

Flexible Learning and Teaching and IT

Alan McMeekin¹

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Abstract

This paper identifies the strategic context of flexible learning and teaching systems and defines key characteristics of flexibility to be *openness*, *transactional distance* and *student centredness*, enabled by *communications and information technology*. Projected student profiles at Monash are analysed in terms of different student learning situations and the types of services required by students. Two 'virtual' campus strategies are identified. The first is the tele-learning/teaching model focussing on synchronous videoconferencing systems. The second is the multimedia model, where an Intranet based on Internet protocols and the World Wide Web forms a systems superstructure which links students to a comprehensive and evolving set of educational and administrative services available synchronously and asynchronously. There are a number of other complex issues that are potential barriers to a successful implementation of a 'virtual' campus, viz. quality, student access, hardware/software lifecycles, system response times, on-call support, student IT literacy, staff training, and 24 hour by 7 day operations.

¹ There have been many sources of information for this paper, and wherever possible credit has been given to the authors. However, some of the sources are unpublished papers for use internal to the University, and authored/reviewed jointly by many staff. In these cases, it has not been possible to accurately reference. Special mention and credit must be given to Asad Khan of Information Technology Services and Di James, advisor to the Vice Chancellor.

1 Introduction

For strategic purposes, Monash University has embarked on a program to enhance learning and teaching by developing systems that increase the flexibility available to students, staff and the university. Communications and information technology will have a key role to play in delivering electronic-based services and resources to students. A multimedia model for a 'virtual' campus is proposed to form a systems superstructure with links to a wide variety of educational and administrative services and accommodates both synchronous and asynchronous forms of service delivery and interaction.

2 The strategic context

In order to retain and expand its current market, and to meet resourcing constraints and student access needs, Monash has acknowledged that university policies and teaching practices require change. Consequently, the development in 1997 of the Monash Plan '*Leading the Way*' provided a new vision and direction for the university as well as an integrated strategic planning and review process. The Learning and Teaching Operational Plan (Operational Draft), which is part of the first stage of the university's policy implementation strategy, was released in March this year.

As a result of this planning process strategic priorities for the university include:

- providing students with greater choice in terms of the place, pace, time and style of learning and interaction with teachers and other students;
- developing more flexible programs, award structures, accelerated study options and articulation with VET and other institutions;
- using new technologies to enhance the quality, integration and scope of the teaching and learning environment; and
- internationalising the curriculum and the undergraduate experience.

The Monash Plan (1999-2003) has identified that "Information Technology has a crucial role to play in transforming the academic environment. Advanced communications facilities and information services will play a vital role in enabling Monash staff and students, wherever located, to participate fully in the life of the University", (p33). The University is in the process of developing an Information Technology Strategy, which has as its core element the design and implementation of an IT superstructure to support the ongoing IT needs of a 'virtual' campus.

3 Flexible learning and teaching systems

Developments in communications and information technology are presenting opportunities which are blurring the boundaries between various models of learning and teaching previously adopted in our universities, such as on-campus teaching, distance education and open learning. The concepts of "*openness*", "*transactional distance*" and "*student-centred*" are useful in understanding what flexible learning and teaching systems are, particularly in relation to the deployment of information technology.

Rumble (1989) defines 15 characteristics of *openness* grouped into five categories as being:

- **"Access related criteria"**, i.e. age, the ability to attend a class, employment status, how tied to an environment the student is (e.g. a seaman, homemaker etc.) relative independence of financial status, and the irrelevance of previous educational qualifications.
- **"criteria related to place and pace of study"**, i.e. able to study in a place of own choosing, can begin studying whenever chosen, study at a time chosen, study at chosen pace, and the ability to study independently of deadlines.
- **"criteria related to means"**, i.e. the existence of a range of media that allows the student to choose.
- **"structure of program in terms of content and assessment"**, i.e. ability to choose a particular course or section of a course, recognition of prior learning or experience, and a student's ability to define learning objectives and to select content, services and assessment method to match.
- **"criteria related to support services"**, i.e. the provision of counselling and advisory services.

