Physical Facilities for Flexible Delivery
Physical Facilities for Flexible Delivery

Flexible Delivery Working Party

June 1994
Physical Facilities for Flexible Learning

Published by the Flexible Delivery Working Party
For further information please write to:

Executive Officer
Flexible Delivery Working Party
Queensland Distance Education College
1 Cordelia Street
SOUTH BRISBANE Q 4101

© Flexible Delivery Working Party

This work is copyright. Apart from any use permitted under the Copyright Act 1968, as amended, no part may be reproduced by any process without the prior written consent of the publisher.

ISBN 0 642 19680 X
Printed in Australia by The Print Approach (07) 888 2488

Acknowledgments:

Physical Facilities for Flexible Learning was developed by the Planning and Evaluation Unit of the New South Wales TAFE Commission for the Flexible Delivery Working Party. The report was prepared by Tony Anderson and Brian LeBransky.

During the project, considerable help was received from Laurie Fitzallen, Gaye Shovon, Peter Gray, John Sharp, Joan Evans, and Tania Green. Special thanks are due to Maree Marsh and Bryan LeBransky who carried out the field work for the study, and those who lent their expertise by participating in the interviews. A special acknowledgment is due to Robin Lockhart and Margaret Swinbourne for their excellent work in conducting the literature search.
Physical Facilities for Flexible Delivery examines the relationship between flexible learning and physical facilities. It reviews the possible impacts on the design of existing and future facilities of the adoption of more flexible approaches to the delivery of vocational education and training. Guidelines and strategies are proposed for the design of learning environments, including industry based facilities, which promote and facilitate access for all learners.

The guide is one of six resources developed by the National Flexible Delivery Working Party to support the implementation of flexible delivery by vocational education and training providers. The Flexible Delivery Working Party believes that the adoption of more flexible approaches will considerably improve the quality, equity, productivity and quantity of vocational education and training in Australia.

All six resources have been designed and developed to assist providers in planning for and implementing flexible delivery. In particular, the resources have been developed to assist TAFE and training systems and institutions to achieve the goals and targets of Flexible Delivery: A National Framework for Implementation in TAFE. The National Framework was developed by the Flexible Delivery Working Party and endorsed by the National TAFE Chief Executives’ Committee (NTCC) in November of 1992. The Framework provides the context in which innovative plans and strategies can be developed for the adoption of flexible approaches to delivery. The resources provide models and tools to assist in the development of plans and strategies.

The other resources developed by the Working Party are:

Cost/Benefit Model for Flexible Delivery.

A Guide to Implementing Flexible Delivery.


Learning Centres.

Appropriate Technologies for Flexible Delivery.

Allan Bowen
Chairperson
Flexible Delivery Working Party
Contents

Executive Summary .................................................................................................................. 1
Glossary .................................................................................................................................... 7

INTRODUCTION ..................................................................................................................... 13
  Purpose of the study .............................................................................................................. 13
  What is flexible learning? ...................................................................................................... 13
  The importance of flexible learning in the workplace ......................................................... 15
  Flexible delivery and the National Training Reform Agenda .............................................. 16
  How the study was carried out ............................................................................................ 17

LITERATURE REVIEW .......................................................................................................... 19
  General impact of flexible delivery on public sector educational providers ....................... 19
  Impact on training within industry ...................................................................................... 21
  The impact of new developments in educational delivery on facilities ......................... 22
  Access for disabled and disadvantaged users ..................................................................... 24
  Planning for the needs of educational staff ....................................................................... 25
  Cost of delivery issues ........................................................................................................ 26
  Learning spaces for tomorrow ............................................................................................ 27
  Some important issues in relation to technology ............................................................... 27
  The importance of evaluation and research ....................................................................... 29
  Summary of key principles identified by the literature ...................................................... 29
  Conclusion ........................................................................................................................... 31

ORIENTATION TO DECISION MAKING .............................................................................. 33
  Analytical framework for the study .................................................................................. 33
  Questions which face the decision maker when planning a flexible delivery program ......... 34
Three important preliminary questions before deciding on a facility ..........38

STRATEGIES FOR FACILITY DESIGN AND USE.................................41

Introduction ......................................................................................41
Management: adopting a flexible approach .....................................41
Course design and development .....................................................45
Access to learning services ................................................................46
Equipment and furniture .................................................................48
Designing large facilities ..................................................................50
Purpose built facilities ......................................................................54
Architectural and engineering considerations .................................55
Building materials ...........................................................................55
Building services (power, water, drainage) .......................................56
Storage ..............................................................................................57
Walls .................................................................................................57
Renovation/modifications to existing facilities .................................57
Occupational health and safety .........................................................58
Physical facility management issues ...............................................59
Summary of key principles in the process of managing flexible delivery ....61

DELIVERY OPTIONS AND SPECIAL PURPOSE FACILITIES ...........65

Self-pacing .......................................................................................65
Mixed mode .....................................................................................66
Audio-visual resources ....................................................................67
Computer Managed Learning .........................................................68
Computer Assisted Learning ............................................................70
Computer Mediated Communication .............................................71
Audio conferencing .........................................................................72
Videoconferencing .........................................................................72
Executive Summary

This study examines the relationship between flexible learning and physical facilities. It examines the possible impacts on the design of existing and future facilities, including learning centres. Guidelines and strategies are proposed for the design of learning environments, including industry-based facilities, which promote and facilitate access for all learners. The study was commissioned by the Flexible Delivery Working Party as part of an overall national project on flexible learning.

The two major conclusions of the study are that flexible learning will have significant impact on the management of physical facilities used for education and training but will have less impact on the design of those facilities. The latter conclusion is the result of the general trend, since the 1980s, of designing educational facilities for flexible use.

The main questions to consider when assessing the likely impact of a flexible learning program on educational facilities are listed below (see Figure 3.2 for more detail).

- What is the learning need and who is the client?
- What is the learning approach?
- What learning media will be used?
- At what locations will the learning take place?
- What will be the effect of the mode(s) of delivery?
- What support does the learning process require?

- If a physical facility is needed, consider the alternatives to construction:
  (a) Can you use a facility sharing arrangement?
  (b) Can you meet the training need in some non-traditional way?
  (c) Can the capacity of existing facilities be increased or extended? For example, can you add a library or resource centre or use communications technology to link learners, teachers and resources?

Guidelines for Managing the Implementation of Flexible Learning

1. **Strategic planning is vital.** Strategic plans will be needed to manage the educational demands of the present, while anticipating short and medium term changes in demands on educational buildings. It is essential to meet the skill needs of industry. Build links with industry and encourage industry to establish and share training facilities.
2. **Plan for the needs of learners.** Flexibility is required in curriculum planning to allow learners to proceed at their own pace, place and time, allowing for experimentation, innovation, and improvisation. The impact of multiskilling and workforce re-education will result in extension of the age range of clients. This will require educational facilities which can cater for the needs of young people and adults.

3. **Analyse the facility requirements when developing the educational plan for the delivery of the course.** This analysis should show whether:
   
   (a) a new facility is needed;
   
   (b) whether the educational provider has enough existing capacity to offer the course;
   
   (c) whether another provider could or should offer the course; and
   
   (d) indicate the staff, support infrastructure, equipment needs, facility type and costs.

4. **Adopt a flexible approach to management and develop an appropriate management culture for flexible learning.** Aim to develop a management culture which fosters the resourcefulness and adaptability of staff and encourages students to be self motivated problem solvers. Consider using multi-disciplinary, self managing work teams to improve the quality of services and support for learners. The successful implementation of flexible learning requires close attention to the management of the spaces within facilities. When more than one educational provider is sharing a facility, share the management.

5. **Attend to needs resulting from the changing role of staff.** Flexible learning will shift the role of educational staff from teacher-centred delivery toward that of being managers of learning. Ensure that staff make the transition from expertise in traditional classroom technology to the use of alternate delivery methodologies.

6. **Plan for an enhanced role for non-teaching support staff.** Flexible delivery can increase the proportion of non-teaching support staff to teachers. Plan appropriate facilities for non-teaching support staff.

7. **Look for new opportunities for establishing community learning centres.** Look for opportunities to establish learning centres within the community, e.g. in a shopping centre or within an enterprise.

8. **Develop a comprehensive plan to improve communications with staff.** Provide a comprehensive plan for achieving effective communication between the various interested parties or stakeholders in educational facilities.

9. **Plan ahead for inclusion of new technology.** Educational technology will influence building design, floor layout and fit-out. Build in the necessary communications infrastructure for receiving television broadcasts and provide for computer networks to open up access to knowledge for learners.
10. **Plan student workstations to facilitate use of educational technology.**
Ensure that workstations and work spaces will meet current and anticipated teaching and learning requirements.

11. **Decide whether to consolidate core expertise and services.** In certain cases there are advantages in consolidating core management services under one management umbrella such as resource development, technology and communications, or learning resource services. Retaining a core of expertise in learning material development is good practice, even when most of the production work is done on contract outside educational facilities.

12. **Establish mechanisms for the dissemination of expertise.** Aim to transfer core expertise to other staff members. This will require an assessment of the information network infrastructure needs, including suitable meeting rooms and conference facilities.

13. **Attend to student support needs.** The provision of effective and timely student support services is an important contribution to the success of flexible delivery of learning programs.

14. **Provide support for multi-use facilities.** Provision of back-up support is important for multi-use physical facilities.

15. **Be fair and equitable about timetabling.** Provide a person to handle space allocation and timetabling who is independent of the various parties using the facility, especially for joint-use facilities.

16. **Develop a plan for monitoring and evaluating facilities.** Continually monitor the utilisation of space and equipment.

17. **Balance security needs with clients’ needs for facility access.** Decide whether 24 hour access to a facility is required and, if so, what means of access will be provided. Make sure that needed physical resources are readily accessible. Do not lock them away in order to manage them.

18. **If advanced technology is to be installed, consider the impact on the facility.** Physical requirements for equipment accommodation may involve issues such as avoidance of exposure to heat, dust, vibration or electromagnetic interference. Consider the impact of high noise levels on surrounding spaces and provide adequate ventilation, and water, power, gas and sewerage services.

19. **Equipment must be robust to cope with learning demands.** There are indications that the adoption of flexible delivery strategies tends to increase the rate of utilisation, and consequently increases wear and tear on equipment. Ensure that equipment is robust and/or is fitted with self-cancelling switches.

20. **Plan for cycles of equipment, furniture or materials replacement.** Anticipate that several times during the life of the facility, removal or servicing of equipment, and the replacement of furniture or materials will be necessary.
21. **Plan for use of mobile equipment.** The use of mobile equipment can greatly enhance flexibility and adaptability of a facility.

22. **Design for people's needs by making facilities pleasant places for learning.** A friendly and relaxing environment (internal and external) is increasingly being seen as an important enhancement to any learning process.

23. **Plan for versatility of use of learning spaces.** Standard architectural design principles for making buildings more flexible may include: a simple structural frame; provision for horizontal expansion; core elements and specialised spaces positioned either in the centre or on the periphery of the building; the selection of standard room dimensions; a capacity to interchange spaces using similar or multiple dimensions; and the installation of services on a grid consistent with that of the structure. Facilities for flexible delivery will need to be adaptable to different teaching disciplines as well as to different learning approaches. Adaptability to future requirements can be facilitated by use of standard modules as a planning discipline.

24. **Include multi-function spaces.** Wherever possible, aim to avoid single-function space in preference to multi-function space which can offer a more integrated learning mode, incorporating suitably flexible and/or portable furniture and equipment, and allow more intensive use of space.

25. **Implement proper environmental controls.** Consider issues associated with the zoning of heating, lighting and ventilation so that only the minimum amount of energy is required.

26. **Plan for future expansion of the facility.** Plan for new additions by making site access available for future use, or consider other arrangements such as hiring, joint ventures or new technologies.

27. **Consider whether a successful design can be repeated.** To save money and time during the design process, consider whether a design which has proved to be successful can be repeated or whether it can be adapted with minor adjustments.

28. **Plan for cost efficiencies and for economies of scale.** Design facilities to enable a wider range of programs to be accommodated in the one facility, reducing the initial construction costs for a given mix of programs, and increasing utilisation levels.

29. **Plan to reduce fit-out and installation costs.** To reduce installation costs, consider the advantages of using either demountable or permanent enclosures (partitions, walls and windows), as these decisions impact on costs of floors and covers, lighting (type and pattern), service ducts and points, and affect traffic flows, storage, and arrangement of workstations. Always consider user safety, comfort and convenience when examining life-cycle cost issues associated with the choice of building materials.

30. **Consider life-cycle factors in relation to building materials.** Decisions about materials and equipment should be based on the type and level of utilisation of a facility, with attention paid to factors such as robustness or expected depreciation.
31. **Monitor developments in information technology.** Developments in the field of information technology are already changing the way that learners access learning materials, databases and teachers. These new developments include the use of a national television network for the distribution of learning materials to the home or the workplace. Managers of educational institutions will need to monitor developments and associated costs in this area continually to ascertain what repercussions these might have for the use and/or future adaptation of educational facilities, since these developments will alter the pattern of demand for, and usage of, facilities.

32. **Ensure that educational staff are more flexible.** Flexible delivery redefines the organisation and function of educational staff. The shift from teacher-centred to client-centred learning will require versatility among staff who specialise in flexible delivery. Staff development programs will be important in helping staff make the transition to flexible learning.

33. **Create instructional design teams with broad skills.** The shift to learner-centred delivery will require a substantial increase in the amount and quality of learning materials. To design educationally sound, cost effective programs for flexible learning, the staff working in instructional design teams will need to know how each delivery mode and medium will impact on course design and physical facilities. They will also have to understand the cost factors involved in blending various modes and media before they are able to decide on the final mix of these for a flexible learning program.
**Glossary**

*Accelerated learning* refers to shortening of the time taken for learning as a result of focused or intensive instruction. Advantages claimed for the technique include benefits for gifted students, students in the category of disadvantaged/at-risk students and for the initial acquisition of basic skills (Robertson, 1988).

*Access centre* refers to a self-contained, flexible use, training facility, used particularly for delivering short courses, fee-for-service training and facility hire. A kitchenette and a foyer are generally included in the facility.

*Administration centre* refers to a venue for the day-to-day management of learning service activities which can vary according to service objectives. It may include accommodation for admissions, records, finance, dispatch, operations, research and/or marketing (Watson, 1990; White and Watson, 1990).

*Audio conferencing*, also called 'teleconferencing', is the use of the telephone for voice-only conferencing.

*Computer aided learning (CAL)* refers to an interactive learning experience between a learner and a computer, in which the computer provides the majority of the stimuli, often in linear sequences or chains of presented material, according to the responses of the student. In advanced applications such as artificial intelligence based tutoring systems which attempt to imitate the problem solving knowledge of a human expert, the computer program analyses student responses and provides feedback to the learner. These systems can be used in integrated theory and practical programs in which the student is tutored in problem diagnoses using a computer simulation, then moves to a practical workshop to correct the fault, installed prior to the lesson, learning the use of appropriate tools and techniques (Anderson, 1990).

*Computer managed learning (CML)* entails the use of computers to manage the progress of students through a course of study by assessing their competence at various stages and advising on the learning action to be taken by students. CML can include functions such as the issuing of tests and the storage and display of student results.

*Distance education*, a term which has come to replace 'external study', refers to a form of education involving and overcoming the physical separation of teachers from students, and usually of students from each other (NBEET, 1992). The distinction between distance education and conventional education is becoming increasingly blurred and is likely to disappear (NBEET, 1992). This is largely because of the extraordinary development of telecommunications which has enabled many educational institutions to educate students outside classrooms enclosing teachers and students. Lectures can be taped and played over at any time suitable to the students; assignments and messages can be transmitted by computer and modem over telephone lines, and stored and accessed when convenient to the addressee. A tutorial between the members of a small group can be held over the telephone; and teaching material can be broadcast over radio or television and recorded automatically until the users are ready to access it.
Flexi-mode entails students attending an educational institution for all of their course, but by using learning packages they attend for less time and have more options as to when and where they learn (Planning and Evaluation Unit, 1992a).

Group and team learning. In group learning the facilitator is more actively involved in leading and guiding the learning process. In team learning the learning group works as an autonomous unit with the educator (teacher) more in the role of a reference person. These forms of learning appear to function best in groups of less than 10, and preferably in groups of six persons.

Independent learning occurs when students determine not only the pace at which they will learn but the method of learning and, in some cases (not CBT) the content to be learned.

Individualised learning occurs when students proceed at their own pace through a course of study tailored to their particular needs. The teachers’ role is to plan and sequence learning materials and to monitor student progress. An extension of individualised learning occurs when students form into networks for homework, peer tutoring, and teams. This form of networking is greatly facilitated by the use of personal computers and modems linked to the public telephone system.

Information centre refers to a centralised facility for access to, study of, and distribution of, learning resource information. A common example is the library.

Learning centre refers to a venue that facilitates student, teacher or resource centred learning. Learning centres can exist as either single sector or multi-sector centres or networks. See the descriptions of types of learning networks in Western Australia (McGregor and Latchem, 1991); the Queensland Open Learning Network (Gooley, 1992) and Open Learning Training Technologies (OTEC) Centre (West, 1992); and TAFE NSW Open Learning Centres (Planning, Evaluation and Research Division, 1992). A national register of learning centres was recently established by the Australian Education Council (AEC).²

A learning resource production centre is a facility for supporting learning services and client demands by producing various learning resource media for (mainly) mixed mode, open learning and distance learning methods. They are usually located on-campus and produce learning resource materials for courses and general sale revenue. These facilities can include accommodation for instructional design, graphic production, audio and visual production, and printing.

Live work centre refers to a hands-on learning venue provided by learning delivery institutions, community centres and industry, for delivering and testing industry standard competencies.

Lock step refers to the simultaneous progression of a group of students through a sequential learning program. It is usually measured in a fixed quantity of time whether delivered on-campus or off-campus. Although the lock step approach to delivery appears to be contradictory to the spirit of flexible delivery, it can be used as part of a flexible program, for reasons of cost-efficiency or, for example, to ensure that a knowledge prerequisite to a flexible delivery program has been mastered by a group of students before commencement of the main program.
Mixed mode is used in two different senses (NBEET, 1992). Sometimes it is used to mean the integration of face-to-face teaching with distance techniques. More commonly it means enrolling students simultaneously or serially in on-campus and off-campus study, as when timetables clash. Mixed mode provides the possibility for students to follow a single program of studies by switching between full-time and part-time (sometimes internal or external), depending on their current personal situation (Hubert, 1989). According to Taylor and White (1991) mixed mode is synonymous with open learning.

