internet uncovers new ways to enhance educational dialogue and increase the interaction between students and academic staff. However, it is clear that pedagogical strategies need to be re-evaluated in light of this new way of working with information. This re-evaluation is necessary because the opportunity to enhance the learning experience for students will be lost unless the use of the Internet moves beyond a 'managerial' thrust to do things faster and cheaper. Indeed, the full potential of computer mediated communications technologies will not be achieved without the enthusiastic participation and leadership from the front line academics involved.

Although there are many obstacles to overcome, changes in the teaching and learning environments are inevitable. The aim in embracing the Internet should be to strike a balance between savings in delivery costs on the one hand and enhancements in educational outcomes on the other. Unfortunately it is often only after large up front investments, in both technology infrastructure and new teaching and learning paradigms, that economies of scale are achieved. There is little doubt however that imaginative use of the Internet can create a teaching and learning environment that is cost efficient, but at the same time is flexible and rich with dialogue. For the Faculty of Business and Law at Deakin, confronting the new information age in education has been an exciting adventure in ideas and technology.

Introduction

This paper will outline the rationale for an approach to the use of the Internet by educational institutions which focuses on educational dialogue. It argues that there are effectiveness gains to be made via this important technology not simply efficiency gains.

In the first section a genesal overview of the opportunities and obstacles is given. The structural changes facing organisations and the impact technology is having on these structural changes are discussed.

The next section gives the background to the case followed by a section detailing the use of computer mediated communications in the Faculty of Business and Law at Deakin University.

The rationale for the approach adopted is detailed followed by an overview of the current approach used and the gains attributed to its use. Finally some of the lessons learned and warnings identified from the case experiences are discussed and some general positive conclusions reached.

Opportunities & Obstacles

In the last few years of this millennium, it has become clear that the world is seeing the emergence of a new way of working with information, based on computer networks and the services they provide.

[Treloar, 1996 June 5a]

As nations transform themselves from industrial to knowledge based economies, many sectors of their economies experience structural and technological changes — including the education sector. Indeed, education has a vital role to play in enabling that transition to occur, and, importantly, in facilitating the changing nature and structure of work.

Knowledge-intensive organisations, such as educational institutions, depend on the ability of individuals to obtain information and ideas [Butler & Gibbons, 1996]. Further, the virtual explosion of computing and communications technologies supporting information storage, retrieval and sharing has given rise to new opportunities to improve the gathering and dissemination of information and ideas.

Among the new information technologies showing the greatest promise are a suite of telecommunications and computer based applications that include Groupware and Group Support Systems (GSS), the Internet and the World Wide Web (WWW) [Jessup & Valacich, 1996]. The Information Superhighway[1] is rapidly evolving. Talk of using the Internet is everywhere. Many private and public organisations are including electronic references in corporate communications. Corporate advertising is increasingly carrying a home page address. Intranets — used for the storage and sharing of private corporate information — are becoming strategic imperatives. New, re-engineered, approaches to traditional operations are emerging everywhere. It should come as no surprise, therefore, that educational institutions are beginning to explore opportunities for change via the use of Internet technologies.

Clearly the delivery of teaching materials using Internet technology will result in some efficiencies. These will be delivered mainly through improvements in staff productivity and reductions in costs such as printing and distribution of teaching materials. However, unless the use of these new and exciting technologies moves beyond mere automating — using Information Technology to do faster and cheaper what we did before [Zudoff, 1984] — the educational institution itself might be streamlined but the opportunity to enhance the learning experience for students could well be lost.

Enhancing the dialogue aspects of learning and teaching by the use of appropriate technology offers the opportunity to deliver a quantum leap in the quality of tertiary education, particularly for distance students. To deliver this quantum leap a significant shift in the culture of the academics involved in the design and delivery of courses will be necessary. And, as with all organisational re-engineering projects, a significant change in resource allocations will be needed to build and maintain an appropriate technology infrastructure. For optimum effect these changed attitudes need to occur in parallel. However, this will only happen when universities see these initiatives as long term competitive strategies; opportunities to improve educational outcomes, particularly for students from other than traditional backgrounds; new and better ways to compete for the mobile, well informed student of the 21st. century.