These characteristics of *openness* could be common to both face to face and distance education delivery modes and any particular sample from either could be labelled in the continuum from *closed* to *open*. For example, a distance education program would be considered to be a relatively closed system if there were an over-dependence on prepared media with little choice of content and little interaction with lecturers and other students. The division between face to face and distance education has become less obvious "as many of the approaches used within distance education systems to teach students remotely can also be used to support classroom teaching", (Rumble).

Moore (1983) introduced the concept of *transactional distance* to define the extent of separation between the teacher and learner. It is a function of two variables: *structure* and *dialogue*. *Structure* refers to the "extent to which educational objectives, teaching strategies, and evaluation methods are prepared for or can be adapted to the objectives of the learner" and can be compared with certain aspects of Rumble's *openness*. *Dialogue* refers to the communication flow between teacher and learner. According to Taylor et al (1996, p.78) dialogue offers these advantages. It:

- personalises the experience for the student;
- overcomes the alienation of distance between teacher and student;
- clarifies students' needs; and
- involves students in the university culture.

Student centred learning is a third dimension. Lewis and Spencer (1986) define "open learning as a term to describe courses flexibly designed to meet individual requirements. It is often applied to provision which tries to remove barriers that prevent attendances at more traditional courses, but it also suggests a **learner-centred** philosophy". Following on, Sewart (1988) relates the adoption of a service industry approach or *student-centred* approach to the provision of education. Sewart identifies the potential conflict that this philosophy might generate in a large-scale distance education system which prepares learning packages and "to tacitly assume the subordination of the needs of the individual to that package".

Finally, what characterises a **flexible** learning and teaching system? Taylor et al (p.xi) uses the term *flexible* to "refer to practices which utilise the capacities for learner-learner and teacher-learner interaction made possible through recent developments in communications and information technology to provide increased openness in both on and off-campus delivery of educational material". The concept of *flexibility* of an educational system can be aligned to the characteristics of *openness*, *transactional distance* and *student centredness* that have been identified in other models, enabled or enhanced by the judicious application of **communications and information technologies**.

4 Student Centredness: Who are our students?

The Distance Education and Open Learning Committee's Working Party on Student Support Services (chaired by Prof. J. Harris) has identified five different learning situations for Monash students.

- Lecture/tutorial (i.e. Without computer mediated technological enhancement)
- Mixed-media (i.e. Lecture/tutorial with computer mediated technological enhancement)
- Intercampus remote delivery (i.e. Lecture/tutorial delivery to remote campuses using one or two-way video/and two-way audio)
- Workplace/Home remote delivery (i.e. Lecture/tutorial delivery to groups or individuals using one- or two-way video and two-way audio)

- Distance education (i.e. Substantial or complete replacement of lectures and tutorials by use of learning materials)

While the methods of grouping students do not match exactly, it is useful to compare these with student load profile projections contained in The Monash Plan (1999 – 2003), and these are listed in Table 1.

Study Mode / Campus	Estimated Actual EFTSU 1998	Planned EFTSU 2003	% increase
On campus/Onshore			
Clayton	16324	15908	
Caulfield	6434	6195	
Peninsular	2485	2000	
Gippsland	1503	1500	
Berwick	732	1225	67%
Parkville	464	740	59%
Total	28041	27568	
On campus/Offshore			
Sunway - Malaysia	656	5500	738%
Other		2798	
Total	656	8298	1165%
Off campus/Onshore	2318	2302	
Off campus/Offshore	1438	3730	159%
'Virtual' *	4506	9585	113%

Table 1: Student load profile 1998-2003

The following facts are significant in our considerations of how a 'virtual' campus might be implemented:

- The load profile for Australian campuses will continue largely unchanged. This implies that Monash will continue to require comprehensive facilities to share resources across multiple campuses.
- The Sunway – Malaysia campus will grow significantly by 738%, which implies that inter-campus links with Sunway will become increasingly important.
- The offshore, distance education market will grow significantly by 159%, and the 'virtual' campus will grow by 113%. This implies that there will be an increasing need for pedagogically effective electronic learning and teaching systems to be accessible world-wide.