Mobile facility refers to a unit used where a fixed facility is either inappropriate or unavailable. Such facilities are suited to the delivery of intensive short courses and for delivery of training programs in remote rural communities to which they can be transported by road, rail or air systems. They are ideal for on-site enterprise training. They can also be placed indoors, inside a larger facility.

Multi-media refers to computers which feature graphics, sound, colour, animation and text, but can also refer to the mixture of a variety of media, as when a textbook, a workbook, audio-tapes and television broadcasts are woven into a flexible delivery program (NBEET, 1992).

Open entry/exit points in an educational program define the stage of recognised learning and training that a client has achieved either at the commencement of a learning program (entry point) or at the completion of a learning program (exit point). In addition to strategies which provide a range of entry and exit points, course design requires consensus on entry points, client selection, and recognition processes which enable credit transfer and articulation (e.g. recognition of prior learning and experiences). Open entry/exit points imply greater flexibility within and between learning services, removing unnecessarily restrictive practices which artificially limit the amount of credit or status which a client can bring to a program (Guthrie and Loveder, 1990).

Open learning is a form of study which the student 'may enter without any prior qualifications' and 'has the greatest flexibility in choice of topics of study, periods of studies, place and time of study, and modes of assessment' and 'includes the possibility of distance education although it is a much broader term' (NBEET, 1992, p.2).

Open Learning Training Technology (OTEC) Centre refers to 'an appropriately resourced area where learning resources can be designed, developed, delivered, trainees assessed and the learning process managed according to the needs of the learners' (West, 1992).

Purpose-built refers to the design and construction of educational facilities for specific function(s).

Real-time (as opposed to delayed time) interaction allows participants to be involved in a conventional classroom experience, at a distance, in which there is a high level of personal interaction between participants and immediate feedback (Lord, 1992). It includes teaching and learning which occur at the same time as in face-to-face interaction, or give the impression of occurring at the same time as, in audio conferencing, video conferencing, and computer-text conferencing.
Resource-based learning ‘involves students working principally on materials supplied by the teacher or the institution, rather than listening to the teacher’ (NBEET, 1992).

Self-paced learning is learning which proceeds at the learner’s own pace, is flexible in terms of entry, exit or re-entry, promotes self-assessment and provides access to feedback at a time to suit the learner. It usually has a self-contained modular structure, with mechanisms for bypassing competencies already acquired, and it can be supported by individualised teaching/tutoring (Morgan, 1990). Self-paced learning can also occur via independent learning. Self-pacing has an impact on facilities because allowance must be made for students to move through a course at different rates and resources must be available when needed. This has implications for the provision of resources for individualised learning.

Shared facility, also called joint use, refers to a building or space utilised by more than one agency based on a collective agreement which may involve individual or syndicated property ownership, rights or a rental agreement.

Shelf life refers to the period of time in which an item (e.g. a building, fixtures, hardware or software, educational materials) can be used efficiently, effectively and appropriately.

A telecommunication centre is a facility designed to link one venue with at least one other venue or network via telephone, radio or satellite technology. Its primary function is to receive and/or broadcast educational material by some form of electronic transmission.

Telecottages are multi-purpose work and learning centres set up by rural and remote communities as a way of overcoming isolation. Lynch (1993) states that they ‘can help rural communities by providing work opportunities using electronic document interchange (EDI) technology and electronic data processing as well as providing training and acting as electronic modes to distance education centres’.

Technology delivered instruction refers to the delivery of course materials by electronic means, principally by computers as in computer aided learning (described above).

Video conferencing is a means of providing interactive visual and audio communication, in at least four ways (NBEET, 1992, p.13):

- one-way video (usually via satellite to many receiving sites) with two-way audio (usually through telephone calls to the originating video studio where the teacher can answer them on-air if needed);
- two-way video and audio between two points, usually using a terrestrial link through the Integrated Services Digital Network (ISDN);
- one-way at a time multipoint video and audio - that is, several sites may be linked but only one of these sites can transmit to all the other sites at a time; and
- multipoint video conferencing, where several sites can all see and hear each other simultaneously, being linked by an electronic bridge.
Video conferencing reduces travel costs for face-to-face meetings and it is now relatively easy to link all forms of video devices (camera, videocassette recorders, graphics scanners, and computers). It can also play an important part in the management of flexible delivery programs by improved inter-organisation communication and more efficient and effective utilisation of scarce teaching resources (Anderson and Chodkiewicz, 1992). The major disadvantage of video conferencing is that the quality of the picture which is transmitted between sites varies according to the rate of transmission: 128 kb/s, 384 kb/s or 2 mb/s.
Introduction

Purpose of the study

This report examines the relationship between physical facilities and flexible delivery. The research aims were to:

1. Examine and report on the impact of the implementation of flexible delivery strategies on the design of existing and future vocational education and training institutions.

2. Examine and report on the impact of the implementation of flexible delivery strategies on learning centres and the use of industry based facilities.

3. Develop guidelines for the design of future learning environments which promote and facilitate access for all learners.

4. Develop strategies to ensure the effective use of facilities in delivering flexible learning to individuals and industry clients.

What is flexible learning?

Flexible learning allows for the adoption of a range of learning strategies in a variety of learning environments to cater for differences in learning styles, learning interests and needs, and variations in learning opportunities. It has the potential to allow training systems to respond more rapidly to client needs and, in the process, become more customer driven. It should allow the quality of training to improve in two ways:

1. Through the expansion of co-operative training and facility-sharing links with industry.

2. Through the development of learning materials which facilitate learner-centred, rather than teacher-centred learning, freeing students from the constraints of place (attending a specific location for learning) and time (being able to study at times which suit them).

Flexible delivery of learning is aimed at:

- increasing access and participation for increased numbers of learners;

- providing learners with greater choice of programs and flexibility in systems of delivery;

- removing barriers to learning; and

- improving the effectiveness and productivity of learning.
Flexible delivery promotes the use of a range of delivery modes (self-paced, resource based, technology enhanced) and delivery venues (campus, workplace, home, learning centres) which can be adopted separately or together to meet the needs of learners.

Flexible delivery embraces a complex set of interlinking delivery modes, media and locations. The Flexible Delivery Working Party expressed this in three main ways:

1. The delivery of instruction away from the institution to utilise the facilities of business and industry. Examples include work-based training, action learning and enterprise training.

2. The adoption of flexible delivery approaches within the classroom. Examples include: self-paced learning; video, audio and computer-based learning; the use of learning centres; resource based teaching; and the use of self managing work groups.

3. Individual study off-campus, at home, in the workplace or at open learning centres. Examples include resource based external study with tutorial support and the use of telecommunications technologies for the delivery and support of learning.

The Working Party characterised flexible learning by:

* learner control and choice of content, sequence, time, place and method of learning;
* flexibility in terms of entry, program components, learning modes and exit points;
* the application of learning technologies where appropriate; and
* flexible assessment processes.

Flexible learning provides for study programs which are student centred where student autonomy is a major organising principle. Some important assumptions underpin flexible learning.

* Learning is primarily seen as an individual activity, achieved only through an internalising process.
* Students are mature, motivated, self-disciplined and, to a considerable degree, self-directed.

It is important to note, however, that flexible learning does not preclude group learning or the use of traditional teacher-led instruction methods. Generally, there is no limitation on how flexible learning is delivered, since it depends largely on the needs of clients, access to appropriate learning resources and provision of appropriate learner support systems. In the Australian context, the challenge of organising learner-centred curriculum and learning must take account of an evolving delivery environment which includes the following developments:

* recognition of prior learning and experiences:
competency-based learning;

- decreasing reliance on teacher-centred instruction;

- increased emphasis on remote, individual or tailored interaction and support;

- the possibility of mixed level self-paced classes and workshops;

- a shift to learner-centred modes of learning, problem learning, discovery learning, self-directed learning, self-paced learning;

- open and independent access to facilities and materials;

- non-classroom learning (including workplace training and learning in the home);

- modularised learning;

- open entry/exit;

- increased resource based learning; and

- an increased variety of media used in educational delivery.

The importance of flexible learning in the workplace

As firms adapt to the current age of rapid and continuous technological change, new forms of work organisation are being adopted which, in turn, demand flexible approaches to learning. A critical role for modern technological organisations is not so much the adoption of the technology in the first place but the process of handling the applications of the technology and dealing with the effects of the developments arising from it (Nyhan, 1991).

The adaptive processes which organisations must go through in responding to technology has created a need for a ‘more complex form of learning brought about by the new technology’ (Nyhan, 1991, p.26). The firms which survive the competitive pressures of the late 1990s will be ‘learning organisations’, probably characterised by flatter and more decentralised work organisation, and the use of autonomous work groups as well as interdependent work groups (multidisciplinary teams). Also, shorter product cycles will be needed because firms must respond quickly to the particular needs of customers (Nyhan, 1991).

The worker in this new type of organisation ‘has to be a self-managing type capable of taking responsibility for company decisions in the workshop and the market place. This worker is the one dealing with the company’s “moments of truth” in which business is won and lost’ (Nyhan, 1991).

The focus on improving learning, developing the ‘self-learning knowledge worker’, has brought a realisation that training systems are only a means to learning (Nyhan, 1991). Learners must invariably control their own learning, hence all learner processes should be orientated towards self-learning. Nyhan (1991) called this the self-learning competency since it enables people to learn actively in a variety of situations throughout their lifetime. This means, for
example, that people can ‘apply knowledge gained in one situation (dealing with a particular industrial/commercial process) to other situations and puzzle out a problem’ (Nyhan, 1991)

Firms must become self-learning organisations as part of an overall business/management strategy (Pedler, 1991, p.128). In similar vein, Nyhan (1991) states:

The message for companies is that the vitality of their daily self-learning is an indicator of their medium and long-term success. The self-learning organisation is the one which can cope successfully with the future.

What are the implications of these new lines of thinking about work and skills acquisition? Managers of training institutions, according to Nyhan (1991, p.53)

...must initiate and nurture the growth of radical new systems of open and flexible systems of learning, which will enable learners to acquire the new competencies which are necessary in the future working place.

Similarly, organisations must cultivate new learning environments. In the Total Learning Environment there is no set place or time for learning, and no set way. Learning takes place everywhere and at all times, using a variety of different methods and flexible delivery systems (Nyhan, 1991).

**Flexible delivery and the National Training Reform Agenda**

The major objective of the National Training Reform Agenda is to make learning more client-centred than teacher-centred. It includes the following initiatives:

- a competency based approach to educational delivery;
- assessment based on agreed national standards;
- modularisation of learning;
- greater flexibility in teaching and learning techniques;
- establishment of a national framework for the recognition of training;
- more flexible training pathways;
- greater utilisation of appropriate learning technologies;
- integration of workplace and off-the-job training components; and
- stimulus given to open learning through establishment of an Open Learning Technology Corporation*.

According to the Flexible Delivery Working Party, the provision of flexible delivery is vital to increasing access and participation, and to improving responsiveness to the needs of individuals and the economy. It will be a primary goal of all providers rather than an adjunct to mainstream provision. A new range of learning services is needed to allow flexible access to learning and assessment such as assessment on demand, workplace assessment, assessment of prior
learning, credit accumulation and transfer, flexible enrolment procedures, individual programs and off-campus delivery.

**How the study was carried out**

Flexible learning is inextricably bound up with notions of the learning organisation (Nyhan, 1991) which, in turn, requires self-learning competency in workers. An analysis of the impact of flexible learning on physical facilities indicated that a learner driven, rather than institutional driven, view of flexible learning should shape the methodology for the study. The conceptual framework for the study is given on page 17.

The study is based on: a literature analysis; interviews with practitioners; group discussions with educational managers, including staff of the TAFE NSW Open Training Education Network (OTEN), facility planners and educational researchers; and visits to educational facilities in five Australian states (32 sites, see Appendix A), as follows:

- Western Australia (six).
- Queensland (10).
- Victoria (eight).
- South Australia (four).
- New South Wales (four).
General impact of flexible delivery on public sector educational providers

Flexible delivery is aimed at improving student choices, particularly what to learn, when to learn, where to learn, and how to learn (Goldman, 1992). As Dawes (1992) notes, better retention rates result when learners are empowered to make the decisions on which method and/or activity suits their learning style.

Several authors have commented on the change in teachers' roles which have followed from the adoption of open learning approaches (Watson and White, 1990; Goode, 1992). According to UNESCO (1992), the teacher is no longer the 'information dispenser' but is now required to perform multiple roles as knowledge specialist, vocational practitioner, course/program designer, curriculum developer, resource material producer, performance evaluator, student guide and counsellor, community and social worker, facilitator of learning, and above all, as an educational manager. Teachers will no longer deliver curricula designed elsewhere. They will work with clients and other educators as learning designers, to plan, develop, implement and evaluate specifically designed learning programs and materials. As learning managers, they will provide educational support, counselling and direction for students.

This change in role will be reflected in the design of resources and facilities. A distinction will need to be made between specialised space and shared or open plan space. In addition, teachers need to be equipped with word processing facilities and on-line access to information sources to locate textual, graphic and diagrammatic data. If materials are to be produced in quantity on site then strategically centralised accommodation for their development and production will require a combination of purpose-built and modified facilities with equipment for word processing, document compilation, graphics, and printing and binding. In addition to being used for on-line searching of databases, electronic linkages will be used for sending prepared material to a designated production centre for compilation and publishing. Other facilities will be required for producing non-print materials, including audiovisual packages, computer assisted learning (CAL) and computer managed learning (CML) packages and preparing material for storage on optical devices such as CD-ROM discs.

The need for flexible buildings is driven by changing technologies, modes of delivery and training needs (Thomas et al., 1983; Coleman, 1987; Butterworth, 1987; Porter, 1987; Sharpe, 1987; Chapman and Holmes, 1990). The implementation of mixed-mode, self-paced, individualised instruction and group team learning approaches will have considerable impact on facilities. There are indications that equipment, including machinery in workshops, needs to be robust when the teaching approach devolves more responsibility and autonomy to students for control of their own learning. This is because equipment may be used more frequently by students, with the risk of a greater number of mistakes being made by them which may damage equipment.
Flexible delivery will impact significantly on the number of future educational institutions, their design, and the way existing institutions cope with new client demands. The VEETAC Working Party on Flexible Delivery (1992, p. 18) considered that educational facilities should:

- cater for and accommodate new approaches to learning which integrate various modes of delivery;
- cater to new client demands for support services; and
- respond to changing attendance patterns and usage levels.

The same working party noted that flexible delivery will require new approaches to the design, location, use and management of facilities, including provision of:

- a variety of learning settings both on and off campus, the latter including industry-based facilities and community learning resource centres;
- realistic (simulated) work situations in colleges; and
- appropriate accommodation for new services and delivery methods, e.g. one-to-one interview rooms, learning workshops, childcare centres, information booths and telecommunications centres.

Determining the effectiveness and demands of a delivery approach will be essential when planning for physical facilities. That is, course design and production will need to be specified before (or as part of) consideration of issues relating to design and usage of physical facilities.

In terms of the way public sector providers responded to these new initiatives, Goode (1992) identified two broad responses: extend the classroom, or change the classroom. These responses and their implications for capital investment, according to Goode, are described next.

*Extend the classroom.* This approach emphasises the role of communication technology in allowing a greater distance to exist between lecturers and students. Video conferencing and (distance education) learning packages are an example of this process. Capital investment for this approach tends to focus on technology since providing the communication links is seen as a priority. Staff development is not seen as a priority as the lecturers' role is believed to be relatively unchanged.

*Change the classroom.* Here, the emphasis is shifted from the traditional teacher-centred delivery process to a learner-centred process. This requires a range of resources to support students either on campus, in the local community or at the workplace, and although the requirements for practice equipment may be reduced, the demand for computer equipment to manage the individual learning programs will increase. Staff development and marketing require significant investment to inform students and to assist staff to adjust their roles and expectations.

Porter and Kravinskas (1992) mention the value of planning for flexibility in addressing the issue of long term property rationalisation, including the ability to lease additional space or sell off under-utilised space. They also mention the importance of maximising property value increases, improving the integration of the facility into the urban infrastructure, and the use of commercial building elements.
According to UNESCO (1992), emerging trends in client-centred delivery involve: interactive classroom instruction; learning facilitating assignment; resource-based learning; discovery-orientated experiments; integrated learning; performance-orientated testing; computer-aided instruction (CAI); computer-based video training systems; open learning systems; and computer-managed instruction/learning (CMI/CML).

Willis (1992) pointed to some potential impacts of new educational technologies on facilities. These are listed below.

- Technology will become increasingly dispersed with the result that a building which is designed to support a single view of technological advancement will be almost immediately obsolete.

- General access to learning opportunities will be provided by communications technology, meaning that large, comprehensive resource centres will not be the only way to provide access.

- Buildings will no longer merely support learning but rather inspire learning by being enjoyable places.

Willis took the view that most learning will not take place in classrooms. If this is the case, then the provision of better learning resources will be a priority.

**Impact on training within industry**

The recommendations of the Deveson Report (Deveson, 1990) and the introduction in July 1990 of the Commonwealth Training Guarantee Scheme, which applied a 1.5 per cent training levy to companies with a payroll in excess of $200 000 (indexed), initiated a strategy to open up a competitive training market. This market included TAFE and higher education institutions; non-government training providers; community and voluntary groups; professional organisations; a strengthened role for Industry Training Advisory Bodies (ITABs); and an increasing number of employers who offer training to their employees and to other organisations on a host basis (industry wide training providers).

Changes evident in the delivery of vocational education and training include an increase in education and training provided:

- within enterprises (enterprise-based training);

- jointly by a group of enterprises or by an industry training body on behalf of members (industry-wide training);

- by TAFE teachers working at industry training facilities; and

- by industry staff working in TAFE colleges.
Impacts on facilities as a result of these changes include:

- an increase in joint-use facility arrangements between TAFE, universities, secondary schools and industry, which include open learning provision;
- the establishment of TAFE facilities on private industry property; and
- increased use of leasing arrangements and hire of enterprise-based facilities.

Barriers to the provision of structured workplace training were reported by Hawke (1991) who identified a range of factors which have in the past inhibited the development of training on the job for courses at and beyond the certificate level. Some of these factors are listed below.

- Employers are unwilling to accept training responsibilities.
- The increasing level of industry specialisation restricts the range of skills and competencies employed on the job. The new integrated training system (NATAS) in Western Australia continues to rely on TAFE to deliver and assess as much as 90 per cent of the total trade training program.
- The technology required for skills training is not always possessed by employers.