Structural changes in tertiary education

It is now clear that the tertiary education sector in Australia will not only undergo changes hitherto not experienced, but it will also be expected to provide the foundations for change in the other sectors of our economy. For educators, the challenge of anticipating and adapting to change is crucial — but exciting. Some of the more important recent changes have included:

- expanded access to post-secondary education and mass education;

[1]The term Information Superhighway seems first to have been coined by the US vice president Al Gore. Today it is seen as the developing collection of interconnected, high speed digital networks around the world. The aim is to have available a network capable of shipping large amounts of various kinds of data to and from virtually any place on the globe.

- rationalisation of tertiary institutions and organisational restructuring;
- declining public funding;
- expanded markets — domestic and off-shore;
- workplace delivery of educational programs; and
- demand for greater flexibility and life-long learning.

Technological change

Technology has been defined as the 'sum of knowledge of the means and methods of producing goods and services' [Bannock, et al., 1987]. In the context of the case described in this paper, technological change involves finding new ways of producing and delivering educational services; new methods to enable dialogue and debate between teacher and student; and approaches which facilitate communication between student and student other than in a face-to-face situation in a classroom at prescribed hours.

The obstacles to achieving this change are the tyranny of distance and, paradoxically, the tyranny of proximity. Distance educators around the world are aware of the barriers of time and space in their struggles with print-based, audio and television technology — any reader wishing to tap into this on going dialogue should monitor the AAHESGIT discussion list (email <aahesgit@list.cren.net>) moderated by Steve Gilbert (email <gilbert@clark.net>).

The difficulty of communication between different locations and different time zones has meant that remote teaching and learning has always been thought to be less desirable and less effective than conventional face-to-face teaching. On the other hand, however, educators whose experience of teaching and learning has been confined to the class room have tended, quite naturally, to be blind to the exciting and challenging opportunities to extend and enrich the domain of teaching and learning skills presented by the new information and communication technologies.

The vast wealth of networked information becoming available on the Internet and the expanding array of new electronic tools have tended to bewilder educators and educational policy makers, presenting them with complex (but vital and financially significant) decisions to make. So educators face the same challenge identified by Treloar for the international information community. They must move beyond the old ways of doing things and create fundamentally new ways of working with information in order to meet the information challenges of the future [Treloar, 1996 June 5b].

In making sound technological choices educators must be guided by their educational objectives, preferred delivery modes and teaching and learning environment. Many of the issues needing attention can be found highlighted in the report 'Teaching and Learning using the WWW' which emerged from the IFIP WG3.4 Working Conference 1996 [Jordan & Hewett, 1996]. It was found that there are many opportunities to use the Internet, the World-Wide Web (WWW) technology in particular, to engage students in more enriching learning experiences and that the students now have the ability to plan their own learning paths. Above all though, it was recommended that more effort be put into preparing people who will be looking for things on the web. Libraries have traditionally offered material that is 'approved' or 'acceptable' — for web based information we have a different situation. Students will need to be able to make judgements, about the quality of material, for themselves.

It is important for educators and education policy makers therefore to build a clear macro picture of the available services. It has been argued [December, 1996 Dec. 2a; December, 1996 Dec. 2b; Treloar, 1996 June 5a] that at the most general level, tools for interaction with the Internet can be divided into Computer Mediated Communication (CMC) and Networked Information Retrieval (NIR).

Computer Mediated Communication

Computer mediated communication is best defined as those computer to computer communication tools which have a primary focus on communication between human beings. In 1994 Treloar proposed that it was most likely that for most users, the CMC aspect of the Internet would be their primary use, measured in terms of the number of hours they allocate to it [Treloar, 1996 June 5a].

Tools classified under the CMC grouping include such things as electronic mail, listservers, network newsgroups, general group support systems and groupware such as Lotus Notes[2] and FirstClass[3].

[2]From the Lotus Corporation a division of IBM.

Networked Information Retrieval

Those software tools available on the Internet not classified above as CMC can, for the purposes of this discussion, be classified as networked information retrieval tools. In the recent past the vast array of NIR tools and their associated services were categorised according to the operations they supported: retrieval, browsing or searching [Treloar, 1996 June 5a]. Retrieval assumes the user knows what they want to retrieve and/or how to get there, i.e. users locate the information they want by being told about it either electronically or in print form. Browsing involves the user in navigating through an information space looking for items of interest, as a student might browse along the shelves of a library. Searching involves accessing electronically based catalogues often via purpose built search 'engines'.

Today the WWW, a user friendly, graphical user interface (GUI) tool supports all of these activities, direct retrieval, browsing and searching. Technically the WWW is a distributed networked hypermedia system, a system of standard encoding which facilitates the seamless use of the many specific purpose NIR tools available. But, for most users the WWW represents the 'human face' of the Internet. In practice what a WWW user sees is a structured document with highlighted links, embedded graphics, sound, even video. In two short years WWW based use of the Internet has probably overtaken CMC as the primary use in terms of the number of hours allocated.