* 'Virtual' includes all distance education programs, other off-shore campuses, off-shore twinning programs and open learning programs

5 Required services

A review of the IT services required to support these learning situations leads to the identification of common elements across all groupings of students. As a minimum, there is a need to provide the capability:

- To access a wide range of learning materials and resources.
- To offer a wide range of learning experiences to suit different learning styles.
- For a high degree of interaction between students.
- For academic staff to provide feedback to students.
- For both synchronous and asynchronous delivery and interaction.
- To evaluate the effectiveness of adopted learning strategies.
- To evaluate student satisfaction.
- To offer a wide range of administrative services.
- To offer a consistent and high standard of services.
- To provide extensive and effective technical training and support services.

There is also an opportunity for the University:

- To form alliances with other institutions to share resources.
- To expand into other student markets.
- To improve operational efficiencies.

An IT architecture that supports the formation of a ‘virtual’ campus will need to satisfy many of these requirements.

6 Towards a ‘virtual’ campus architecture

There are two fundamental strategies that can be adopted to implement a ‘virtual’ campus. The first is sometimes referred to as the **tele-learning/teaching model**, whose principal characteristics are that it supports synchronous interactions between students and academic staff via such applications as videoconferencing, audioconferencing, and audiographics. Monash has already made a significant progress in videoconferencing services with 6 videoconferencing and 9 tele-learning/teaching rooms operational between all Australian campuses, except Parkville. Expansion of these services is planned.

An alternative and more comprehensive strategy for a ‘virtual’ campus may be referred to as a **multimedia model**, where students have access to a wide range of multimedia resources, synchronously and asynchronously via a university Intranet. An Intranet may be defined as a computer applications system and network connecting an affiliated set of clients using standard Internet protocols, especially those supporting World Wide Web services. From a user’s perspective Intranets provide a means to engage in group-work, to communicate, and to access customised information through standard web browsers. A well-designed Intranet brings order and structure to key services and organisational information.

Intranets, specifically designed for students and staff, are proposed to form the systems superstructure of a 'virtual' campus that underpins the delivery of electronic based systems to support flexible learning and teaching at Monash. The Intranets will provide a one-stop front end for accessing most of the university's information, teaching, communication, and administrative functions through the integration of a technology based teaching environment, publication of learning materials, messaging system, library systems, and integrated administration systems. It is anticipated that all Monash students will access this system and be presented with:

- a common student environment consisting of a comprehensive and expanding set of core services available to all students, and
- a customised student environment which matches the needs of each individual student and host faculty.

Staff will also be provided with an interface tailored to suit the specific needs of various roles, personalised to the individual, which provides services that parallel those available to students.

The extent of services and resources that can be linked into this superstructure will develop over time and provide for a great degree of flexibility for future expansion. Developments may occur centrally, or be devolved to match organisational structures. The superstructure developed by this project will provide the flexibility to link to a number of independent application services provided by various departments of the university, and external agencies. Faculties will be able to prepare multimedia subject materials using software provided by this project, or developed independently. Services provided by the Distance Education Centre to students studying remotely will be integrated with these Intranets, as will advanced electronic services available as part of the new Library system,. The new administrative systems will also be fully integrated, enabling authorised update and appropriate student access.

A macro-level design for the Intranets, is shown in Figure 1.