A study of work-based learning practices and facilities (Planning and Evaluation Unit) identified serious deficiencies in the amount of training provided by firms with one to nine employees. Based on 962 interviews in four locations in NSW, the study showed that among enterprises with one to nine employees, only 6 per cent had formal training facilities, only 17 per cent had training plans, and only 38 per cent provide some form of training. Since small firms account for 85 per cent of all enterprises in Australia, the implications of the TAFE study are that a large number of Australian workers are not receiving workplace training.

The impact of new developments in educational delivery on facilities

The move to student-centred and resource based learning, according to UNESCO has given rise to the following trends.

- Classroom instruction is becoming more interactive.
- Assignments and laboratory experiments are increasingly being used to facilitate learning, using the techniques of discovery learning and integrated learning (designed to integrate knowledge and skills already gained).
- Learning is becoming more resource based.
- Testing methods are shifting toward performance-orientated testing.
- Computer based video training systems (video-disk systems) are being used particularly for training in advanced technology areas.
- Computers are increasingly being applied to instructional problems.
In 1993 Guerin examined the impact on facilities of four forms of learning: mixed-mode delivery, competency based training, integrated theory and practice and on the job versus off the job training. He also highlighted the importance of TAFE educational facilities being able to cater for a diverse client group, ranging from young people in their senior high school years, to mature adults.

Guerin notes that not all learners feel comfortable with any one particular mode of learning and new forms of learning appropriate to the adult nature of post-compulsory education will need to be adopted, in particular:

- individual, autonomous, learning programs;
- group and team learning;
- accelerated learning or intensive programs, especially when the learning need is urgent;
- interactive techniques (where feedback about the learning is immediate and directly related to the person’s interests).

Guerin has commented that group and team learning will make noise control particularly important. The multiple use of rooms will mean that both conventional lecture-type presentations and small group activities may take place in the same room. This will require flexible seating arrangements and tables; various forms of media will be used which will require well-planned general and secure storage.

Since facilities will need to be designed for ‘rotation of functions’ (Guerin) there will be a need to retrieve equipment from storage areas, located either on the periphery of learning rooms, in cages or from a built-in cupboard or a walk-in pantry within rooms. The ‘rotation of functions’ within classrooms will require support staff such as room supervisors and/or technicians whose duties would cover the preparation of rooms for multiple uses.

Guerin anticipates increased administrative loads resulting from the implementation of competency based training, mixed-mode delivery, and integrated theory and practical programs. It is difficult, at this stage, to estimate the impact which this will have on administrative facilities. One obvious impact will be an increased need for computer facilities to record and manage learning activities.

Guerin also refers to the need for drop-in rooms on campus for use by students when they visit the facility, say, to consult with staff. Drop-in rooms will be important where institutions adopt off-campus and mixed-mode programs which require students to attend at pre-arranged times or when they come to colleges for help.

The push toward the introduction of competency-based training (CBT) gave rise to a study which examined the likely impact of CBT on facilities (Planning and Properties Division, NSW TAFE Commission, 1992). The study found that:

- The implementation of CBT did not appear to require more space in buildings.
- The creation of resource rooms or resource areas for the implementation of
self-paced CBT programs was the most significant change needed to TAFE buildings but could be achieved by a reorganisation of existing spaces.

- CBT courses delivered in a lock-step fashion required more equipment to be available for practical work.

- Where greater workshop space was needed to accommodate CBT, this could generally be achieved by removing walls and creating large open spaces within existing facilities.

- Resource rooms for the implementation of self-paced CBT need to have
  - a minimum of 2m² per student and
  - must be able to accommodate up to half the number of students from the practical areas at one time.

One important factor that should not be overlooked is the major contribution to the flexible use of facilities which arises from the use of modules, especially the use of hour modules since these make the overall utilisation of a facility more manageable and reduce required access time. Mead (1993) emphasised that the use of this type of module would lead to more flexible access to computing facilities and, in particular, make scheduling easier. Note that if teachers spend smaller amounts of time with students they will either be able to interact more frequently with individual students or carry out other duties. In either case they will need suitable accommodation.

**Access for disabled and disadvantaged users**

Facilities that cater for all types of users must consider access difficulties which may confront disabled and/or disadvantaged users. These users might experience permanent or temporary difficulties in the following areas: physical; sight; hearing; intellect; speech; communication/language; literacy; and/or personal commitments. In TAFE NSW, a report on improving access for students with mobility difficulties found that a continuous, accessible path of travel was the governing rule for providing good access (Planning and Research Unit, NSW TAFE Commission, 1991b). Once implemented, it was possible to extend the selected courses which were considered accessible and/or extend the number of specialist areas which already had good access features. Important design issues to consider include provision of:

- adjustable work stations and furniture;

- a continuous, accessible path of travel between relevant areas of use such as learning areas and amenities (toilets, parking, and food/beverage services);

- floor access such as ramps or conveyor systems (lifts, belts or escalators);

- adequate space around a work station to allow movement and the provision of a support teacher, if necessary;

- signage installations for directions, controls, warnings or hazards, including position, colour, size, selected languages or symbols; and
child care amenity for those constrained by child care responsibilities.

Mead (1993), commenting on the design of computer facilities, recommended the provision of adjustable furniture in each computing facility, and emphasised the need for adequate space around work stations to allow freedom of movement, both of which improve access for persons with disabilities.

**Planning for the needs of educational staff**

Staff development issues must be catered for in a flexible delivery system. Awareness-raising approaches include introducing staff to the philosophy behind open learning and flexible delivery. The effectiveness of management in a flexible learning environment will be significantly influenced by staff numbers, expertise and organisational structure. For example, Schmidmaier (1991) reports that the delivery of open learning activities is an adherence to quality and accessibility, involving three main areas: design and development of learning materials; management and delivery of courses; and the evaluation and implementation of appropriate technologies.

For flexible learning, the facility will need to accommodate the many functions carried out by staff when meeting the needs of clients which, according to Watson (1990) and White and Watson (1990), include a consultation function. That is, clients requiring some level of advisory service will fall into one of the following categories: those who require little assistance because they know exactly what it is they want to achieve and have already chosen appropriate learning options; those who can identify the skills they require but need assistance in determining the type and level of program which is best for them; or those who telephone or come into the advisory service seeking assistance without really knowing what it is they require.

Duties which staff perform in an open learning environment were listed by White and Watson. They are stated here to serve as a checklist identifying accommodation issues.

*Functions performed within an administrative facility*

- providing information and documentation;
- accepting enrolments, receiving fees and issuing receipts;
- providing career advice to clients;
- carrying out aptitude testing;
- advising on available financial assistance;
- directing clients to appropriate staff or areas;
- guiding clients in their selection of learning programs;
- advising on available learning options and organising appropriate timetables;
- carrying out required placement testing;
• advising on likely program exemptions or advanced standing;
• administering day to day operations;
• operating the switchboard;
• carrying out data entry operations; and
• carrying out dispatch and mailing operations for on and off campus programs.

Functions performed in a learning resources facility

• supporting enrolled clients and members of the public who will have access to campus facilities on a fee for service basis;
• assisting staff to meet the needs of program provision; and
• providing opportunities for clients to develop appropriate techniques for independent learning.

Functions performed within a learning assistance facility

• providing clients with a simulated workplace environment to enable them to gain practical experience in the operation of a variety of machines;
• facilitating client choice of an appropriate learning experience through a diverse and comprehensive range of information sources, including print, non-print, computers and resource people;
• enabling clients to gain skills in the operation of microcomputers and associated software;
• ensuring the greatest flexibility of use by not dedicating the facility to specific occupational, trade or study areas.

Cost of delivery issues

The type and quality of learning services will be greatly dependent on the overall cost of service delivery. Goode (1992) has asserted that the existing emphasis on producing a building is to the detriment of providing an effective learning service. That is, for a learning service, the building cost (such as site costs and architects’ fees) plays a dominant and disproportionate role in relation to other necessary non-building costs such as equipment, course design, staff development, learning materials, marketing and planning.

Taylor and White (1991, pp.27-35) report on a cost effectiveness evaluation of multi-media mixed-mode services, offered at the University of Southern Queensland, using an activity costing model which accounts for cost recovery. These authors, commenting on the cost effectiveness of mixed-mode methods, reported costs associated with preparation, production and delivery. Cost recovery was dependent on the institution’s policy on maximum recovery charges, economies of scale, and the significance of preparation and maintenance costs. For non-distance education providers, they found that mixed-mode teaching would
cost at least 10 per cent more than conventional, face-to-face teaching. Only if the instructional materials are prepared as part of a provider’s distance education program (such as a Distance Education Centre), or if previously prepared materials can be purchased at less than cost recovery, is the option available on a comparative cost basis. It should be noted that cost recovery precludes capital works investment but includes course development costs, which can be a major financial investment. The question of cost issues is further discussed in pages 84-86.

Learning spaces for tomorrow

Cassels (1992) suggests some key points about the learning space of tomorrow:

- technology will become increasingly dispersed and potentially anarchic. Buildings designed to support a single view of technological advancement will be almost immediately obsolete;

- access to newer technology will be the key factor in acquiring knowledge. The provision of larger and more comprehensive centres for resources and communications will be the only way to provide general access to learning opportunities.

Cassels concludes by stating that many educational buildings are prisons of learning, yet new technology has empowered the individual to escape from using educational buildings.

Some important issues in relation to technology


- No technology can be singled out as intrinsically superior to all others or able to service all needs.

- Technology cannot be considered in isolation. It must be suited to the learning context, the learner’s level of motivation and the level of learning activity.

- Technology can serve three functions at various stages of learning:
  - to motivate and inform;
  - to guide and support;
  - to facilitate self-study and independent inquiry; and

- Any implementation of technology requires careful planning and proper evaluation.

The establishment of the Open Learning Technology Corporation marks a major government initiative to increase the information and telecommunications infrastructure for electronic campuses and classrooms. The rapid improvement in
communications between computers now permits computers to be used for direct personal contact by voice and picture (video conferencing) and graphically by use of audiographic systems where the audio (voice) is transmitted by telephone, and the graphics by computer (Lord, 1992). Facsimile machines can also be added. Audiographic software allows one site (teacher) to be linked to three to six other sites. This has the advantage that computer graphics, which were down-loaded to the receiving sites before the lesson via modem, are up-dated on computer screens at each site as they are changed during the lesson. Apart from the appropriate computers, monitors and modem, facilities used for audiographic communications will need appropriate sound-reducing materials.

The increasing use of computers for the management of learning, for communication and for instruction has been noted by NBEET (1992, p.26). In an evaluation of education computing facilities in TAFE NSW, Mead (1993) reported that these facilities were provided in three distinct forms:

- educational classrooms set up in a configuration of 16 personal computers;
- open learning computer facilities in seven large TAFE colleges, used primarily for training students for the information technology industries, and housing 50-70 personal computers and up to 18 Apple Mackintosh computers; and
- specialised computing facilities to support training in selected industries or specialist fields such as CAD/CAM. Numerically Controlled machines, computerised design/cutting equipment, and robotics.

Mead notes that the computing needs of particular teaching disciplines has begun to throw into question the value of a standard computer room. Facility planners need to examine how computer facilities for particular disciplines can be designed with commonalities in usage, perhaps by use of a clustering approach where one college is established as the nucleus for a specific teaching discipline and other colleges acting as feeders. Other recommendations for computing facilities made by Mead are summarised below:

- investigation of appropriate room design, such as the E-shape, with inclusion of a passageway at the back of the middle leg of the E and the use of room dividers to allow more flexibility in the number of students per group (the U-shape was considered inappropriate for various reasons);
- modification of general purpose (GP) classrooms to accommodate 15 students, rather than 30, using movable dividers;
- adherence to ergonomic guidelines for furniture and lighting;
- provision for the front bank of lights to be switched off independent of the others to allow for more effective projection of images;
- provision of open learning environments in addition to teacher-led rooms;
- provision of hand-held computers for use in the field where this is possible to free existing computing facilities.

In Appendix C, some examples of furniture layout for computer usage are
provided: E-shape (Figure C.1), U-shape (Figure C.2), and a recent proposal for Tea Tree Gully College of TAFE (Figure C.3).

Health and safety matters will need constant attention as the use of information technology increases in education. Issues to be considered include lighting, heating, exposure to electromagnetic radiation, and the need for furniture which does not cause problems with posture. Multi-use facilities, where a range of age groupings is serviced, will need careful attention to health and safety factors.

**The importance of evaluation and research**

The success of an educational provider in delivering learning services in the future will be dependent on its ability to forecast and plan; provide high quality, cost effective, skills formation programs; make rapid and relevant responses to the demands of clients; and ensure that organisational arrangements facilitate needs driven programs (White and Watson, 1990). This will require a major strategic role for research and evaluation in the vocational education and training sector.

**Summary of key principles identified by the literature**

The following key issues were identified in the literature.

*Strategic planning is vital.*

Strategic planning for joint use of facilities with other educational providers will become increasingly important for reasons of cost efficiency. Strategic plans will be needed to manage the educational demands of the present, and to anticipate short and medium term changes in demands on educational buildings. This may include the technique of constructing educational profiles for a campus, institute or region. Future issues and trends must be identified or estimated as accurately as possible for planning purposes. Strategic planning should occur at the master site planning stage if possible.

*Facilities must cater for a wider age range of clients.*

The impact of multi-skilling and workforce re-education will result in extension of the age range of clients, from young to mature aged, requiring facility design which is agreeable to adults and young people.

Institutions must decide on the learning objectives and delivery approaches before considering facility issues.

Specify strategies for course design, production, and delivery before making decisions about facility requirements.

*It is essential to plan for flexible structures.*

Physical facilities must reflect design principles of flexibility and adaptability to cater for the various modes of delivery, client demands and utilisation levels.

Buildings need to be adaptable over a long life and to accommodate changes in
technologies and education styles and purposes. For example, a long life expectancy of a building, say 20 years, could be four times the life expectancy of a computer classroom. Note that a holistic approach is recommended for service coordination and long-term planning, to meet learning needs.

Flexible structures will require:

- quality moveable walls and fittings or removable partition walls and fittings of good construction;
- use of building materials which do not interfere with radio and electromagnetic signals;
- flexible and accessible services such as lights, power points, water, telecommunications and telephone, preferably from overhead bars or through ducting placed at mid-height around the walls;
- access to computer facilities and networks;
- noise control for machines, computers, printers, group discussions and general movement;
- lighting design which does not constrain flexible use of floor space;
- cabling between buildings;
- the purchase of fewer yet higher quality and more robust items of equipment and machinery;
- provision of storage and security within spaces;
- increasing need for provision of resources (libraries), discussion and tutorial rooms, and communal rooms, reflecting the increasingly important role of TAFE in life-long learning;
- an increase in the size of teaching and learning areas by approximately 15-20 per cent to accommodate extra movement of students and small group learning; and
- provision of videoconferencing facilities for teacher training and program delivery.

Management of spaces is essential.

It is important to establish mechanisms for the management of spaces within facilities, especially if the facilities are jointly used.

Facilities must provide an environment conducive to learning.

Changes in education styles mean that the challenge is to design facilities which encourage learning rather than accommodating teaching procedures. The appearance of learning environments, their friendliness as perceived by users, is an important part of building accessibility. Both exterior and interior building surfaces should embody warmth, calm and friendliness, achieved by the use of materials of suitable colour, texture and shape. Plan to minimise distractions by establishing a
sense of calmness, where users are not distracted by spaces, but experience as setting. The best choices for interior fit-out are those that best harmonise with frequent changes of learning objectives. Emergency signs and essential information should be prominently displayed. Space should be allowed for notice boards, posters and displays of work by staff and students.

*The necessary communications infrastructure should be built in.*

Provide communications infrastructure for receiving television broadcasts delivered from satellite or land-based systems, and provide for computer networks using fibre-optic cabling if necessary. There will be a need to address the issue of links to telecottages, local learning centres and individuals studying at home or in workplaces.

*Appropriate research and evaluative studies should be planned.*

Flexible delivery strategies must recognise and evaluate new approaches in the design, location, use and management of physical facilities.

*Needs resulting from the changing role of staff must be attended to.*

Changes in the roles of teachers, coordinators and support staff will require special meeting rooms and staff training facilities. Facilities may also be required for the design and development of curriculum materials.

*Curriculum planning and industry links must meet the needs of learners.*

Flexibility is required in curriculum planning to allow learners to proceed at their own pace, place and time, allowing for experimentation, innovation, and improvisation. It is especially important to recognise emerging developments in industry and to build links with local enterprises to harness available physical and human resources.

*Management issues must be resolved.*

Adopt learning management procedures and encourage a management climate which fosters flexible approaches to delivery, i.e. a combination of student, teacher and resource centred learning.

*Access and equity issues must be dealt with.*

Flexible learning strategies can be a means of removing barriers to learning and providing equitable access.

**Conclusion**

The literature review points to a framework for the examination of flexible delivery strategies and their impact on facilities. This framework is outlined below.

<table>
<thead>
<tr>
<th>Who?</th>
<th>Who are the clients, and what are the clients’ circumstances?</th>
</tr>
</thead>
<tbody>
<tr>
<td>When?</td>
<td>When does access begin, and for how long?</td>
</tr>
<tr>
<td>Where?</td>
<td>Where will educational programs be accessed - at institutions, at workplaces, at home?</td>
</tr>
</tbody>
</table>
How?  How is the material to be presented (media, mode, and form of access - face-to-face, distance, electronic)?

What?  What is the final program to be and what are the impacts on physical facilities?

These questions are taken up again in the next section.
Orientation to Decision Making

Analytical framework for the study

As a concept, flexible learning assumes a virtually limitless mix of delivery modes, media and locations which can all interact according to the learning needs to be addressed, the aims and scope of the curriculum, the outcomes of instructional design, and the resources available to achieve learning outcomes. Since learning objectives vary widely, no attempt was made in this study to assume either a typology of learning objectives or particular instances of learning objectives.

Rather, this report provides a decision-making framework. This framework assumes that the person who uses this report will have a learning problem to solve, and will use the information to examine how flexible delivery strategies could solve that problem and how the solution will impact on facilities. A big advantage of this approach is that readers will be able to examine a range of options, and gauge the likely impacts on facilities, and will therefore be able to list the cost elements for purposes of obtaining quotations. Figure 3.1 illustrates the focus of the study.

![Analytical framework at the commencement of the study](image)

Figure 3.1: Analytical framework at the commencement of the study
Questions which face the decision maker when planning a flexible delivery program

The planning of a flexible delivery program can be categorised as posing six questions (Figure 3.2).