Educational Materials Delivery

A range of information technologies is presently being used to codify and deliver educational materials and services. They may be print based (e.g. textbooks, study guides, readers, manuals, etc.) or non-print based (e.g. computer managed learning CML, computer assisted learning CAL, video, audio, CD-ROM, WWW, etc.). The degree of interaction can range from passive (textbook) to less passive (interactive CD-ROM and WWW pages) but in all cases the interaction is between the learner and the medium that has captured the codified information. Newly emerging technologies will enable more cost effective (from the perspective of the educational institution) delivery of materials. However, the focus of the case detailed below is on the technologies that underpin the teaching and learning environment; technologies that will enhance the learning experience for students; and approaches to the use of technology that will facilitate interaction between student and teacher and collaboration between students.

Educational environments

Relatively few universities throughout the world have paid extensive and systematic attention to changes to the teaching and learning environments made possible by modern technology. Indeed, the major proportion of 'list time' on the AAHESGIT discussion group, referred to above, concerns the lack of understanding individual pioneers find in their institutions and the resultant lack of the resources needed to bring about change. Physical space is well understood and has been used for centuries in both Socratic mode and for intellectual discourse and debate. Less well understood is the ability to create virtual environments that achieve similar and sometimes superior teaching and learning patterns with the use of CMC, in particular, group support systems.

CMC technology forms the backbone of the new *modus operandi* in the Faculty of Business and Law at Deakin, for it achieves the twin objectives of intellectual dialogue and the development of a flexible and liberating teaching and learning environment. Unlike the technologies used for materials delivery, this communication technology involves human interaction. Interaction not simply with the technology but through the technology with teachers and other students.

Economics of technological choice

The use of information technology for materials delivery achieves the objective of flexibility. Students are able to use the materials when and where they wish as they learn. The pace of learning can be adjusted to suit the learner, and iterative processes can be employed until an acceptable level of understanding is achieved. Codified information of this type may be broadly (traditional textbook and/or NIR) or selectively (CAL package) applied, but always has a fixed content. It is generally expensive to produce and in many subject areas becomes quickly dated.

By contrast, the use of information technology for interactive communication, e.g. electronic conferencing using CMC technology, is relatively cheap to implement, but rather more expensive to run. However, it can be used across the entire curriculum. Content is continually recycled and

[3]From SoftArc.

refreshed, is highly interactive, and inexpensive to change and update. Asynchronous use of the technology provides flexibility in time and space while, at the same time, providing for dialogue and debate on a on-to-one or one-to-many basis.

Information delivery and retrieval technologies and information communications technologies are different in nature: they are complementary, not substitutes. Within financial constraints, choices must be made about the appropriate balances of the technologies to suit a growing variety of markets. An educational system based on information delivery and retrieval technology is capital intensive whereas one based on information communications technology is labour intensive. Capital costs are relatively high for the former, but recurrent costs are low. The best blending of both technologies will produce the highest quality educational service on the one hand, while a print-based or even NIR-based 'no-frills correspondence course' represents the cheap end of the market. Educational policy makers are now being confronted with difficult and complex choices about the shape of tertiary education in the information age.

Background to the Case

After two large institutional mergers, in 1990 and 1992, Deakin University inherited a plethora of undergraduate and postgraduate business-related programs offered by the three antecedent institutions. One significant opportunity presented to the newly established, cross-campus Faculty of Management[4] was to transform 13 separate (highly inflexible) undergraduate business and commerce programs into a single innovatively flexible, forward-looking Bachelor of Commerce program: a program that would meet the challenges of the new educational and work environments; that would be intellectually challenging and professionally-relevant in the modern world of work; that would offer students real choices; and which would eliminate duplication of content and rationalise the number of units and majors on offer. The program would have to run in a flexible mode with high quality educational materials and operate in a multi-campus, cross-cultural, and 'virtual' teaching and learning environment. In recognising the imperative to grasp the significant educational benefits of modern information and communication technologies, and wishing to be adventurous and innovative, we had to deal with three key issues:

- empowering students to make real and informed choices;
- choice of time and space in teaching and learning; and
- changes to staff work practices.

In confronting these challenges some of our colleagues were fortunate in having had a decade of experience of conducting a world-class distance learning Master of Business Administration program across national and international boundaries. There was, in other words, some culture of flexible, distance learning.