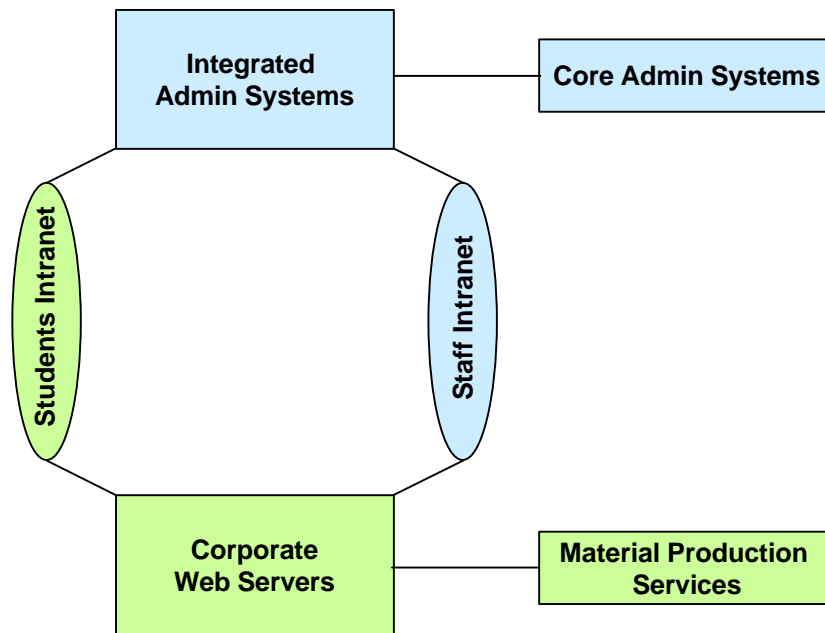


Figure 1: Staff and Student Intranets, Khan, A. (1998)

A representation of how these components will be assembled to form the infrastructure for a Flexible Learning & Teaching environment is shown in Figure 2. Some of the components required to build these Intranets are either available or will shortly be available.

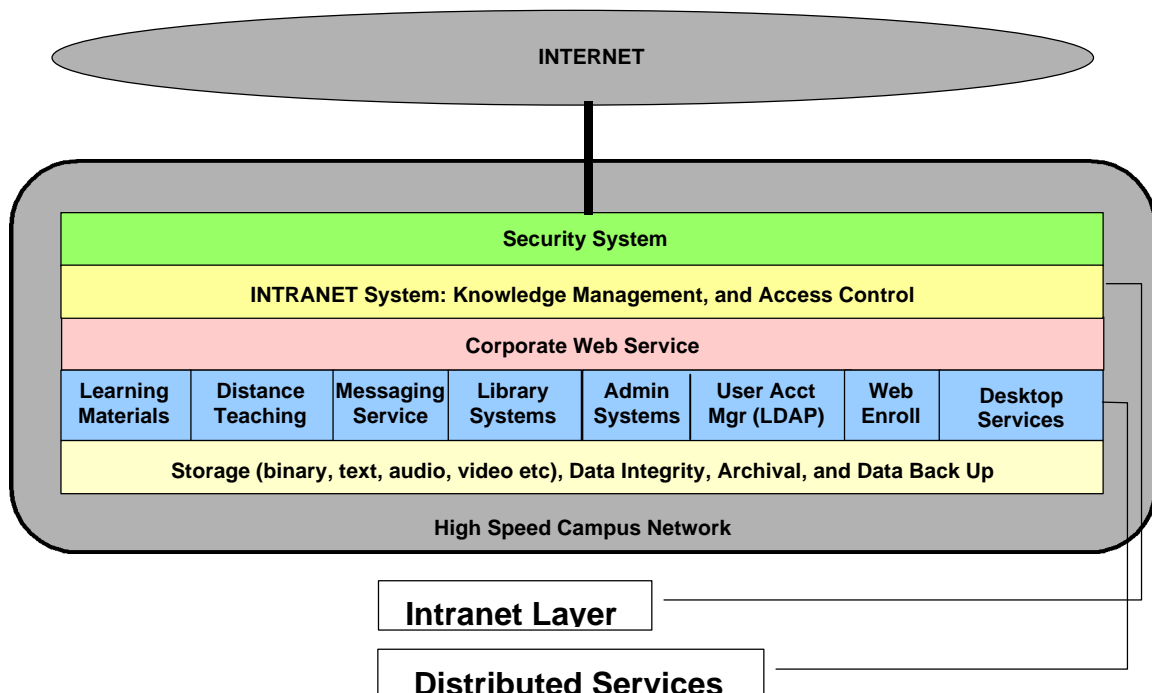


Figure 2: Infrastructure components for supporting Flexible Learning & Teaching environment, Khan, A. (1998)

Security Layer

The role of the security layer is critical, and requires the consistent adoption of security policies, procedures and infrastructure across the university. It provides the mechanisms for students and staff to identify themselves for service customisation, and to minimise the threat of various types of security breaches.

Intranet Layer

The Intranet layer will act as the vehicle for presenting all the underlying distributed services in an integrated manner over the web. User management and customisation of user interface functions will be handled within this layer.