Figure 3.2: Decision-making questions.

An explanation of the terminology used in Figure 3.2 follows (see also the Glossary).

**Client.** The client represents the educational consumer, and can be an individual (a full-time or part-time student), a group, or an organisation, including a single enterprise, an industry-based training provider, or a private or public provider.

**Learning approach.** Flexible delivery spans a very wide range of learning options. For reasons of simplicity, Figure 3.2 only lists four learning approaches: distance, self-paced, face-to-face or some other approach. The delivery approach may involve some or all of the characteristics listed below:

- orientation and/or induction programs:
- either restricted or open enrolment;
- recognition of prior learning and experiences;
- structured learning curriculum, based on instructional design principles;
- an available range of learning resources;
- assessment procedures for practical components and/or theory;
- accredited learning service;
- access to experts and peers; and
- feedback about learning progress.

The selection of the learning approach will depend on the needs which relate to factors such as:

- costs;
- place of learning; and
- desired rate of completion.

**Distance in time and space.** This means that students are separated from educational providers by a time delay (requiring, say, watching a videotape of the lecture), as well as by distance (e.g. undertaking learning programs at home). In other words, students are dependent on learning services that are delivered outside the providers' premises (i.e. off campus).

**Self-paced learning.** Here students learn at their own speed, based on their own ability to learn. This approach allows them to finish courses and graduate or otherwise qualify in a shorter or longer time than the conventional lock-step system. For the providers, it means that as consumers leave the course, whether by graduation or withdrawal, their places can be taken by new entrants (if enrolment is available at any time) so that a constant number are on course and the cost per student may be lower.

**Face-to-face teaching.** This refers to an immediate transfer or exchange of information in real time, and includes: traditional classroom teaching, videoconferencing, audio conferencing or computer conferencing. Face-to-face teaching implies an immediate, real time interaction between participants.

**Mixed mode.** Consumers attend the providers' venues for part of the course, and for the remainder, work independently using resource materials.

**Learning media.** Examples of delivery media shown in Figure 3.2 are: audio and/or visual aide, print, computer managed learning, computer aided learning, electronic communications, and use of special equipment. The delivery media support the delivery approach by offering a range of material for facilitating the learning process which the client may either choose or be required to use.

**Audio-visual aids.** These include the use of sound, image or both: sound such as cassette tapes, compact discs, vinyl records, radio; image such as graphic and
three-dimensional images including charts, diagrams, text and illustrations.

Print. The traditional use of text and graphics on a paper-based product.

Computer managed learning. The use of a computer system or network to manage course programs and to issue tests.

Computer aided learning. The use of computer software programs or packages for the delivery of part or all of the learning process.

Electronic communications. This includes the use of communications technology such as:

- Satellite delivery (one-way video, and two-way audio);
- Videoconferencing using the Integrated Services Digital Network (ISDN) to allow students to interact with teachers at remote locations using television sets as the bridging communication interface;
- Computer mediated communication e.g. using electronic mail, bulletin board systems, and computer conferencing that can include videoconferencing technology;
- Computer assisted instruction (CAI), including multimedia CAI encompassing hypermedia, CD-ROM, compact disk interactive (CD-I) which allows a high degree of interactivity with the user, interactive videodisc (IV), and artificial intelligence based applications;
- Computer managed learning which automates the management of students and can issue and store assessment marks;
- Audiographic;
- Audio (audio conferencing, use of radio);
- Television; and
- Facsimile.

Special equipment. The use of specialised equipment for industry standard requirements such as workshop or shop floor equipment.

Location. Figure 3.2 gives four examples of locations or venues for educational delivery: on campus, industry, at home or somewhere in the community. The convenience of location may involve some or all of the characteristics listed below:

- proximity to user;
- proximity to support services;
- access period; and
- security.
Support for the learning process.

Figure 3.2 gives examples of support for the learning process, including: theory, practical, educational support and advice, reference sources, and materials and equipment. Learning access, in turn, involves decisions about:

- instructional design and assessment requirements;
- availability of resources to support learning services;
- time availability in 24 hours/52 weeks;
- distance, proximity to users;
- assistance such as notice board, staff, smart machines or electronic bulletin boards; and
- security method, such as staff, key, password, 'smartcard'.

Theory lessons. Clients may require access to tuition, group meetings or some formalised instruction as part of learning services.

Practical instruction. The hands-on provision as part of a learning service involves the capacity to access an area for skills practice, demonstration or testing of a competency.

Student support services. Clients could require the availability of specialist assistance for learning or vocational guidance as part of a general learning service. Consumers of learning services may require such access prior to enrolling as part of a need for vocational counselling or assistance with learning problems; or during their course for general learning guidance; or after their course when further vocational counselling may be required.

Reference sources. Learning services might require consumers to access further information outside their normal support framework, such as further reading or documentation, or consultation with other educational providers or field experts.

Materials and equipment. Clients could require access to a collection of materials and equipment for meeting learning objectives. This might include: trade equipment and associated consumable materials; preparation equipment for the presentation of assignments, such as computers, printers and photocopiers; communications equipment for sending or receiving, such as facsimiles, telephones, television, radio, stand-alone or networked computers.

Facility type.

Examples of facility types given in Figure 3.2 are fixed facility, a transportable mobile facility, and temporary facility. The latter refers to, say, an industry situation where a machine or piece of equipment and its associated space is set aside for a few hours for teaching and learning purposes.

The facility type may involve some or all of the following characteristics:

- purpose built, or modified;
flexible building structures for modification;
- easily moved or transportable;
- automated and manual control of services and security for flexible use;
- special construction features such as noise control (acoustic construction); and
- specialised work stations designed for specific activities.

The functions of facilities used in flexible delivery programs will vary according to need. A practical space implies use for hands-on learning, demonstration or assessment activities, in contrast to a theory space which infers use for individual study, tutorials, lectures, group study activities or conferences, e.g. a room with table and chairs designed and arranged for fixed or flexible activities. A mixed space caters for some interaction between practical and theory teaching, e.g. trade workshops that provide separate spaces for theory and practice, but within the confines of the workshop or shop floor area.

Other facility functions can include non-learning activities such as administration, support staff accommodation, child care, general amenities such as toilets, food outlets, and bulk storages.

Three important preliminary questions before deciding on a facility

**Question 1: Do you need to build an educational facility?**

Is a built alternative the best alternative? Is there an alternative at less cost and greater benefit to clients? Can you

- make a joint venture arrangement using or renting facilities held by the private sector;
- cross-use facilities between TAFE colleges, universities and schools;
- meet emerging training needs in a non-traditional way, such as adoption of flexible delivery strategies; or
- increase the utilisation of existing facilities?

An example of a non-traditional solution was the approach by TAFE NSW to meeting a need for a considerable volume of workshop space. A private contractor was retained by the TAFE Commission to erect a standard warehouse building which was then leased to the Commission. A subsequent post-occupancy evaluation found this to be a cost-effective solution. Providers need to consider other alternatives, e.g. varying land zoning requirements to encourage provision of a community child care centre and/or library in a shopping centre development.
**Question 2: Can the capacity of existing facilities be increased?**

When providers are looking to improve the capacity of individual facilities to satisfy local needs, they should consider the following:

- the provision of a library/resource centre;
- the provision of an open access individual study centre to include print, audio-visual and computer resources (both hardware and software);
- linking the facility into the satellite television broadcast system by incorporating a satellite reception dish and associated telecommunications equipment;
- incorporation of videoconferencing facilities;
- the use of closed circuit television;
- the use of computer systems and networks and associated facilities;
- the provision of additional support facilities for staff and students, including additional recreational facilities;
- the need for more flexible arrangements to accommodate individual learning, small group learning, integrated theory and practical work, and accommodation for larger presentations;
- proximity to teaching departments and tutors;
- proximity to the street and to parking;
- re-arrangement of functions and relationships; and
- 24 hour, seven-day-per-week access.

**Question 3: What will be the effect of the mode(s) of delivery?**

As noted previously, flexible delivery impacts on physical facilities in three ways:

1. Facilities need to cater for and accommodate new approaches to learning which integrate various modes of delivery.
2. Facilities need to cater for new client demands for support services.
3. Facilities need to respond to changing attendance patterns and usage levels.

The various modes of learning delivery, such as competency-based training, self-paced learning and open learning, reflect the transition from traditional face to face delivery to flexible delivery, occurring both on-campus and off-campus.
Strategies for Facility Design and Use

Introduction

Educational facilities for flexible learning must support student-centred, rather than teacher-centred delivery. This means that the roles and responsibilities of teaching staff shift toward those of facilitators of learning and managers of the process of opening up access to learning. This section describes how strategies for flexible delivery of learning influence the design and use of physical facilities. The section builds on the literature analysis, using data from observations of facilities for flexible delivery, interviews with flexible delivery practitioners and comments by facility planners and researchers.

This section begins by identifying several key concepts guiding the management of flexible delivery. It concludes with a summary of the key principles which guide the process of managing. Note that Appendix B provides further information and clarification about the construction or modification of facilities for flexibility and adaptability.

Management: adopting a flexible approach

Develop an appropriate management culture

Aim to develop a management culture which fosters the resourcefulness and adaptability of staff and encourages students to be self-motivated problem solvers as called for by Nyhan. Note that solutions to flexible delivery challenges do not lie only in 'high-tech,' options. A holistic approach is needed in fitting flexible learning to local needs.

Staff at the Joondalup Campus (WA) identified the importance of helping staff to make the transition to flexible delivery from conventional, face to face teaching practices. Develop a culture of flexibility and adaptability at the grass roots level. An important part of building an effective management climate is to provide access to staff development (described later in this section).

The link between success in implementing alternative learning delivery strategies and the adoption of an open and devolved management style was identified during the Tea Tree Gully (SA) implementation of flexible delivery. One technique for devolving management is to use multi-disciplinary, self managing work teams to improve the quality of services and support for learners. Such teams would include staff from the academic program, learning resources and administration areas, and, in some cases, external consultants for the addition of specific expertise.

Facilities for flexible delivery will need to be adaptable to different teaching disciplines as well as to different learning approaches. They will need to be designed to facilitate, rather than to dominate or constrain the learning process.
Establish co-operative links with other providers and industry.

Important trends in the expansion of the vocational education and training market include the development of resource-sharing arrangements between educational providers and industry. Note that new opportunities for networking can open up as a result of flexible delivery. For example, it is now possible to link flexible delivery subjects and modules with educational programs carried on the national television broadcast network. Here, the TV broadcasts could distribute the theory component of the subject for integration into learning programs, while local TAFE or other facilities are used to provide the necessary educational support such as tutorials, seminars and practical components.

Look for new opportunities for establishing community learning centres.

Look for opportunities to establish a telecottage or learning centre within the community, e.g. in a shopping centre or within an enterprise.

Pay close attention to staff development needs.

Ensure, in particular, that staff make the transition from expertise in traditional classroom technology to the use of alternate delivery methodologies, learn how to make the most out of flexible, multi-use facilities, and understand occupational health and safety regulations. Flexible delivery requires that teachers have skills in project planning, resource planning and time management. The main impact on facilities here will be the need to accommodate training in either a dedicated or multi-use area.

Encourage sharing of facilities across teaching disciplines.

In managing the use of space and equipment within an educational facility it is important to be sensitive to staff perceptions of the ownership of a particular territory or space within the facility. Aim to foster co-operation in the sharing of facilities and equipment across teaching disciplines, to avoid problems of territory ownership within a facility. Ownership of territory within a facility can have a positive effect and lead to pride in, and care of, the facility, or it can have a negative effect by leading to the erection of social barriers to flexibility, especially if groups contest the ownership of particular territory within the facility.

Develop a comprehensive plan to improve communications.

The experience of implementing flexible delivery at Tea Tree Gully showed the importance of having a comprehensive plan for achieving effective communication between the various interested parties or stakeholders. The opening up of communication lines between staff will be helped by providing access to meeting rooms/spaces and appropriate communications technology.

Establish appropriate management systems.

Systems to manage students will be essential.

Establish mechanisms for the dissemination of expertise.

The establishment of mechanisms for the dissemination of knowledge and expertise in the processes of implementing flexible learning is of major
importance. For example, staff of the Open Training and Education Network (OTEN) identified the need to transfer core expertise to teachers in the TAFE NSW institutes where mixed mode delivery was being implemented.

**Impact on facilities.** The dissemination of expertise from a central location through a network of providers will require an assessment of the information network infrastructure needs, including suitable meeting rooms and conference facilities.

**Decide whether to consolidate core management services.**

In certain cases there are advantages in consolidating core management services. For example, OTEN services some 22,000 students in 11 institutes and 13 training divisions run by TAFE NSW. The OTEN experience showed that quality could be improved, provided core services were contained under one management umbrella. These included:

- resource development (including design, development, production, distribution and sale of learning materials, including kits, student texts and non-print based resources);
- technology and communications (including film and video production); and
- learning resource services (such as libraries).

**Retain a core of expertise in learning material development, even if you contract out resource development.**

Retaining a core of expertise in learning material development is good practice even when you out-source most of the production work. This is because benchmark information is retained for monitoring both quality and costs. The extent of the impact on facilities of this strategy will vary but at a minimum it will require space and furniture for desktop publishing and related equipment and printers, and facilities for audio-visual production.

**Impact on facilities.** Listed below are questions to ask when you consider how the processes of developing resources will impact on facilities.

- Do instructional design staff need to be accommodated or will outside contractors be used? Note that it is advisable to retain a core of in-house expertise to ensure consistently high standards and cost-effective products. Having in-house instructional designers enables management to have an accurate idea of actual development costs to use as benchmarks when evaluating tenders.

- What kind of project management system will be effective in meeting the needs of project managers and senior managers? Note: it would be expected that the project management system would be computerised and run either on a personal computer, or the organisation’s mainframe computer.

- Will production be in-house or outsourced? Retaining some in-house production expertise in each delivery medium is advisable to monitor actual costs, as mentioned above, and to provide an educational focus for contractors.
Plan for an enhanced role for non-teaching support staff.

Under flexible delivery the proportion of non-teaching support staff to teachers is greater than in conventional teaching systems. Non-teaching support staff are needed for many functions such as: instructional design, word processing, desktop publishing, operation of specialist technology (e.g. communications equipment for teleconferencing, videoconferencing, facsimile), production services (e.g. film, television and audiocassette), equipment maintenance and repair, security, mail sorting and distribution and so on. Staff performing these functions will need appropriate facilities.

Use communications technology to open up access to knowledge for learners.

Communications technologies will become increasingly important means by which learners and teachers interact. Staff will need access to specialised facilities and equipment for the development of multi-media instructional packages.

Attend to student support needs.

Student support needs include access to teachers, tutors, local co-ordinators, peer support, notice boards, and amenities. The provision of effective and timely student support services is an important contribution to the success of flexible delivery of learning programs.

Impact on facilities. Provide space and equipment for the processes of co-ordinating student support services whether these are delivered face-to-face, by electronic means or by mail. Provide a local co-ordinator to organise orientation programs, tutorials, counselling services, child care and appropriate recreational amenities, since these contribute to the reduction of learning stress. Provide appropriate space and fittings for food services, lounge and reading areas, and recreational and fitness areas. Implement approved guidelines for the physical access of persons with a disability. Provide child care facilities or ensure alternative services.

Provide support for multi-use facilities.

Allow for back-up support to be readily available to forestall difficulties in implementing multi-use physical facilities. This will require appropriate accommodation.

Be fair and equitable about timetabling.

Establishing joint-use facilities in TAFE NSW has highlighted the value of having a person to handle space allocation and timetabling who is independent of the various parties using the facility.

Develop a plan for monitoring and evaluating facilities.

Continually monitor the utilisation of space and equipment. Conduct research, especially into finding new pathways for flexible delivery of learning to clients, and evaluative studies addressing issues of program effectiveness, efficiency and appropriateness.
Course design and development

Analyse the facility requirements within the educational plan for the delivery of course.

Develop educational plans outlining who the clients are, what the learning needs are, what learning approaches(s) will be used to achieve course objectives, what learning media is required, where the learning will take place and what support is required. This analysis should show whether:

(1) a new facility is needed;

(2) whether educational providers have enough existing capacity to offer particular courses; and

(3) whether other providers could or should offer these courses.

Educational plans should be future-directed and allow educational providers to adapt quickly to changes in client needs. Such plans should result from an analysis of the relationship between:

* current and medium-term client needs;

* educational strategies required to meet those needs;

* the staff required to implement those strategies;

* the support infrastructure required;

* the equipment required;

* the type of facility required and/or spatial needs; and

* the total cost of providing educational services (staff, support, equipment and facilities).

If an analysis indicates that new facilities are required, educational plans should demonstrate that this is the best option in terms of student outcomes, system flexibility and cost. The potential impact of changes within industry and educational technology on any proposed facility should also be outlined. Any proposal for a new facility should, ideally, show how the facility has built-in flexibility to be used for other functions in the future as educational needs change.

Use instructional teams for learning resource development.

The selection and/or preparation of appropriate learning materials and their arrangement into modules is a major task in flexible delivery. The effort required for this purpose can be substantially greater for flexible delivery than for traditional delivery. Flexible delivery creates a need for teachers to do more instructional design work which requires an understanding of the relationship between resource development and delivery; in particular, how the type of delivery will impact on the teaching and learning process. Getting the content and instructional design right is one of the more difficult aspects of implementing flexible learning.
There is an increasing trend towards using a team approach to the design of instructional materials, where teams consist of academic or content specialists, instructional designers, development experts and technical specialists. The academic specialists are responsible for course content; instructional designers are responsible for the instructional strategies to be used; development experts consist of editors and graphic designers; and technical specialists are called upon as required for expertise in audio, video, or computer managed learning.

**Impact on facilities.** Using a team approach will require appropriate accommodation for the development of multi-media packages. It may also require access to technology which facilitates team work locally or at a distance, (e.g. by using computers linked by modem and/or connected to special electronic displays similar to the familiar electronic whiteboard or by using computer-based videoconferencing). Library access and storage facilities will be needed to facilitate the work of these teams.

**Develop self-contained multi-media instructional packages.**

The major impact on the design of learning materials for flexible delivery arising from the shift to learner centred delivery will include:

- greater use of modular units of self-paced learning, much of which will be in competency based format;
- greater emphasis on skills used within the enterprise; and
- the need for better integration of off-the-job and on-the-job training, the integration of theory and practical instruction taken in different locations, the use of learning teams and the creation of learning situations which permit discovery learning.