A number of institutions around the world have experimented with the use of Internet technology to support teaching and learning. Most of the work undertaken, both practical and theoretical, concentrated on the *delivery* and *assessment* aspects of education. But, as indicated above there is a significant difference in educational use of CMC technology which encourages interaction and individual communications and educational use of NIR technology which concentrates on the distribution of course materials and the retrieval of additional support materials. In essence it is the difference between two way communication and independent information acquisition.

However, we felt the largest potential was in the enhancement of communications, both student-teacher communication and student-student communication — the use of technology to support the *dialogue* aspect of teaching and learning.

The use of Computer Mediated Communication

Educational *dialogue*, which we believed could be enhanced, extends from the traditional student-teacher level to include the provision of peer support in developing understanding, and social interaction, since all of these aspects together form the basis of sound education.

In 1991 groups of academics at Deakin University began using electronic communication to help create and nurture a collaborative learning environment for students studying at a distance. The

[4]Note — in August 1996 the Faculty of Management was renamed the Faculty of Business and Law in order to more truly reflect the nature of its undergraduate and graduate offerings.

initial pilot system was in a Masters of Distance Education course. This course was developed as a collaboration between two universities (Deakin and the University of South Australia), students studied at a distance and were drawn mainly from Victoria and South Australia. The system, known as the Tutorial and Electronic Access System (TEAS), was developed as a prototype to introduce computer mediated communication to this course. TEAS was a text-based system housed on a central computer and accessed via terminal emulation software. These experiments, in the use of simple bulletin boards to support students, produced mixed results. However, we believed that the large size of the groups involved prevented effective interaction and did not encourage a feeling of intimacy or belonging.

In 1993 the pilot was expanded. It was our firm belief that the traditional delivery of tertiary education to both on campus and off campus students could be substantially improved using technology which was already available; and unless we continued experimenting we would not be in a position to capitalise on anticipated future technologies such as those in the area of interactive multimedia, the use of CD-ROMs etc.

At Deakin we had a well regarded MBA delivered at a distance. What differentiated the Deakin MBA from the many distance MBA's which have followed it was the use of small study groups and the focus on collaborative learning. While in general the study groups worked well, the disparity in the geographical location of many students meant that interaction was less than optimal. The aim of the extended pilot was to expand the potential of these proven groups by supporting them using CMC. Thus, students in the MBA intake for 1993 were introduced to a 'new' CMC facility, the objective of which was to improve their communications with Deakin and each other. In an effort to derive some economies, as well as to ensure a real trial was undertaken, use of the system was made compulsory.

The MBA has a larger enrolment than the Masters of Distance Education program. This larger body of students enabled us to gather further data on the potential and the problems of this approach to collaborative learning, with the objective of detailing the requirements for the next system. During 1994 tenders were called for a more robust CMC application.

Building Blocks

There are three components interacting in our enlarged view of the service:

- staff desktop technology;
- central server for storage and distribution control; and
- student personal computing facilities – either private equipment or equipment available in supported computer laboratories throughout Deakin's six campuses.

This interaction enables:

- Course Dialogue — academic coordinators to all students enrolled;
- Student Dialogue — public interaction with staff and all students enrolled; and
- Student Group Interaction — both formally established study groups used in discussion and submission of assessable work, and informal study groups set up by the students themselves.

The Current System

In 1995 we introduced a more sophisticated CMC system to support the teaching and learning at Deakin. The product chosen was FirstClass, a computer conferencing system from SoftArc. Together with FirstClass, a suite of communications and application management software programs was selected and bundled into a user package. This application suite is called Deakin Interchange. Users are provided with an easy to use graphical interface, with icons, pull down menus and full mouse driven functionality, which allows access to networked services through standard TCP/IP connection. The communication software is scripted to automate the connection procedure and minimise the amount of intervention required from users in the connection process.

The improvements in the operation of the CMC software and the reduction in complexity in the communications software encouraged us to expand the use of CMC into other Faculty programs. Students in the off campus Law program commenced using Deakin Interchange during 1995. In 1996 we included off campus undergraduate students in the Bachelor of Commerce. The problems we encountered here guided our expansion and the planning for 1997. The next phase of the implementation is to introduce CMC to the on campus undergraduate students. The target for this

radical switch in teaching environment is 1998. Eventually students studying in the Faculty's offshore programs will be included. The ultimate opportunity is an international learning experience for all students in the Faculty.