Corporate Web Service Layer

An effective web service underpins many of the electronic services delivered under the banner of flexible learning and teaching systems. Information on a website should be customer-driven, relevant, current, well organised, attractively designed and accessible. This project proposes a four tiered management structure for the development of Monash's web presence: infrastructure management, information management, content management and content creation.

Distributed Services Layer

This layer can be expanded in the future to include any number of services, but in the immediate term it will support the following components:

- Multimedia learning materials published by academic units in a format suitable for the WWW, it may be prepared in a number of ways: ranging from authoring HTML pages, to the use of "packaged" systems.
- A distance teaching environment will be available to provide a number of management tools for an online environment, including such facilities as online assignment submission and evaluation support.
- The Monash Messaging System will provide the workgroup support through email, directory service, discussion forums (managed newsgroups), calendar service, and Internet video/audio/text based conferencing facilities. Forms of synchronous communications such as video, audio and text will also be supported.
- The Library services will include literature search systems, online references, online document delivery service, and video/audio archives. The new Library system (operational from Semester One, 1999) will integrate with this model.
- A wide range of administrative services will be available. These might interact on-line to the university's core administrative systems or through data extracts from these systems. Once implemented the new Integrated Administrative Systems (IAS) will be fully integrated into these services. Course related

information, timetables, and other frequently updated information would be dynamically updated on the web using the existing infrastructure of a web-enabled Oracle service.

- Staff and students will be able to transparently access information residing on their Novell/UNIX accounts and their desktops. This information could be published on the Web, with easy to apply access controls.

Electronic Storage Layer

The increasing reliance on electronic media requires the University to provide services that guarantee resources are readily and transparently available to students and staff, without imposing unacceptable operational burdens. The continued development and extension of Monash's Hierarchical Storage Management (HSM) system will accommodate the increased reliance on the storage of electronic media, in text, graphical, audio and video forms.

High Speed Campus and Inter-campus Network

The network forms the most fundamental component for the delivery of all electronic services. Monash has expended a significant amount of effort planning for and partially implementing high speed links within and between campuses. Funds will be required to enhance these networks as the basis for transmitting electronic communications and learning materials.

7 The "Hard Yards"

The implementation of student and staff Intranets at Monash will go a long way towards improving services to students and achieving operational efficiencies for the University. While the adoption of this superstructure will help institutionalise new modes of learning and teaching, there are a number of important secondary issues that need to be addressed, before we can claim a successful implementation of a 'virtual' campus. Policy needs to be formulated for each of these issues, procedures defined and resources allocated. Some of the issues that present major challenges to the successful implementation of a 'virtual' campus are:

- The presentation of a professional, consistent standard of quality

The proposed model for a 'virtual campus' provides the opportunity to present layers of services/resources provided by the institution, faculty, department and individual academics. A policy needs to be developed which identifies the responsibilities of each of these layers, defines the presentation style of each, and identifies mechanisms for quality and version control.

- Student Access

Students require convenient access to a computer and the Monash campus network for these services to be properly utilised. The percentage of students

with these facilities is already high as private ownership is rapidly becoming the norm within Australia. If current trends continue, one might expect that the next few years will be transitional years after which every student will come to Monash willing to invest in these 'tools of trade'. There will be opportunities for Monash to negotiate with suppliers for attractively priced packages including computer hardware, software, Internet access, support and training.

- Hardware/software lifecycles

The lifecycle for desktop and Internet software products is decreasing, and each new version inevitably requires greater processing and storage capacity as features and functionality improve. The University has no control over these development cycles. It is obliged to follow these trends to some degree, and it is impossible to quarantine the development of Monash applications software. One of the greater challenges is to strike a balance between the need to upgrade desktop and applications software to versions that are supported by suppliers, along with the need to minimise expenses for students and the University.

- Increasing demand for on-campus computer laboratories

The demand for timetabled and non-timetabled access to computer laboratories will increase as faculties and individual academic staff respond to University-wide initiatives in flexible learning and teaching. The nexus between academic decision-making and the provision of computer laboratories needs to be managed tightly. Arrangements need to be in place to make the most of our investment in laboratories by extending their hours of operation.