The impact of these changes on facilities will depend on whether instructional packages are produced in-house or out-sourced, and the extent to which communications technologies will be used for the distribution of learning materials. Where a learning program/package is being produced to a customer’s specifications, special accommodation that facilitates the interaction between provider and customer may be required.

**Access to learning services**

**Pay close attention to improving physical access and access to course information.**

Providing access to clients who are disadvantaged by traditional classroom delivery methodology is a major impetus behind the development of flexible learning service strategies. Open entry/exit focuses on the barriers encountered by potential students when accessing learning services. Barriers that impede access can include inflexible attendance times, entry qualifications based on formal academic achievements only, failure to provide literacy and numeracy support, physical barriers, and failure to provide other support services and facilities.

To cater for an increasingly diverse range of learner needs, client access can be
improved in such ways as

- introducing more responsive and client centred admission and enrolment procedures;
- providing full and accurate information about vocational education and training programs and methods of delivery before enrolment;
- ensuring availability of multiple pathways to achieve a variety of qualifications;
- providing opportunities for work-based and workplace learning;
- establishing management information systems to support a variety of models of learning;
- providing counselling to assist learners; and
- setting up support structures and services to cater for learners with special needs.

Improving access can be accomplished in various ways, such as:

- ensuring access for disabled people, by adopting building design procedures for them (Planning and Research Unit, 1992b);
- increasing enrolment access, by providing open entry and exit points (Guthrie and Loveder, 1990);
- ensuring time access, by providing out-of-hours access to a venue, or to an electronic network (McGregor and Latchem, 1991);
- increasing learning access, e.g. learning package delivery via print or electronic media (Thompson, 1991; West, 1992).

The Carmichael Report calls for equal participation of men and women in the Australian Vocational Certificate by the year 2001. Particular impacts on facilities which will arise from pursuing national and state goals for increased participation of women in vocational education and training will include the necessity for provision of student support facilities, to cater for the increased number of mature age women (20+) undergoing retraining associated with award restructuring. This will include provision of:

- mechanisms for the recognition of prior learning for women;
- child care facilities;
- means for these students to access resource materials designed to help them to step up to the levels required by TAFE trade and other programs; and
- other student support such as improved access to course information and resource kits specially designed to increase women's participation in TAFE courses, counselling, tutorial staff (and seminar rooms), and the encouragement of peer support for female students in non-traditional trade classes.
Balance security needs with clients' needs for facility access.

Decide whether 24 hour access to the facility is required and if so, what means of access will be provided and whether access might be linked to competency levels which the student has achieved. For example, a range of access times could be spread over a 24 hour period and implemented by introducing an electronic lock that only recognises individual passcodes or smartcards at designated times, based on the students' level of competence. The competency level for allowing after hours access might be determined by the student's need for interaction with teaching or support staff, in which case access would be confined to periods when staff or nominated representatives were on hand. As a general rule, access to facilities must involve suitable support/backup procedures. Make physical resources which are relevant to learners and support staff readily accessible - do not lock them away in order to manage them. Where delivery is to take place at a particular site, check that it is on a transport route or make provision to transport the students to that site.

Note that 24 hour access may be accompanied by a customised entry procedure such as a smartcard, key-lock device, digital code, or attendance register. This might also include supervision such as surveillance cameras (closed-circuit television, video-recording cameras), infra-red movement indicators, comprehensive intruder alarm systems, entry/exit detectors, or staff provision; or other building installations such as reinforced steel doors, window and door grills, double-glazed windows, deadlocks, lockable windows, safety deposit facilities, grated ducts and automated fire-extinguishing systems.

Equipment and furniture

If advanced technology is to be installed, consider the facility impact.

If advanced technology equipment is to be installed for students to use, consider that a special building design, layout or treatment may be required to protect either the equipment and/or the users.

Impact on facilities. Physical requirements for equipment accommodation involve issues such as avoidance of exposure to heat, dust, vibration or electromagnetic interference. In the case of mobile machinery, e.g. 'pick-and-place' robots, or where hazardous chemicals or fumes are a danger, special attention may need to be given to the users' safety. Consider the impact of high noise levels which arise from the use of machinery, in general, and from workshop facilities for heavy metal fabrication, in particular on surrounding spaces. Provide adequate ventilation and water, power, gas and sewerage services. In addition, these issues need to be carefully considered in relation to the provision and use of mobile equipment.

Equipment must be robust to cope with learning demands.

There are indications that the adoption of flexible delivery strategies tends to increase the rate of utilisation of equipment, which increases wear and tear. Where learning methods are used that increase the amount of student experimentation, this requires that equipment be robust and, where appropriate, be fitted with automatic cut-out devices.
Impact on facilities. Although these impacts are difficult to estimate, equipment which is more robust should last longer and so reduce the amount of storage needed for replacement equipment and parts, and, perhaps, reduce the frequency of servicing. Consider whether a service and replacement agreement is needed.

Plan for cycles of replacement of equipment, furniture and materials.

The design of facilities for flexible delivery, including purpose-built facilities, should anticipate that several times during the life of the building installation, removal or servicing of equipment, and the replacement of furniture or materials will be needed.

Impact on facilities. Plan the facility for ease of installation and removal of installed and portable equipment items by providing a continuous, accessible path of adequate structure and dimension. In addition, include access for transport and delivery vehicles such as forklifts and service vehicles.

Plan student work stations to facilitate use of technology-delivered teaching and learning.

Impact on facilities. Ensure that work stations and work spaces will meet current and anticipated teaching and learning requirements. For computer work stations, ensure that sufficient work space exists on the desk for an A4 folder to be opened out, and for the mouse or drawing tablet to be used unhindered. Computer work station flexibility is increased when provision is made either at the work station itself or within the computer area for the student to take a theory component of the lesson while facing the teacher. Computers equipped for multi-media teaching will need headphones to enable students to listen to sound effects or voice commentary without distraction to other students. For processing machinery, ensure that there is a buffer area around a work site to minimise interaction with passing traffic; that signage is clearly visible; and that there is uninterrupted access to emergency equipment and controls. In all instances, ensure compliance with occupational health and safety standards, particularly in multi-use or high utilisation areas.

Furniture: balance flexibility against special purpose uses.

Check that furniture is suitable for ease of rearrangement as room layouts change to accommodate different forms of learning. Note the special requirements for computer rooms and videoconferences (see diagrams in Appendix C). Do not overlook safety requirements. For instance, proper flooring, lighting and ventilation must be considered when a space involves multiple activities, or frequent changes in learning activities. Do not overlook the provision of services, including possible expansion and/or upgrading, or proximity to equipment use.

Plan ahead for inclusion of new technology.

Information technology and associated networking will influence the design of buildings by changing the way that educational facilities are used and, in some cases, will eliminate the need for a fixed facility. Computer bulletin boards and computer mediated conferencing allows individuals to interact in an electronic classroom. Laptop and notebook computers can now be used in practical workshops to perform calculations being linked into a Local Area Network (LAN), using infra-red links which do not require direct 'wire' links via a modem connection. New developments such as speech recognition, touch screens and
write-on screens are available and will change conventional views on ergonomic furniture and floor layout. The use of broadcast television is expected to increase and will require suitable locations of satellite receiving dishes and associated wiring, and provision or co-ordination of viewing areas for television broadcasts.

**Plan for the use of mobile equipment.**

Mobile equipment can be operated independently from building services, that is, it can contain storage for water, gas, power and waste. Use of this type of equipment can greatly enhance flexibility and adaptability of a facility.

Impact on facilities. This includes a need for storage, access and connection to building services such as power, water, gas, sewerage, telephone and electronic cabling, and ventilation.

**Designing large facilities**

**Design for people needs by making facilities pleasant places for learning.**

Educational facilities will be required to reflect an intimate rather than an impersonal feeling. A friendly and relaxing environment (internal and external) is increasingly being seen as an important enhancement to any learning process. Regardless of the flexibility and multiple purposes for which the facility is designed, the exterior and interior building surfaces should embody warmth and friendliness, achieved by the use of materials of suitable colour, texture and shape.

Impact on facilities. The design of a flexible learning space must be based on careful evaluation of those exterior and interior styles or installations which enhance regional or community environments or identity, or best harmonise learning conditions, particularly if frequent changes of learning activities or high utilisation rates occur. Plan to minimise distractions. Ensure that furniture for study and relaxation is ergonomically designed and aesthetic. Ensure that essential information and emergency signs are displayed prominently. Allow space for notice boards, posters and displays of staff and student work.

**Include multi-function spaces.**

Provide practical learning facilities that reflect real-world situations. Wherever possible, aim to avoid single-function spaces in preference to multi-function spaces. These can offer more integrated learning modes, incorporating suitably flexible and/or portable furniture and equipment, and allowing more intensive use of space. Special attention must be given to the interaction of learning practices, particularly where quiet and noisy activities may occur, and to storage requirements, especially when mobile equipment is used. If you are locked in to providing a single-function space try to include flexibility for a later shift towards multi-function use. Note that demand for conventional teaching spaces, such as classrooms, may fall if there is a wider adoption of information technologies for the distribution of teaching, such as closed circuit or satellite television broadcasts or use of videoconferencing to remote locations.
Implement proper environmental controls.

Consider issues associated with the zoning of heating, lighting and ventilation within the facility. Ensure savings can be made by zoning those parts of a building which will be used outside normal hours to receive heating, lighting and ventilation. The control system should itself be flexible so that alterations to timings can easily be made. Sub-metering of areas that are likely to be used by outside commercial activities should be considered. Size of zoning will naturally be affected by a balance of what is desired and what can be afforded.

Ensure that the environmental systems will anticipate, as far as possible, the likely needs for adaptability of the accommodation as a whole. For example, to allow more freedom in replanning of activity areas such as workshops, it may be necessary to anticipate later inclusion of alternative systems such as plug-in ventilation or mechanical extraction units. It may be necessary to allow building occupants to have some level of environmental control over spaces where, for example, heat producing equipment is installed in what had been a general purpose room. It is advisable to plan for adaptability of the environmental systems, for example, by providing some spare capacity in the central plant to allow for increased loads at a later date.

Use representative design teams for facility design projects.

The design team should reflect broad representative participation, and aid the work of any facility-based management team. The size of the design team tends to be directly proportional to the planning and design time, due to the difficulty in resolving differing opinions on needs and priorities.

Design for flexibility and adaptability.

Design for flexibility of teaching and learning areas, including multiple use of these areas. Allow scope for the expansion of teaching areas to cater for changing needs, in terms of dimensional/spatial or relationship changes. If demand exceeds capacity, consider whether additional built modules can be added.

Avoid over-complicated facility designs which attempt to solve all possible future needs. Instead, consider a relatively simple design which enables quick adaptation for multi-use teaching and learning.

Where possible, design large structures as an envelope with lightweight partitioning for internal walls. However, note that wear and tear on the internal walls may increase the life cycle costs of the building. Internal partitions may not fit together properly after as few as two changes. Design the envelope or building shell to meet those requirements which are common to all potential users.

Plan for versatility of use of learning spaces.

General purpose spaces of varying sizes and locations should accommodate a range of different activities. New technologies usually require complex electrical transmission systems. Such facilities can be planned in varying degrees at the outset by making provisions in the building infrastructure that permit the initial system to be expanded and changed over time as new technologies are developed.
Barriers to the versatility of a facility can include the following problems.

- The environmental control system was too difficult to adapt.
- It was too expensive to make changes.
- The users were unaware of the facility's potential.
- Administrative procedures inhibited such action.

When examining ways of making a facility adaptable to changes in requirements for new technologies and spatial layouts, consider the design issues associated with mechanical and electrical equipment. At one extreme the design can be planned for full flexibility of spatial layout and mechanical and electrical equipment. A moderate approach is to make special provisions only in the electrical and mechanical systems, since changing the placement of walls of standard construction is a relatively simple and inexpensive procedure.

*Plan for future expansion of the facility.*

The facility might be planned in such a way that new additions are easily added on adjoining open space. Other approaches may include planning for an optimum size of facility and building an entirely new facility to cater for growth in student population; or re-evaluating the need for a new facility when other arrangements become possible, such as hiring facilities or engaging in joint ventures. By mixing spaces and activities, the provision of client services can be sub-divided into sets of accommodation and associated provisions which are manageable, flexible and friendly.

*Plan for cost efficiencies.*

Designing facilities to enable a wider range of programs to be accommodated in the one facility can reduce the initial construction costs for a given mix of programs, and increase utilisation levels. In costing multi-use facilities, note that there may be additional costs incurred in providing storage, plus back-up staff to change room layouts. Use appropriate cost analysis methods such as economic appraisal techniques to evaluate choices between solution options and value management or investment appraisal techniques to test building design choices. Perform Post Occupancy Evaluation (POE) studies 12 months after a new or modified facility has come into use. These studies are effective in revealing design oversights or mistakes which can then be taken into account in the next building.

*Plan for economies of scale.*

Attempts to reach the goal of achieving economies of scale is influenced by whether there is an opportunity to create a network of physical resources to serve clients within a defined region. Evaluate economies of scale in terms of the strategic intention to add on further facilities either through purpose-built construction, refurbishment or adaptation of neighbouring buildings, or in terms of a broader scheme to involve industry and/or community facilities within the learning delivery framework. Assess the effective placement, dimension and utilisation of existing and surrounding space before making a building investment decision.
Plan for effective budgeting of costs.

For the purposes of cost planning, the total money available for building work and furniture should be treated as one, regardless of whether it is allocated from different sources. Investment appraisal techniques can be used for determining an appropriate cost target for a project. At the budget setting level this involves the costing of options by means of discounting procedures (with a cautious view of future benefits) to meet the project objectives. At the project level this involves an assessment of benefit(s) to be gained from particular design details or construction methods.

Achievement of cost savings is helped by setting a cost target not just for the project as a whole but for each main and subsidiary element within it. As design work develops the resulting anticipated cost of each element can be periodically checked against its cost target.

Plan to reduce fit-out and installation costs.

To reduce installation costs, consider the advantages and disadvantages of implementing either demountable or permanent installations such as enclosures (partitions, walls and windows), as these decisions impact on costs of floors and covers, lighting (including type and pattern), service ducts and points, and affect traffic flows, storage, and arrangement of work stations. Always consider user safety, comfort and convenience when examining life-cycle cost issues associated with the choice of building materials.

Building a new facility allows for all the requirements to be fully accommodated and, where specialist facilities are to be included, can be less costly than refurbishing an existing building. Adapting an existing building can result in compromises on quality and incur additional costs in providing alternative accommodation during the construction period.

Other cost issues are listed below:

- The provision of flexibility or multi-use in a facility incurs increased capital cost per square metre of building area, compared with conventional teaching.
- Providing for additional functions in a common space may be considerably more cost effective than building separate functional spaces.
- Value management techniques should be used in the briefing and design stages for assessing costs and value for money, that is, to help make choices between quality (educational worth) and cost.

Consider whether a successful design can be repeated.

To save money and time during the design process, consider whether a design which has proved to be successful can be repeated or whether it can be adapted with minor adjustments. This might involve the building structure, layout, room size, proximity to services, decoration, architectural style and so on.
Use a modular planning approach.

Adaptability to future requirements is facilitated by use of standard or regular modules as a planning discipline. This helps to ensure that building elements can be properly co-ordinated. The level of adaptability will ultimately depend on the relationship of specialised space to unserviced or lightly serviced space and the affordable cost per square metre.

Fixed elements will include the structural frame and floors, vertical circulation and fire walls. Not all other building and fitting-out elements will need to be equally adaptable. For example, furniture will change more frequently than partitions, some partitions will change less frequently than others, and service connections will change more often than main and secondary pipe runs. This type of hierarchical approach to planning will then make it easier to determine the appropriate performance specification for each element.

Core areas can be established for a functional structure, where each core contains selected modules. For example, Queensland TAFE in 1983 prepared a prototype for small TAFE colleges, defining the following core teaching areas: Technology, Business and General Studies, Regional Management Centre Administration, Cultural Activities and Applied Science, Student Amenities and Social Science, and Rural Studies.

Purpose built facilities

For purpose built facilities, keep the following design principles in mind.

- Adopt modular dimensional control, using small planning modules to increase the number of options and maintain a good fit between adjacent units.
- Use a structural frame rather than load-bearing walls.
- Make partition walls, whether demountable or not, non load-bearing and keep them free of services and other fixtures.
- Provide clear, direct routes for supply of main services so that changes or additions can be made with least disruption to the use of the facility.
- Keep floor levels continuous if possible.
- Windows should be dimensioned and positioned to allow rooms to be enlarged or reduced in size.
- Furniture and fittings should be free-standing and easily movable, not built in, and allow for various configurations of layout.
Architectural and engineering considerations

Use standard architectural and engineering design principles for flexible delivery where possible.

Some standard architectural design principles for making buildings more flexible are summarised below.

- Keep the structural frame simple (at least six metres between columns) and include the maximum number of floors and sufficient load-bearing capacity throughout the building to meet maximum anticipated requirements.

- Allow up to 100 per cent expansion horizontally on the site with sufficient height clearance to the underside of the structure (at least 3.5 metres, unless slab-on-ground construction is being used) and a planning grid that is consistent with the structure and window spacing (within the range 1.2 to 1.5 metres).

- Core elements should not be expected to change during the life of the building and should be designed to meet the standard required by all potential users; these elements should be positioned either in the centre or on the periphery of the building.

- A select number of standard room dimensions (say 20-30m², 60m², 90m² and any specific large spaces) should be used wherever possible for the incorporation of associated services, fittings, furniture and equipment.

- A capacity to interchange spaces should be implemented by specifying adjacent rooms having demountable walls, and similar or multiple dimensions.

- Service installation should be on a grid consistent with that of the structure, designed to allow for a possible doubling of capacity and enable access that does not disrupt educational activity.

Use an adaptable fit-out

Ensure that the adaptable elements are dimensionally integrated with, and physically independent of, each other. It will be appropriate where a substantial proportion of technical work is carried out and where there could be a need to change office space to practical areas, or demonstration/practical areas to processing areas. It will be also appropriate where alterations to floor layouts and subdivisions must meet precise requirements of changing tenants, such as rented office areas.

Building materials

Consider life cycle factors in relation to building materials.

Decisions about materials and equipment should be based on the type and level of utilisation of a facility, with attention paid to factors such as robustness or expected depreciative life. For instance, frequent changes in use and the adoption of flexible patterns of use of facilities by staff and students could
significantly alter the functional inclusions such as floor surfacing, practice equipment or lighting.