The Opportunities for Educational Dialogue

Deakin's implementation of CMC to support the MBA, the LLB and the BCom employs both open (or public) and closed (or private) conferencing space and other virtual spaces for teaching, learning, administration, social activity, and other purposes. At Deakin these conferencing areas are further combined into a standard desktop that includes email, library catalogues, book ordering, electronic library reserve, database, electronic directories, WWW access, newsgroups, file transfer, telnet and many other faculty, library, training and administrative services.

From an educational point of view, the open and closed teaching spaces are at the heart of the system. They are likened to physical teaching spaces such as lecture theatres and tutorial or seminar rooms even though quite different behaviour may occur within them. Open spaces are provided for each of the units in the program. Unit chairs and lecturing staff can convey educational and administrative information to all students and to a limited extent students respond, ask questions, provide information of their own and interact with staff. The provision of a case study, recently published article or policy document can stimulate open discussion and maintain interest and involvement in the course of study. This has its place. However, in our experience small closed group activity is the key to success.

These small closed groups best enable the socialisation of group members as described by Kaye [1992]. It is the establishment of a cooperative learning environment using CMC technologies which seems to deliver the benefits we observed. In this our observations are supported by Klemm who felt that it was a wasted opportunity not to include cooperative learning in the use of CMC in educational environment — 'in situations where students are separated by time and distance, conferencing is the only practical way to implement any meaningful CL' (Cooperative Learning Environment) [Klemm, 1995].

The establishment of virtual groups

The establishment of virtual tutorial groups is critical to the success of any CMC based collaborative learning environment. Kaye [1992] argues that for any meaningful and useful collaboration to occur within a CMC system it is essential that there is motivation to participate; that there are shared goals and aims; and that there is some structure to the virtual environment created. The use of virtual tutorial groups within the Faculty's programs is done with these objectives in mind. CMC groups are established using two approaches.

In the MBA, students are introduced to CMC during a face-to-face orientation program. An outcome of this program is the self selection of tutorial groups based on the interaction that occurred during the program. In some cases geography still influences the establishment of these groups, however this influence is decreasing as student locations become more widespread. Initially MBA students tended to progress at the same rate as their peers. Therefore, in most cases, students would remain with the one group for the duration of their study. However, the introduction of new flexible entry points has resulted in MBA students who progress at differing paces through the program. In the 1996 MBA student cohort we noted more volatility in virtual group membership than was evident during the initial years using CMC. The groups have remained self selecting however, an approach felt to be important in the 'high pressure' MBA environment.

In the BCom, there is no initial orientation program thus students are allocated to tutorial groups randomly. Students progress through the BCom at different rates. The BCom is a more flexible and broadly based program than the MBA. Therefore, tutorial groups are based around units. This results in an individual student being involved in more than one virtual tutorial group, in the same way as they would be allocated into multiple tutorial groups if studying on campus. Initially students experience some difficulty interacting comfortably and team forming takes a little longer than hoped. Further this 'burn in' phase happens every semester as new virtual tutorial groups are created for new units of study. Thus, more pressure is placed on the teaching staff to assist in the smooth formation of groups. They must find ways to nurture the establishment and maintenance of these virtual groups. This task is not significantly different, however, from the need teachers find to establish and nurture traditional face to face tutorial groups. Indeed Kaye [1992, p.15] points out that

'many of the social skills needed for nurturing online collaboration are not specific to the CMC environment'.

Use of the virtual groups
A number of pedagogical strategies have been implemented using CMC to encourage collaborative learning and student dialogue as this is the area where traditional distance students are at a disadvantage. Teachers have used progressively expanding case studies discussed using the virtual group; contemporary issues from the popular press have been used as 'discussion starters'; the virtual groups have been used to simulate formal forums; and collaboration in the development of assessment submissions has been encouraged because of the benefits this has as a learning experience. For a detailed discussion on the pedagogical techniques often used to encourage CMC usage in the learning environment the reader might like to access Paulsen's Online Report on Pedagogical Techniques for CMC [1995 August].

Progressive Assessment
In both the MBA and the BCom, students in virtual tutorial groups are involved in addressing sets of traditional tutorial questions throughout the duration of the teaching period. Within each group the questions are spread amongst those involved (sometimes using a formal approach, sometimes the group itself allocates tasks) solutions are posted into the group's private space, the group interact to critique the initial responses and agree on a final assessable submission. Academic staff act as mentors in this process. In all but exceptional circumstances this group interaction results in a higher quality learning experience [Stacey, 1996; Stacey & Thompson, 1996].