- Reliable response times

Service quality seen as delays in accessing resources, are dependent on several factors, but primarily on the capacity of the network and network servers.

The network forms the basic plumbing for all IT services. Funds are required on a regular basis to upgrade the campus local and wide area networks to accommodate increases in traffic and uses of multimedia resources. At least these issues are under the control and management of Monash. On the other hand, the Internet is a very unpredictable resource, beyond the control of any single organisation. Some of the potential sources for diminished service quality include the links from Monash to AARNet, AARNet international links, the standard of Internet services in other countries, and the standard of the Internet Service Provider employed by the student.

There are strategies that can be adopted which will minimise these risks, including the deployment of mirror sites and proxy servers, nomination of preferred ISPs, and the deployment of redundant communications links to AARNet and between Monash campuses.

- On-call support

From time to time students need help for any number of reasons: simple enquiries about administrative matters, advice about academic matters, or technical assistance, with first time users of electronic services usually in most need of help. Well-publicised and extended support hours need to be available via telephone or via electronic mail, like a traditional call-centre or help desk. Staff offering this first level support should be adequately trained and supported by intelligent software that caters for the most common questions. Unanswered questions can be recorded and referred to the appropriate area of the University, with appropriate management and follow-up.

- Student IT literacy

Students need confidence in accessing electronic resources and using services which are often an integral part of their studies. Many students entering university directly from high schools are very computer literate. Students from other backgrounds often require substantial support. There are a number of strategies that might be useful to address this, but probably the most effective is to incorporate the acquisition of appropriate IT skills and literacy within the academic programme. The Library, ITS and other service areas may assist in this process.

- Staff training

Staff wanting to use these methods within their courses require both “hands on” IT skills, and the ability to incorporate electronic based services within their courses in ways that are pedagogically effective. Any training programme needs to contain both of these two elements, preferably in a seamless way where examples of good educational practice are practised in a “hands on” sense.

- 24 hour by 7 operations

University IT operations and support services will need to be available around the clock. As students and staff become very dependent on IT operations to perform their core activities, and students could be living and studying in any time zone around the world, the University’s online services must be available. This could be an extremely challenging and expensive undertaking. There are just so many potential points of failure, in practical terms it will become a matter of minimising the risk of failure and the impact of failure. An obvious strategy would be to place all servers in a controlled and managed environment. The expense of providing fail-safe servers, duplicate network and telecommunications structures, local mirror and proxy servers, and extended hours of telephone support is considerable and must be justified.

8 Conclusions

The key characteristics of flexible learning and teaching have been identified as *openness*, *transactional distance*, and *student-centredness*. A model for a ‘virtual’

campus has been presented which offers Monash students enrolled in different situations and with differing personal circumstances a great deal of flexibility to complete their studies. It describes a systems superstructure under which a comprehensive range of educational and administrative services may be included, which caters for diverse national and international student profile, and which accommodates a devolved mode for content preparation. However, as discussed in this paper, there are a number of broader issues relating to IT that need to be addressed, before the implementation might be considered as successful.

References

- Khan, A. (1998), Intranet diagram first presented in an internal departmental paper.
- Lewis, R. and Spencer, D. (1986) What is Open Learning?, Open Learning Guide 4, London Council for Education Technology, pp. 9 - 10
- Moore, M. (1973) 'Towards a theory of independent learning and teaching', Journal of Higher Education, 44, p. 664.
- Rumble, G. (1989), "'Open learning", "distance learning", and the misuse of language', Open Learning, vol. 4, no.2, pp. 28 - 36.
- Sewart, D. (1988) 'How student-centred is the Open University?' in Paine, N. (ed) (1988) Open Learning in Transition: An Agenda for Action, Cambridge, national Extension College, p. 248.
- Taylor, J.C. (1995) The Tyranny of Proximity, University of Southern Queensland, unpublished paper
- Taylor, P.G. et al (1996) Flexibility, Technology and Academics' Practices: Tantalising Tales and Muddy Maps, J.S. McMillan Printing Group, Canberra.

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