Decisions about enclosure type and location should be based on what is necessary to support learning activities such as proximity to services, spatial dimension and whether structural support of the building is required. This in turn influences whether the enclosure is to be permanent or demountable.

Before deciding on layout or placement of technology and/or equipment, consider the sound or electronic transmission or absorption properties of the building materials to be used. Remember that all components of a learning space, including the people in it, affect sound levels.

**Building services (power, water, drainage)**

*Locate major building services centrally.*

Services which will be required by a wide range of potential users should be distributed from a centralised supply source. These will include power, water, natural gas and drainage. This will allow layouts within rooms to be changed easily and for basic use of rooms to be changed. It may be more economical to meet some demands for building services by using localised sources, such as compressors or vacuum pumps, or special bottled gases.

*Use fixed components for service installations.*

Locate services in accessible ducting in fixed components such as the floor, walls and ceilings. The principal options for distributing services around a work space or group of work spaces include use of raised floors, floor trunking, suspended ceiling void, suspended boom or perimeter trunking. However, ensure that the main and secondary services distribution is co-ordinated with the structural framework and circulation pattern of the building.

*Provide good access for maintenance of services.*

The overall aim of a services design should be to allow for existing services to be extended or new ones to be easily added. Provide sufficient duct space and good access to the ducts. Enable future maintenance and alteration work to be conducted without interfering with or disturbing work or alterations taking place elsewhere.

*Provide services for transient needs.*

Check that the service grid provides for plug-ins or mobile plug in units that can be wheeled in and out of a large storage space and connected for short periods of time.

*Provide effective cable installation.*

In new buildings, the main cable supply and distribution should be dealt with in the same way as the rest of the building's main supply services. For an existing building, cable management issues should include factors such as the capacity of the existing electrical distribution, restrictions on layout that service distribution imposes, and ease of maintenance. For work station connections, avoid expensive
floor or ceiling connections at each work station by installing furniture-mounted trunking or screen or wall-mounted trunking.

**Storage**

*Define the need for storage.*

Storage must be considered in terms of factors such as:

- whether it is to be fixed, demountable or portable;
- capacity to store a particular volume or size;
- the need to expand, share or change the function of the storage areas;
- the period of time required for storage; and
- the type of goods to be stored, and their life expectancy.

*Plan for changes in storage provisions and use.*

Storage areas must be designed for flexibility and adaptability. These areas must be close to, or provide a clear, continuous path to activity areas, especially for mobile equipment.

**Walls**

*Plan for the most suitable partitioning.*

Decide on the required performance for a wall, its placement and whether it should be fixed, operable or demountable. The capacity of a wall to respond to changing needs for concurrent or sequential usage should be used as a measure of design performance. For instance, partition walls should be non load-bearing, which is why a structural frame is preferable to a design requiring load-bearing walls. Consider the various characteristics of a wall type (see Appendix B), especially the impact on the immediate and adjacent spaces and users.

*Do not install services in partition walls.*

Keep partition walls, whether demountable or not, free of services and other fixtures. Long term installations such as ventilation, air conditioning, evaporative cooling, lighting and fire protection should function unconstrained by wall position.

**Renovation/modifications to existing facilities**

*Plan for the facility to be easy to adapt to different functions.*

The adaptation of an existing facility may require relocation, replacement, removal or the addition of construction elements, services, or finishes other than paint. This is essentially large magnitude/low frequency change.
The capacity for improvement of the facility will depend on such factors as:

- the structure and configuration of the building;
- the money and time available for renovation;
- the extent to which parts of the building can be freed for the renovation to be carried out; and
- the attitude of those using the building.

Make sure any renovation work is cost effective.

The easiest and most cost effective arrangement is for all the required work to be done as a single project. This, however, is often not possible, either because a whole building or a major part of it cannot be vacated for the duration of the project, or because sufficient funding is not available for the scale of the project involved. More commonly small modifications are made from time to time as money becomes available. Too often these simply alleviate some immediate difficulty or improve a particular aspect of the building, without regard to whether such action will improve or inhibit the flexibility or adaptability of the building as a whole. It is therefore essential that such modifications be carried out within an overall redevelopment plan.

Establish priorities and an overall plan for building improvement.

Decisions about setting priorities for improvement should include the following.

- Establish a long-term flexible design strategy to guide minor works decisions. The strategy needs to be capable of adjustment and should be directed towards improving the flexibility of particular spaces within the facility.
- Rationalise the zoning of activities and the disposition of spaces.
- Decide what key planning dimensions are to be adhered to and how services are to be provided.
- Decide on issues of decor.
- Leave the existing structure of free-standing facilities as untouched as possible and provide some form of independent light structure within it for affixing clip on fittings.

Occupational health and safety

Attend to occupational health and safety issues.

A detailed discussion of occupational health and safety issues associated with the use of educational facilities is outside the scope of this study. However, note that in multi-use facilities, where the internal space layout is subject to regular change, emergency escape routes and access to fire extinguishers may be affected. It is important to involve local emergency services such as the Fire Authority in the planning stages such as the sketch design stage, and at the final design stage.
Plan to minimise the effects of noise on learning.

Check that any sustained noise is below the recommended occupational health and safety levels, and does not interfere with adjacent learning activities. Specialised noisy activities should involve special design treatment, such as the segregation of areas, and acoustic construction procedures involving discontinuous construction -insulated partitions, sound baffles, floor coverings and wall-mounted acoustic panels.

Physical facility management issues

Install an effective computer management system.

Such systems will be essential, due to the increased administrative load which is expected to result from the implementation of flexible learning.

Monitor regularly accommodation needs.

Improving the use of existing accommodation, by systematically analysing the utilisation of accommodation on a day by day basis is the first step towards seeing how the use of space can be improved. Improving the room scheduling process can improve facility utilisation, as can networking between educational providers and industry in regard to the shared use of facilities. Central to accomplishing the above objectives is a computerised, interlinked student/programs/space computerised management system.

For shared facilities, share the management.

The management of a multi-use facility is more complex than the management of a dedicated facility because of the range of users and potential users that have to be catered for. It is good practice to use a joint management group when facilities are to be shared, and to have an independent person perform the space allocation and timetabling, as mentioned previously.

Other management guidelines are stated below.

- Good planning and appropriate consultation can minimise the need for changing the specifications for a building at a later stage.

- Ensure that suitable professional advice is available, either on a consultancy or employee basis, for any building improvement work.

- In the briefing stage, know what degree of adaptability and flexibility is required in the building and what balance between adaptability and flexibility is appropriate for various types of accommodation. Ensure that highly specific needs are not allowed to inhibit the intended ability of the building to respond to change. Involve the architect at this stage if possible.

- In the design stage, regular liaison is essential between all involved members of the project team to ensure that the requirements of the brief are being met and that flexibility or adaptability are not being inadvertently eroded through other design features taking precedence.
In the fitting-out stage, the selection of furniture and equipment should be an integral part of the design process. These items should be compatible so that rearrangements within and between spaces do not lead to mismatching. As with the building as a whole, a balance should be struck between the initial cost of furniture and fittings, their required life and the likely cost of replacement. The same level of specification will not necessarily be appropriate throughout. For example, it is considered inappropriate to economise on items such as taps, valves and other moving parts that will be heavily used.

Appoint a facility manager to achieve optimum utilisation of the facility, including the re-allocation of spaces, and organise maintenance.

Ensure that users understand the functional aspects of the facility.

Develop a building handbook or user’s guide which clearly sets out how the facility is designed to function, and the procedures to be followed in emergencies or when making structural changes. Keep users informed about the facility and associated installations.

Be conversant with types of sharing, leasing and loan arrangements associated with educational facilities.

Types of sharing are listed below:

- donation of equipment and raw materials;
- real work occasions, where students undertake tasks for an enterprise which are part of the everyday business of the company concerned;
- educational providers making their equipment available to industry on a charge basis;
- industry-owned equipment leased out-of-hours;
- industry-owned equipment made available free out-of-hours;
- industry-owned equipment loaned on a short-term basis;
- industry facilities used for teaching purposes with company staff as trainers;
- joint facilities especially skills training centres and facilitator agencies;
- industry staff working in educational provider venues on a paid or loan basis; and
- educational provider staff working in industry venues on a paid or loan basis.

Encourage the development of enterprise or industry-owned training facilities.

Industry should be encouraged to establish training facilities that are accessible to the educational provider. This has the advantage of increasing the pool of facilities available for use for training.
Summary of key principles in the process of managing flexible delivery

The analysis provided in this section has provided insights into the more complex process issues in the management of flexible delivery.

Pay close attention to managing the process of flexible delivery.

Management

- Develop an appropriate management culture.
- Establish co-operative links with other providers, and industry.
- Look for new opportunities for establishing community learning centres
- Pay close attention to staff development needs.
- Encourage sharing of facilities across teaching disciplines.
- Develop a comprehensive plan to improve communications.
- Establish appropriate management systems.
- Establish mechanisms for the dissemination of expertise.
- Decide whether to consolidate core management services.
- Retain a core of expertise in learning material development, even if you contract out resource development.
- Plan for an enhanced role for non-teaching support staff.
- Use communications technology to open up access to knowledge for learners.
- Attend to student support needs.
- Provide support for multi-use facilities.
- Be fair and equitable about timetabling.
- Develop a plan for monitoring and evaluating facilities.

Course design and development

- Analyse the facility requirements within the educational plan for the delivery of courses.
- Use instructional teams for learning resource development.
- Retain a core of expertise, even if you contract out resource development.
- Develop self-contained multi-media instructional packages.
Access to learning services

- Pay close attention to improving physical access and access to information.
- Balance security needs with the clients' needs for facility access.

Equipment and furniture

- If advanced technology is to be installed, consider the impact on the facility.
- Equipment must be robust to cope with learning demands.
- Plan for cycles of replacement of equipment, furniture and materials.
- Plan student work stations to facilitate use of technology-delivered teaching and learning.
- Furniture: balance flexibility against special purpose uses.
- Plan ahead for inclusion of new technology.
- Plan for use of mobile equipment.

Designing large facilities

- Design for people needs by making facilities pleasant places for learning.
- Include multi-functional spaces.
- Implement proper environmental controls.
- Use representative design teams for facility design projects.
- Design for flexibility and adaptability.
- Plan for versatility of use of learning spaces.
- Plan for future expansion of the facility.
- Plan for cost efficiencies.
- Plan for economies of scale.
- Plan for effective budgeting of costs.
- Plan to reduce fit-out and installation costs.
- Consider whether a successful design can be repeated.
- Use a modular planning approach.
- Use standard architectural and engineering design principles for flexible delivery where possible.
- Use an adaptable fit-out.
Building materials

Consider life cycle factors in relation to building materials.

Building services (power, water, drainage)

- Locate major building services centrally
- Use fixed components for service installations.
- Provide good access for maintenance of services.
- Provide services for transient needs.
- Provide effective cable installation.

Storage

- Define the need for storage.
- Plan for changes in storage provision and use.

Walls

- Plan for the most suitable partitioning.
- Do not install services in partition walls.

Renovation/modifications to existing facilities

- Plan for the facility to be easy to adapt to different functions.
- Make sure any renovation work is cost effective.
- Establish priorities and an overall plan for building improvement.

Occupational health and safety

- Attend to occupational health and safety issues.
- Plan to minimise the effects of noise on learning.

Physical facility management issues

- Install an effective management system.
- Monitor accommodation needs regularly.
- For shared facilities, share the management.
- Ensure that users understand the functional aspects of the facility.
- Be conversant with types of sharing, leasing and loan arrangements associated with educational facilities.
- Encourage the development of enterprise or industry-owned training facilities.
Self-pacing

The features of self-paced learning defined in the glossary are used here to identify issues and their impact on facilities design. Self-pacing can be applied in the following contexts: classrooms, college libraries (using individual carrels), learning centres, workplaces, homes. It can also be used in small groups whether on-the-job or in classrooms.

*Students work at their own pace. Pace is not teacher driven.*

This means that students will be at different stages/places in the learning process. The role of the teachers changes to that of manager of learning and class sizes may need to be smaller than in those classes using teacher centred strategies. Although the students work independently they could be required to do some group work depending on the delivery mode. Students can be assessed when they are ready, in other words assessment is not teacher-driven.

*Facility impact (in general).*

Classroom design or learning centre design needs to reflect the individualised nature of learning, with adequate personal space and quiet areas. Areas should be available for group work but note that the size of groups will tend to vary. Teachers may require access to a particular area for assessment of individual students.

*Students can choose their own pathway through learning packages (modules).*

This means that students need access to whole learning packages and any related equipment. Recognition of prior learning (RPL) issues will also need to be addressed.

*Students can start and finish modules at varying times.*

This means that enrolment needs to be flexible. Assessment issues and classroom management issues must also be dealt with.

*The learning materials can use a range of media.*

The main facility impact here is that regardless of delivery mode, students may require open access to facilities containing specialised equipment, e.g. computers, and other resources, e.g. print and video material.

*Students may need to attend laboratory sessions/practical workshops.*

The impact on facilities is that open access is needed to laboratory and practical facilities and equipment which are specified by the course. Note that open access may mean that having a room of standard size is not important but considerations of costs will be associated with use, particularly if teachers and technical staff must be in attendance.
**Mixed mode**

The approach for implementation of mixed mode delivery discussed here is that which is used at the Open Training and Education Network (OTEN), summarised in Step 2 below. The steps and processes in implementing mixed mode delivery according to the OTEN approach are listed below, with their impact on facilities. An important advantage is that this form of delivery offers TAFE NSW colleges the ability to offer courses or subjects which otherwise would be unavailable due to lack of resource, demand or expertise in a particular area. It can meet the needs of local industry in developing programs to suit their time requirements and locations using existing print material or other resources.

**Step 1: Initial planning.** This involves consultation to negotiate suitable programs for proposed courses and is dependent on the available resources, since certain subjects require specific resources. Courses can operate only if the specific resources needed are available, and only if the required expertise is either available at the delivery location or can be provided by having subject specialists travel to colleges.

**Step 2: Student enrolment.** Students enrol with OTEN or are redirected to local colleges running mixed mode. In the latter case they enrol at these colleges and undertake courses using OTEN material. Provision of advice to students is important at this stage. Teachers need to be well versed in managing flexible delivery. Note that it may be necessary to negotiate with individual students.

**Step 3: Orientation Day.** This is necessary to inform students about student support services, such as course information and library amenities; the program for mixed mode; the timetable for weekend practicals and their location; and the network of current students for peer support. Note that mixed mode delivery requires that students be advised of resources available locally and of the availability of teachers for telephone contact and/or tutorials. Orientation days require appropriate facilities for student/staff interaction.

**Step 4: Students study printed material at home.** The college provides time when students can phone teachers for additional support. Contact with nominated teachers is available via a modem in a designated time period. This requires modem equipment for teacher/student interaction and associated desk space for the management of mixed mode students.

**Step 5: Practical sessions.** These are conducted on weekends or by videoconference and are conducted either at colleges which have the specific resources or by having teachers travel to delivery sites to conduct the session if portable resources are used. This requires organisation of the relevant teachers and equipment for the session. At the end of this stage a sectional test is completed. This requires feedback to be provided at a specific time to avoid impeding the learning process. Programs are run in parallel to ensure adequate numbers to run the practical session. Be careful to provide all the equipment necessary to run the session successfully, as well as trained teachers or support persons to assist during the sessions.

**Step 6: Major assignments.** These are co-ordinated by colleges and require recording and storage of marks.
A summary of facilities impacts from mixed mode delivery is given below.

- Facilities are needed for:
  - practical work as specified in courses;
  - computers, production of print and other materials;
  - videoconferencing and audio conferencing;
  - provision of student support services; and
  - enrolment and management of students.

- Equipment is needed for electronic communication with students, such as video conferencing, audio conferencing, computer mediated communication, e.g. modem and bulletin board.

- Teachers will require additional space for communication with students. Note that video conferencing is already available for personal computers and, if teachers communicate with students from their desks, they will require installation of noise reduction measures.

A preliminary review of the trial of mixed mode (Advanced Certificate in Urban Horticulture, TAFE NSW) indicates that although facilities costs are often regarded as fixed costs, the reduced attendance requirement of mixed-mode students facilitates more efficient use of rooms and reduces wear and tear. There are indications that colleges can accommodate more students or accommodate the same number of students in a smaller area. Moreover, it appears that accommodation can be used more flexibly and facilities such as those offered through an open learning centre or a library can provide learning opportunities for students in different courses at the same time. In the trial, students were able to use a computer aided learning package in the library to work through a section of the course at their own pace.

**Audio-visual resources**

The emerging trends in audio-visual delivery in colleges or open learning centres (OLCs) includes increased use of these materials as an integral part of the learning process, increased sharing of facilities by students from different institutions and educational sectors, and increasing use of technology to control and record access to audio-visual (AV) resources, e.g. bar code readers.

Implementing audio-visual delivery at a college or an OLC requires the following conditions.

- Access to:
  - desks, equipment, and booths configured for AV access;
  - communications facilities such as phone, fax, voicemail, computer conferencing, electronic whiteboard and projection equipment;
- tutorials, review sessions, guest lecturers and other student support services;
- competency assessment tasks such as tests or other forms of assessment; and
- access to learning areas via a security system.

- Storage (introduce easily accessible shelf storage systems to avoid the trap of locking resources away in order to manage them).
- Management: It is important to be able to implement adaptive management of resources to meet changing demands including the scheduling of classrooms for support activities such as tutorials, review sessions and guest lectures. Aggregate resources to maximise access across courses for the greatest number of students. Position desks, booths etc near resource storage. Provide mechanisms for the submission of assignments and the recording of student progress. Also consider likely student numbers, comfortable viewing distances from monitors, and the number of power outlets required.

**Computer Managed Learning**

Implementing computer managed learning (CML) is the process of using computers to manage the delivery of learning but not to perform the actual delivery. The impact on facilities from the implementation of CML can be tracked through five general stages: (1) establishment of the system, (2) set-up of CML facilities, (3) enrolment, (4) selection of the next unit of study, and (5) conclusion of the unit of study.

In establishing CML systems, the central issue is the training of CML managers, teachers, facilitators and technical support staff, and the main facility impact is on provision of training rooms and hands-on access to the equipment (computers, computer network, and printers) for development work and for system configuration and testing. As with computer assisted learning, a support centre able to contribute expertise and training in CML practice and policy is required.