Further, the use of a single submission by group reduces the resources used in assessment. Experiments have been successfully conducted in multiple choice assessment. The automated marking and feedback of results again reduces resources used in assessment with no resultant loss of quality. In fact, the faster turn around and minimal effort enables the scheduling of additional progressive assessment. The result of this more frequent progressive assessment is the earlier identification of students who appear to be struggling and the consequent early intervention by the tutor. It is believed that this early intervention will reduce student drop out rates.

Outcomes – Lessons from the Case

Individual implementation is not easy
Experience with the initial TEAS pilot convinced us that the installation of the CMC system and the required communications software on the personal computers in the offices and homes of the target users was a significant issue. While the level of general knowledge about the Internet is rising, the practicalities of Internet connection are still a formidable barrier to participation. An approach was required which simplified the installation and hid the technical details of modem connection and data transfer protocols from the often technically naive users.

Changes required in pedagogy
We were able to demonstrate that the use of CMC required significant changes to the methods traditionally used in the delivery of distance teaching. The increase in interaction between students and teaching staff meant that existing teaching and learning paradigms needed to be re-evaluated to ensure that the potential for this approach to teaching and learning was maximised. Findings such as these are being repeated elsewhere. Whenever the introduction of new technologies is trialed the need to re-engineer the processes involved in the teaching and learning environment seems to be identified , for other good examples see Berge and Collins [1995].

We observed an improved effectiveness in student learning [Stacey, 1996; Stacey & Thompson, 1996]. Further, we were convinced that, in order to deliver any efficiencies in teaching, use of the system needed to be compulsory. Efficiencies were gained through the asynchronous nature of the communication made possible using CMC, as messages can be read and responded to without consideration for time and place. Academics can easily communicate with all students provided all students are connected via CMC.

Costs to be spread
It was clear that the cost of access to the Deakin network and provision of network infrastructure would be significant. This cost was initially borne by Deakin (Information Technology Services Division, the Faculty of Business and Law, and others, shared the costs of the pilot). It was obvious

that to scale up this project to encompass over 2000 users, as would be required to introduce this technology to all undergraduate students in the Faculty of Business and Law, would require a different approach. The justification of centralised IT infrastructure would need to change. Students need appropriate computers and software. Finally, a method of cost recovery for Internet use is required. Legal difficulties in imposing these costs on students are yet to be resolved.

Savings & Improvements delivered by CMC

The ability to answer a multitude of similar enquiries with one response and the emergence of peer group solutions in closed conference reduces the demands on staff while simultaneously raising the levels of services to students. In short we have seen:

- flexibility in program design and delivery;
- educational benefits to staff and students;
- efficient use of time;
- timely and more efficient program management;
- ease of contact with students; and
- timely and accurate monitoring of student progress leading to higher retention rates (note—only early qualitative evidence is available on this outcome).

Warnings identified

The provision of adequate staff training to ensure the development of teaching skills is essential. Academics must be motivated to change the traditional mechanisms used to deliver off campus education. The established institutional norms that determine teaching loads, student-teacher ratios and academic autonomy will be challenged. CMC brings new tools for interaction between students and, in general, they enthusiastically embrace this new ability. However, without enthusiastic participation and leadership from the academics involved, the full potential of CMC to enhance the learning experience will not be achieved.

There is a significant difference between showing a technology is feasible during a pilot and actually having infrastructure in place to enable mainstream use. Whilst it is easy to fund a small scale pilot, the allocation of resources needed to expand infrastructure to fully implement the use of this technology within a mainstream program with large numbers of students will require significant institutional forward planning. Two forms of infrastructure pressures will be experienced:

- the use of network and communications hardware will dramatically increase;
- demands on IT support staff for assistance with installation and connection procedures will peak at the commencement of teaching periods.

It is only after a large front end investment that the use of computer mediated communication offers economies of scale.

The compulsory requirement for students to acquire appropriate computers and software may require a reinterpretation of Australian Government guidelines. Further, the charging of students for remote access to what will become a compulsory part of their learning may also require a reinterpretation of these guidelines. Legal difficulties in imposing these costs on students are yet to be resolved.

Conclusions

The emergence of new electronic tools useful in creating a teaching and learning environment that is cost efficient, while at the same time flexible and rich with dialogue, is an exciting prospect. But, of more significance is that it is achievable using technologies available to both students and educational institutions —now.

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