In the set-up phase, the central issues are:

- preparation of the centralised database:
- the planning of the computer room(s), with attention to the number of computers needed to meet student and teacher demand:
- allowance for after-hours access for links between the source, e.g. the learning provider's 'host' computer and the learners' computers or for provision of access from homes or workplaces to the 'host' computer:
- the need for a quiet environment for concentration; and
- the provision of supervision of assessment.
The facilities impact of CML is outlined below.

- Space is required for:
  - installation of workstations/terminals and the computer network equipment, where a ratio of one workstation/terminal for every 10 enrolled students is suggested, with two printers for every 10 workstations,
  - telecommunications equipment and associated transmission lines,
  - maintenance and backup equipment,
  - servicing of equipment, including carrying out replacement and upgrading programs, such as distribution of new and upgraded software, technical support, including a support hotline,
  - secure storage for software and student data and open-shelf storage for manuals and learning materials,
  - inclusion of quiet spaces for concentration, such as ‘call-off’ rooms,
  - course/subject assessment if this is done away from the computers, and for the purposes of recognition of prior learning,
  - staff, including management staff keeping records and technical support, and also for meetings and staff training, and student amenities if these are to be included within the area in which computer managed learning takes place. One example is the computer facilities at Hamilton College of TAFE, Newcastle where an entire floor of a building in the commercial district was remodelled as a self-contained computer teaching laboratory (see Dovey, 1990).

- Security is required for:
  - ensuring security of data, physical installations and equipment, and
  - managing after-hours access.

- Sound-proofing is required, especially if call-off rooms are not provided.

In the enrolment phase, space and facilities will be required for:

- automatic transfer of student information to CML systems and possible online enrolment;
- the handling of processes entailed in the recognition of prior learning, and the provision of ready access to item banks at the time of enrolment; and
- access to CML facilities and related facilities such as workshops or laboratories if required at this time.
In the final two phases - selection of the next unit of study and conclusion of the unit - the main issues and their associated space and equipment requirements relate to:

- pre-testing;
- access to work stations or terminals;
- access to systems and associated materials, possibly out-of-hours;
- post-testing and feedback;
- recording of results and teacher access to the results; and
- learner access to staff and to communications links such as phone, facsimile and computer-mediated communication.

**Computer Assisted Learning**

This refers to the interactive use of computers to deliver learning and training. CAL can be implemented in TAFE colleges, workplaces, community centres, or at learners’ homes. Steps and issues in implementing computer assisted learning (CAL) in a TAFE college, a relatively large scale implementation, are listed below, together with their impact on facilities.

Establishing a computer assisted learning system and the development of CML modules to be made available for TAFE courses requires access to a support centre able to contribute expertise and training in CAL practice and policy. Using CAL modules requires timetabling for both the computer hardware and the actual modules. If modules are for home use, arrangements will need to be made for students to lease/borrow/hire/purchase the necessary equipment. If modules are not for home use, a booking system will be needed to manage computer hardware and software (if these are not already installed).

Issues relating to student access to CAL modules and their impact on facilities are listed next.

- Access and equity, requiring standardised equipment for use throughout TAFE;
- Quality of end-product (requiring regular state of the art upgrades of equipment);
- Out-of-hours access requiring security of rooms and equipment;
- Availability of facilitators and technical support requiring suitable staffing, together with the necessary office space and equipment for hotline support if supplied; and
- Need for a quiet environment for concentration, requiring soundproofing and/or call-off rooms.

Note: In the event that the CAL resource is only one of a number of
resources being used by students, consideration will need to be given to the size of work spaces to accommodate the use of additional resources, and to the location of work spaces near other resources such as libraries.

Follow-up activities associated with CAL include assessment, which will require access to CML facilities if these are not available on the same computers as the CAL program, and the supervision of other assessment for which special areas or rooms should be made available.

**Computer Mediated Communication**

This refers to the use of computer-based electronic mail, bulletin boards and conferencing where computers and telecommunications equipment are linked via modems and used as tools to compose, store, deliver and process student-teacher communication. This form of communication can be used for course delivery and student support at educational institutions, the workplace, community centres or at students’ homes.

As with CML and CAL, the establishment of computer mediated communication (CMC) requires access to support centres for training. The enrolment process can be handled by CMC with access to admissions staff. This will require close relationships between enrolment and delivery systems. Delivery issues to be addressed in regard to computer mediated communication, and their impacts are listed below.

- Hardware and telecommunications will be required for teachers and learners. For home use, lease/borrow/hire/purchase mechanisms will be needed. If CMC is not for home use, appropriate spaces and locations will be needed.

- The cost of transmission. The issue will be who pays, and a usage accounting system will be needed.

- Access out of normal hours. Room and equipment security will be needed.

- Teacher and student support, requiring availability of technical support and/or a hotline.

- Access and equity. This involves standardisation of equipment.

- Handling of assignments. This will require a close relationship with student management systems.

Course preparation and student follow-up will require delivery of support materials and work items, access to library resources, and access to teachers by telephone and facsimile. This in turn will require accommodation for distribution systems, remote access or ease of access and telephone and facsimile availability.
Audio conferencing

Audio conferencing is the linking of individuals or groups between two or more locations via telephone lines. It is useful for tutorial support and meetings and can be deployed in colleges, workplaces, community centres or homes. The establishment of audio conferencing requires access to support centres for training. Delivery issues and facilities impact are as follows.

- The optimum number of participants is 1-10, requiring a conferencing system with adequate number of lines on the PABX.
- The system needs to cater for planned and incidental use. This will involve appropriate spaces and accessible locations.
- Good sound is important. This will require quality audio equipment and acoustically designed spaces.
- Cost of transmission. As with computer mediated communication, the issue will be 'who pays', and a usage accounting system will be needed.
- Access out of normal hours, needing security of room and equipment.
- Booking and setting up of rooms. Support staff must be available.
- Availability of facilitators and technical support, requiring allowance for office space and/or hotline support.

Preparation and follow up will entail delivery of support materials and work items and access to other resources. This will require distribution facilities and locations near to other resources such as library facilities.

Videoconferencing

This combines audio and visual media to provide interactive communication between two or more sites, and is suitable for the delivery of courses, tutorials, and student support, and for meetings between educational institutions, workplaces, community centres and homes. See Appendix C (Figures C.4, C.5 and C.6) for examples of videoconferencing room layouts. Issues in establishing satellite transmission, which differ from those regarding audio conferencing are:

- Enrolment. Liaison is required with videoconferencing coordinators. This may entail availability of TAFE staff and systems out of normal enrolment times.
- Broadcasting requirements. The implications of being at the hub of a network, especially in terms of specialist technical support staff and equipment, must be considered.

One example is Ecunet. Edith Cowan University's video conferencing network in Western Australia. The network provides a two way, full bandwidth analogue video network linking the three major metropolitan campuses of Churchlands, Mount Lawley and Joondalup through telephone exchanges and Telecom's Television Operating Centre (TOC). Through a switching system in TOC, operated at Churchlands, full bandwidth interactive video can be transmitted between
campuses, to provide live lectures, the downloading of pre-recorded material and a variety of other services. The system provides two way signals, although the preferred mode may be one way video and two way audio, on the grounds of the increased costs related to two way transmission (Grant (1992)).

A studio and appropriate equipment are required, together with instructional materials and support, to establish such a facility.

**Satellite television**

This entails the transmission of audio and video signals via satellite to designated receiving sites and is suitable for the distribution of educational materials to institutions, workplaces, community centres and homes. Issues in establishing satellite transmission, which differ from computer mediated communication and audio conferencing, are listed below.

- **Enrolment:**
  - liaison is required with the satellite coordinator/adviser which may involve availability of TAFE staff out of normal enrolment times, and
  - publicity for the course or program is needed.

- **Broadcast transmission from a studio facility with the aim of achieving a quality production and broadcast calls for a fully equipped television studio and transmission facility.**

- **Broadcast reception at the local site:**
  - a well equipped room is required because of the importance of good quality sound, lighting and design,
  - the layout needs to be designed for viewing, discussion and audio conferencing (requiring flexibility for multi-purpose use), and
  - continued reliability of the system depends on maintenance and backup equipment, a replacement and update program, and technical support and a hotline.

**Open learning centres/libraries-information centres**

**General facilities impact**

The purpose of these types of facilities is to provide flexible physical spaces for flexible learning. They need to:

- provide flexible internal spaces which support open access and self-paced learning and have specialised equipment to support mixed mode delivery;

- include cabling suitable for multimedia transmission; and
• provide access to 24-hour machine readable courseware, to amenities and library resources.

Appendix C provides an example of a traditional (Figure C.7) and systems (Figure C.3) furniture layout.

Example 1: Queensland Open Learning Network

Space, material, and equipment requirements are listed below.

• microcomputer, printer and modem;
• software;
• electronic mail access;
• facsimile machine;
• audio conferencing and/or videoconferencing equipment;
• quiet study areas;
• course materials;
• information about careers, courses, and so on;
• 24-hour access to particular services such as computer/printer equipment;
• storage; and
• amenities, such as toilets.

Example 2: Joondalup TAFE campus (WA)

The Joondalup facility is a complex of rooms specially designed for the delivery of open learning activities. 24 hours a day, 7 days a week, 50 weeks a year. Mead (1993) describes the facility as including five open areas which have all necessary resources including videos, manuals, books, technology delivered instruction and a teacher. There are approximately 300 networked personal computers with CD-ROM equipment available at a central location. Students are encouraged to mix with staff to develop a team concept rather than separating into various disciplines. An important part of the management strategy for the campus is to encourage team work among staff to allow for the development of materials. It is expected that students will make increased use of remote access, multi-media, integrating technologies, videoconferencing, computer managed learning and technology delivered instruction. Students will be encouraged to be problem solvers.

Facilities impact. Space and equipment are necessary for the services mentioned above, and for staff. Electronic access is provided to library catalogue systems. Photocopiers, video and audio equipment, and fax machines are available according to study needs. Vocational and study support and counselling are provided. Additional uses of the facility which are intended to encourage support from the local community include community-based activities, educational brokerage services, and industry hire.
Example 3: The Open Learning Centre model, TAFE NSW

This model embraces the following:

- course inquiries and information;
- an instructional design centre;
- computing facilities for students;
- an individual learning centre and an adult study centre; and
- a library.

Centre has the following functional areas:

- resource storage for open and closed access learning materials;
- photocopying;
- TAFE library catalogues;
- computer facilities with communications technology;
- open learning space and group meeting rooms; and
- an office/workroom for the centre's co-ordinator.

An information centre

An information centre provides a centralised location for access to and distribution of information, e.g. a library (Appendix C, Figure C.9). These facilities are usually purpose built and contain a collection of printed, electronic, film and tape information for course and client needs. They also contain selected equipment for information access such as CD-ROM, microfiche readers, computerised catalogue systems/networks, a computerised mail system, and audiocassette/videotape equipment.

Such a centre could contain: a reception and control desk; a staff workroom; a reader service area, i.e. a catalogue system; a quiet study area, i.e. individual study stations; a book stack; an audio-visual workroom, seminar room and store; a group study area; and a casual reading area. Other areas could be included, such as a bookshop; a computer/telecommunications/information technology room; study carrels; a separate store; and a closed book stack.
Mobile facility

Description

A mobile facility is a unit which primarily delivers specialist education and training programs where a fixed facility is either inappropriate or unavailable. These units are suited to delivery of training programs (trades), post-education qualification in specialised fields, company based training for local industry, and special community courses in isolated (country) regions. They are also suitable for on-site enterprise-based training as they allow the integration of teaching disciplines and the delivery of integrated theory and practical programs, with the theory component being delivered close to actual on-site practical work. They provide flexibility and adaptability, which are important for the delivery of programs to isolated communities.

Mobile facilities have an important part to play in flexible delivery because they can be temporary or semi-permanent. They can stand alone or rely on-site services such as power, fresh water, waste disposal and storage. Note that in some cases the local communities may support mobile units with parking locations and services. They can be relocated by road, rail or air. Specialised equipment and fittings can be installed and they can be equipped with state-of-the-art teaching aids.

Services requirements for mobile units require careful planning. The units often require air conditioning for climate control. It is preferable that they be connected to a fixed building for fresh water and other services as needed. Even when a unit has its own power and water supply, it is advisable that, if available, site services can be readily connected. Fittings and equipment should be easily removed for upgrading or replacement to keep pace with changing technology. Where a vehicle is used to transport the mobile facility, it is obviously important to adhere to proper maintenance procedures for the vehicle and equipment to avoid breakdowns in remote areas.

Management issues include:

- The importance of evaluating the suitability of curriculum materials for use within, or from, the mobile. Careful timetabling is needed to ensure efficient use of the mobile;
- The need for effective administration of mobile units for the scheduling of stock preparation, servicing, movement, siting and associated activities;
- The need for careful planning for anticipated recurrent costs such as transport and travel time, purchase of consumables, promotion of programs, and additional or replacement equipment items; and
- Attention to conditions of employment, and provision of relief teachers.

Example: Mobile Training Kitchen, TAFE NSW

The mobile kitchen (Appendix C, Figure C.10) is a refurbished catering unit, fitted with semi-commercial equipment, that delivers training courses in catering, food and hospitality to remote areas of NSW. It is currently used in isolated Aboriginal communities. It features six main areas: food preparation, cooking, servery.
washing up and storage. An annexe (9m x 2.5m) is included to expand the training area (Le Bransky, 1992). Applications of this type of facility include the delivery of post-compulsory training, especially CBT, RPL and self-paced learning. The facility is suitable for tutorials, lectures, conferences, group/team learning, and practical instruction/action learning.

Use in implementing flexible delivery strategies

Mobile facilities have the potential to reduce capital expenditure on fixed facilities where long term needs are uncertain or use would be periodic. They also facilitate rapid addition of an extra room, placed outdoors or within an existing enclosed space such as a warehouse, and provide other benefits such as:

- suitability for a variety of learning approaches, including self-pacing;
- relative ease of transportation and installation; and
- minimum requirements such as standard water and electricity supply.

They can be fitted with special services such as water supply, waste (liquid/gas) disposal/storage, LP bottle gas, electrical outlets with circuit breaker protection, vacuum and air pressure outlets, and cupboards, drawers, and racks for storage. However, the level of their operational flexibility is reduced by the fixed installation of equipment and structural features.

Trade workshop centre

A trade workshop centre is a hands-on learning venue for delivering and testing industry standard competencies, provided by educational and training institutions, community centres and industry. Trade centres are usually purpose-built to meet local demands and projected trends. They are designed to encourage flexibility of operation(s) and contain specialised equipment for training purposes.

Two examples of this type of layout are included.

Example 1: Beauty Therapy Facility, TAFE NSW

The following features of a beauty salon’s layout (Appendix C, Figure C.11) were considered important (Guerin and Sadleir, 1992, p.14)

- work stations i.e. treatment couches, along one wall;
- a central theory/demonstration area with tables and chairs;
- specialised training areas such as a steam room placed along one wall;
- a large (minimum of 14.5 m²) store, accessible from salon(s);
- storage space for the day’s support equipment; and
- an environment that is clean, quiet and restful. Interior decoration was considered important, particularly the colour scheme, pastels and muted warm tones rather than beige.
Example 2: Australian Chamber of Manufacturers Training Centre

The Australian Chamber of Manufacturers Training Centre (ACM) in Victoria was established in 1989. It provides facilities for training in such areas as machine shop practice, electrical/electronic procedure and management processes. The machine shop (Appendix C, Figure C.12) accommodates about 80 trainees per day. The gross floor area is approximately 5500m² and provides training in machining practice equivalent to that given in an industry environment. A special design feature was the incorporation of an elevated area within the glazed walled demonstration, test and study areas. The centre has a reputation for its accelerated apprenticeship training.

The centre provides for recognition of prior learning, competency based training, experimental learning, self-paced learning, technology delivered instruction, use of computers to deliver and manage learning and use of telecommunications technology, including videoconferencing for networking with other venues. It provides a common venue for users, and locates specialist equipment in one place. However, the costs are high, and the need to provide some fixed equipment reduces the level of operational flexibility.

Telecottage

Telecottages are multi-purpose work and learning centres which provide electronic document interchange (EDI) technology, electronic data processing and training in computer and work-related computer applications, as well as acting as electronic adjuncts to distance education centres. They can be built in a rural location or on campus, or the functions they provide can be incorporated into an existing facility.

Access centre

An access centre is a self-contained, flexible training facility, used particularly for delivering short courses, fee-for-service training and for facility hire. It is usually a purpose-built or modified facility, and is usually externally accessible. The accommodation and equipment vary depending on the demand, and type of use. Equipment and fittings may provide for specialist training, while still supporting some level of flexibility in accommodation and course delivery.

Example: Access Centre, TAFE NSW

Various access centres have been constructed by TAFE NSW as part of their program to service local communities effectively and flexibly. Appendix C, Figure C.13 illustrates some typical features of these centres which, excluding amenities such as toilets and tea rooms, may include reception areas, offices, preparation and computer areas, and general areas for course instruction or activities. Sometimes they include specialty installations. Other areas that could be included are secretarial support, telephonist/switchboard area, storage and specialist areas.
Administration centre

The functions of an administration centre can include centralisation of management services for flexible delivery and provision of support for decentralised management tasks. It can be purpose built, modified or provided in rented premises. Space requirements, fittings and equipment include: a PABX switchboard, computer record system, duplicating area for publication and printing needs, dispatch/mailing area, special storage area for holding manual records and files, electronic communications and other facilities for staff.

Example: Administration Centre (hypothetical)

The typical administration centre (Appendix C, Figure C.14) might be expected to provide the following accommodation, as well as common amenities such as toilets and tea room:

- reception;
- bookshop and course information;
- registrar’s office;
- manager’s office;
- general office for typing, computing and clerical duties;
- a resource production area for photocopying and printing requirements;
- a meeting room for staff and clients;
- a storage area for clerical and client records, and office supplies; and
- Interview/Examination Room(s).

Print production

The implications of flexible delivery processes for facilities designed for print production can be discussed under three headings: production of learning materials, delivery and administration.

Production of learning materials.

The print production function will entail the adaptation or customisation of existing materials, the design and development of new materials using in-house or out-sourced expertise and/or resources, or the use of existing materials. For out-sourced production of materials, the important function is financial control.

Facility impacts. Facilities are required to acquire materials from state, national and/or international databases. The customisation or adaptation of existing materials in-house requires facilities for instructional design, graphic design, editing and word processing.
Delivery.

As noted previously, flexible delivery encompasses flexible locations, such as colleges (multi-campus attendance), workplaces or home. It also features flexible programs using such approaches as modular curriculum design, competency based module resources, flexible entry entry and exit points, self-paced or RPL assessment procedures and provision of student support, e.g. course information, study guides, library services, tutorial support, counselling, special provision for disabled/disadvantaged students, and general student amenities.

Facility impacts. Various facility needs may result from the adoption of print based delivery such as:

- provision of space and equipment on campus (or off campus);
- provision of communications facilities such as phone, fax and voicemail;
- sharing of facilities (across institutions);
- student support needs can be serviced by access to a course information database, study guidance, library/stored resources and counselling; and
- curriculum research facilities, in house or external.

Administration.

The adoption of administrative procedures for a flexible learning environment can be expressed in the following ways:

- flexible enrolment and assessment procedures;
- financial management;
- management of materials such as storage/filing, retrieval, dispatch and receipt, and security; and
- facilities security, and authorised access.

Facility impacts. These can result in the need for facilities to accommodate student records systems; financial accounting systems; storage space, filing systems, retrieval systems, dispatch capability, handling systems and security arrangements; and security and access systems using appropriate technology and applications.

Example: Learning Resource Production Centre (hypothetical)

This example describes a hypothetical learning resource production centre for supporting learning services, particularly mixed mode, open learning and distance learning delivery methods. It would include specialised services, equipment and fittings for the needs of course development and production such as instructional design, printing, graphic design, high technology (e.g. computer aided course production, audio and video tape production and telecommunication delivery). Space and equipment would also be needed for the number of specialised staff to be accommodated for course development and production, including course coordinators, instructional designers, editors, graphic artists, computer experts. Other than general amenities such as toilets, staff rooms or delivery bays, the
learning resource production centre (Appendix C, Figure C.15) might be expected to accommodate the following areas:

- combined reception and bookshop;
- instructional design area for course production (print and electronic);
- administration areas for the manager and support staff;
- multimedia and graphics support;
- clerical support - typing, computing and administration;
- resource production and distribution - printing, dispatch and mailing;
- storage for centre needs; and
- PABX.

Facilities needed in the home

The following list covers a range of items which could be required for effective flexible learning at home. Note that other special needs required by particular courses, such as a microscope or drawing table, would need to be added to the list. It includes:

- a desk or table, and a chair (not necessarily ergonomic);
- target lighting such as a desk lamp;
- a telephone;
- television;
- a videotape player;
- an audiotape player;
- a personal computer, with the following optional items
  - modem and communications software, and
  - facsimile transmission hardware (send/receive); and
- a printer for the computer.
### Estimates of costs for various space requirements

Table 5.1 gives cost estimates for various types of facilities and associated applications.

<table>
<thead>
<tr>
<th>SPACE IMPACT</th>
<th>PROVISION</th>
<th>$ RATE</th>
<th>$ COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial areas¹</td>
<td>Administration</td>
<td>(m²)</td>
<td>1 800</td>
</tr>
<tr>
<td></td>
<td>Staff accommodation</td>
<td></td>
<td>1 500</td>
</tr>
<tr>
<td></td>
<td>Library facilities</td>
<td></td>
<td>2 500</td>
</tr>
<tr>
<td></td>
<td>Laboratories²</td>
<td></td>
<td>2 500</td>
</tr>
<tr>
<td></td>
<td>Canteen/student amenities</td>
<td></td>
<td>3 000</td>
</tr>
<tr>
<td></td>
<td>Car parking</td>
<td></td>
<td>2 500</td>
</tr>
<tr>
<td></td>
<td>Specialist areas</td>
<td></td>
<td>1 800</td>
</tr>
<tr>
<td></td>
<td>General classrooms</td>
<td></td>
<td>1 500</td>
</tr>
<tr>
<td></td>
<td>Staff and student toilets</td>
<td></td>
<td>3 000</td>
</tr>
<tr>
<td></td>
<td>On-site/internal travel</td>
<td></td>
<td>1 500</td>
</tr>
<tr>
<td></td>
<td>Covered areas</td>
<td></td>
<td>750</td>
</tr>
<tr>
<td></td>
<td>Site services</td>
<td></td>
<td>1 500</td>
</tr>
<tr>
<td>Facsimile⁴</td>
<td>Hardware</td>
<td>one item</td>
<td>$900-$5 000</td>
</tr>
<tr>
<td>Videoconferencing³</td>
<td>Hardware</td>
<td>per site</td>
<td>$120 000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$100 000-$150 000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$200 000</td>
</tr>
<tr>
<td>Room hire and transmission</td>
<td></td>
<td>per hour</td>
<td>$300-$1 200</td>
</tr>
<tr>
<td>Call charges⁶</td>
<td>Microlink/hour</td>
<td></td>
<td>$15-$43</td>
</tr>
<tr>
<td></td>
<td>Macro link/hour</td>
<td></td>
<td>$51-$150</td>
</tr>
<tr>
<td>Audio conference⁷</td>
<td>Hardware</td>
<td>one item</td>
<td>$800-$10 000</td>
</tr>
<tr>
<td></td>
<td>Subscription cost</td>
<td>per month</td>
<td>$40</td>
</tr>
<tr>
<td>Computer mediated</td>
<td>Hardware</td>
<td>one package</td>
<td>$1 000 plus⁷</td>
</tr>
<tr>
<td>communication⁹</td>
<td>Software</td>
<td>one package</td>
<td>$70-$250 plus¹¹</td>
</tr>
<tr>
<td>Computer managed learning</td>
<td>Hardware and software</td>
<td>Laboratory</td>
<td>$500 000 plus¹²</td>
</tr>
<tr>
<td>(networked)</td>
<td></td>
<td>(networked)</td>
<td></td>
</tr>
<tr>
<td>Computer assisted learning¹¹</td>
<td>Hardware</td>
<td>one package</td>
<td>$1 500 plus</td>
</tr>
<tr>
<td></td>
<td>Software</td>
<td>one package</td>
<td>$2 000-$10 000</td>
</tr>
<tr>
<td>Open learning centre¹⁴</td>
<td>Open Learning Centre (Queensland)</td>
<td>Network</td>
<td>$10 million</td>
</tr>
<tr>
<td></td>
<td>The Hastings Open Learning Access Centre (New South Wales)¹³</td>
<td>one centre</td>
<td>$77 050</td>
</tr>
<tr>
<td></td>
<td>Tea Tree Gully College (South Australia)¹⁴</td>
<td>Campus</td>
<td>$33 million</td>
</tr>
<tr>
<td></td>
<td>Joondalup College of TAFE (Western Australia)¹⁵</td>
<td>Campus</td>
<td>$10 1 million</td>
</tr>
<tr>
<td></td>
<td>Open Learning Centre, TAFE NSW¹⁶</td>
<td>Institute Library</td>
<td>$129 000 to $329 000</td>
</tr>
</tbody>
</table>
1 The spatial area costs relate to prices for a TAFE standard brick construction with a lifespan up to 40 years, and include construction and basic fit-out but not loose furniture (Properties Division, 1993).
2 Includes nursing, engineering, agricultural science.
3 Includes tiered lecture space.
4 Tkal, p. 5.
5 Sources: Tkal, p. 37; Anderson and Chodkiewicz (1992) quote Telecom process as at December 1991, p. 8; McGregor and Latchem (1991); pp. 5: 92-93 and Form 1 document, at Orange College of TAFE; in Educational Brief, Open Learning Centres, Implementation Strategy for Open Learning Centres in all TAFE NSW Institute Libraries, Planning and Evaluation Unit, TAFE NSW, 1992. Note that equipment costs for personal computers for videoconferencing are $8,000 to $10,000 each.
6 Anderson and Chodkiewicz quote Telecom prices as at December 1991, p. 9.
7 Tkal, p. 16.
8 Tkal finds television delivery costs are very service dependent, p. 43.
9 Tkal shows that there are various charges depending on user needs such as hardware, software, annual subscription, registration fees, service charges, rental charges, and so on. These costs refer to electronic mail, bulletin board and computer conferencing applications (pp. 7, 10, 14).
10 Tkal refers to a standard equipment package that involves a computer, printer, modem and cable, pp. 7, 10, 14.
11 Tkal refers to software alternatives such as (cheaper) public domain software and (costly) communications software, pp. 7, 10, 14.
12 Tkal finds the costs are variable for hardware and software installation. This cost refers to CML networked on VAX per laboratory site.
13 Tkal, p. 22.
14 Based on two periods or phases of three years. Phase 1: 1989-1991, $4 million; Phase 2: 1992-1994, $5-6 million. About 60 centres are to be established (Phase 1: 20; Phase 2: 40) with various associated costs including equipment, satellite technology and courseware development. See Horner and Reeve (1991), pp. 72-73.
16 Establishment cost reported by Goode (1992), p. 16.
17 Quote from Director of the North Metropolitan College of TAFE (Mrs Kath White) in 1992.
18 Currently 11 TAFE NSW institute libraries are being established. The upper range includes $200,000 for video conferencing equipment. The 11 centres were estimated at a cost over five years. From the Educational Brief Open Learning Centres produced in November 1992 by the Planning and Evaluation Unit, TAFE NSW.
19 Quote from Workshop Manager in 1992.
20 Horner and Reeve for operation costs only. This cost excludes such extras as site rent, fittings and furniture, desktop publishing, video conferencing, database provider (pp 84-86).
21 Planning Division (1987a) costs are highly variable, depending on the type of vehicle, fit-out, nature of the mobile unit and level of training required.
23 Coulon and Collins, p. 11.
25 Coulon and Collins, p. 10.
26 Planning, Evaluation and Research Division, TAFE NSW (1993), hire cost of TAFE NSW and owned six seater, twin engine aeroplane.

<table>
<thead>
<tr>
<th>SPACE IMPACT</th>
<th>PROVISION</th>
<th>$ RATE</th>
<th>$ COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade Workshop</td>
<td>Australian Chamber of Manufacturers (Victoria)</td>
<td>Training Centre</td>
<td>$6.5 million</td>
</tr>
<tr>
<td>Telecottage</td>
<td>Small</td>
<td>per site</td>
<td>$30,000</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td></td>
<td>$70,000</td>
</tr>
<tr>
<td></td>
<td>Large</td>
<td></td>
<td>$120,000</td>
</tr>
<tr>
<td>Mobile</td>
<td>Rail</td>
<td>Carriage</td>
<td>$50,000 plus</td>
</tr>
<tr>
<td></td>
<td>Road</td>
<td>Caravan</td>
<td>$80,000 plus</td>
</tr>
<tr>
<td></td>
<td>Road</td>
<td>Panotechnic/trailer</td>
<td>$300,000 plus</td>
</tr>
<tr>
<td></td>
<td>Road</td>
<td>Bus</td>
<td>$250,000 plus</td>
</tr>
<tr>
<td></td>
<td>Air</td>
<td>Cost per flying hour</td>
<td>$400,000 plus</td>
</tr>
</tbody>
</table>
Assigning costs to educational benefits

Introduction

Capital expenditure is sometimes analysed over a 20 year period, approximately the minimum life of a capital resource such as an educational facility. If the number and composition of student places provided by a capital project are uncertain, then a precise monetary value cannot be placed on the public benefit of the educational provision. This means that cost-benefit analysis cannot be used because the benefits cannot be expressed in monetary units. Instead, the technique of Cost Effectiveness Analysis (CEA) is used where benefits are expressed in physical units, in outcomes or outputs, such as student places. Note that the major outcome of TAFE provision is a non-traded commodity, education.

Even in cost-effectiveness analysis, there are cases when the dollar value of a known and quantifiable benefit such as 500 student places cannot be accurately judged because the value of each place depends on what courses are provided. The difficulty here is that the human capital increase as a result of training will vary from course to course.

For conventional face-to-face teaching, the precise mix of courses offered by any facility over the 20 year life of a building will be unknown, being determined by the relevant institute or college when the facility is operational. For flexible delivery, the problem of estimating outputs or outcomes is even more difficult. Moreover, the social good provided by the availability of increased TAFE provision is difficult to cost, and would vary from region to region and over time as the economic environment changes.

Flexible delivery is in the early phase of the diffusion of innovations cycle, and is likely to attract students hitherto outside the tertiary education boundary because of its potential to provide educational access for a greater number of people than conventional, face-to-face teaching.

Rather than attempt a cost-effectiveness analysis for flexible delivery, this section raises general issues relating to the costing of flexible delivery, including the need for performance indicators.

Initial and recurrent costs

Budgetary control has tended to concentrate on initial capital costs, usually unrelated to the cost of furniture and fittings, and paying little or no regard to recurrent costs. These recurrent costs, or ‘life costs’, can be represented on an annual basis. Depending on the life of the facility, these annual costs can accumulate to over half the total outlay, including initial establishment costs which are usually associated with land (if required) and the building itself.
**Example:** Total life costs of a facility categorised as initial and recurrent costs:

<table>
<thead>
<tr>
<th>Initial Costs</th>
<th>Recurrent Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• land</td>
<td>• furniture replacement</td>
</tr>
<tr>
<td>• building</td>
<td>• equipment replacement</td>
</tr>
<tr>
<td>• furniture</td>
<td>• equipment maintenance</td>
</tr>
<tr>
<td>• equipment</td>
<td>• building adaptation</td>
</tr>
<tr>
<td>• building maintenance</td>
<td>• building maintenance</td>
</tr>
<tr>
<td></td>
<td>• building</td>
</tr>
</tbody>
</table>

The cost categories above reflect conventional issues in establishing and maintaining physical facilities. Investment appraisal techniques can be used for determining an appropriate cost target for a project. This involves, at the budget setting level, the costing of options to meet the project objectives and, at the project level, an assessment of the benefits to be gained from using particular construction methods.

**The advantage of developing a cost plan**

A plan which sets out the cost target for a new building or an alteration project should be established before any design work commences. This cost target should also include main and subsidiary elements within the project as a whole. As design work proceeds, the anticipated cost of each element can be checked against its cost target and the design or specification can be adjusted. Alternatively, savings can be made on one element to cover increases on another. In this way cost control can be maintained throughout the life of the project.

For cost planning purposes it is good practice to treat as one the total money available for building work and furniture. The flexibility this bestows has been found to be of great advantage in getting the best end results, provided that only user requirements are satisfied (Clynes, 1990).

**Avenues for cost savings**

The development of an open and competitive training market is forcing traditional education centres to seek avenues for cost savings. These include:

- formation of partnerships between traditional providers and other centres of expertise which combine their respective skills and knowledge in a complementary, team-based approach;

- co-ordination of cost effective delivery strategies by using internal and external resources;

- sharing or hiring physical and human resources for defined periods of time;

- adapting existing learning materials to suit the demands of particular client groups; and
marketing educational services in order to either make a profit or to recover high developmental costs.

Costing for flexible delivery services

Generally costing strategies involve associated components of conventional capital works ('bricks and mortar') ultimately balanced against the notion of student contact hours (or some derivation such as 'effective full time students'). Some of the costing questions to address in relation to flexible delivery are listed below.

- What are the delivery costs of achieving the stated learning objectives to a quality standard which meets the clients' needs?
- How can the best use be made of existing accommodation and associated support structures?
- What opportunities exist to share costs with other providers and industry?
- What opportunities exist to recover costs, e.g. development costs, by sale of educational resource materials?
- What staffing levels are required to allow for adequate access to expert opinion or guidance?
- How can operational costs be reduced, e.g. reduction of travel and accommodation costs, through use of communications technologies such as videoconferencing or computer mediated conferencing?
- Can leased buildings and equipment be used?
- What cost recovery procedures can be implemented equitably to offset the high establishment costs of physical facilities and technologies?

The need for performance indicators

The major difficulty faced in attempts to promote or capitalise on a benefit is recognising the effectiveness of learning services. Various performance indicators can be adopted but the following questions need to be continuously asked:

- How well do the learning services meet key competency (enterprise skill) objectives?
- How flexible and adaptable are learning services in meeting client needs?
- How accessible are learning services?
- What human resource issues are influencing the delivery of learning services?
- What physical resource issues are influencing the delivery of learning services?
- How flexible and adaptable are government, industry and community standards and guidelines?
Possible Future Impacts on Facilities

Introduction

This section asks the question: What are the main changes for physical facilities likely to be during the implementation of flexible learning over the next three years? The approach taken in answering this question was to estimate how a set of flexible learning options might impact on a particular group of physical resource variables.

Estimation of trends

Trends were estimated over a three year period (1993-1996). In estimating trends it was assumed that the training market would expand as a result of the National Training Reform Agenda. The trends were based on published information, and on the results of a two-day workshop held with a panel of TAFE NSW facility planners and researchers to assess the likely impacts on physical facilities of flexible learning approaches. It is important to note that the trends are ‘best-guess’ estimates only since the adoption of flexible delivery concepts is still in the early phase of the cycle which typically occurs in the diffusion of innovations.

In Tables 6.1 and 6.2 allowance is made for four possible impacts of delivery mode on an existing physical facility or piece of equipment: low, medium, high or variable.

A low impact of change is defined as a zero to negligible influence or cost associated with capital outlays.

A medium impact of change is associated with a mild influence, perhaps in terms of minor renovation, refurbishment, reconditioning of parts or alterations to learning resources. For expenditures, minor capital costs (less than $500 000) should be expected. For learning resources, alterations might involve minor re-writes of printed materials or examination procedures.

A high impact of change recognises a strong influence, suggesting a major renovation, construction, total replacement, or alterations to learning resources. For expenditures, major capital costs (more than $500 000) should be expected. For learning resources, alterations might involve major re-writes of printed materials, examination procedures or replacement of course curricula or modules.

A variable impact of change infers that the nature of the impact cannot be easily identified without further investigation of the selected service.
TABLE 6.1 Estimated extent of impact of delivery process/location on physical resource variables

(EXTENT OF IMPACT  L = low, M = medium, H = high, V = variable)

<table>
<thead>
<tr>
<th>LEARNING PROCESS, MEDIA, LOCATION AND FACILITY TYPE</th>
<th>PHYSICAL FACILITY ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FURNITURE/EQUIPMENT</td>
</tr>
<tr>
<td>LEARNING APPROACH</td>
<td>L</td>
</tr>
<tr>
<td>Distance/Print</td>
<td>M</td>
</tr>
<tr>
<td>Self-paced</td>
<td>LM</td>
</tr>
<tr>
<td>Traditional face to face</td>
<td>M</td>
</tr>
<tr>
<td>Work-based</td>
<td>L</td>
</tr>
<tr>
<td>Action learning</td>
<td>H</td>
</tr>
<tr>
<td>Industry-wide learning</td>
<td>L</td>
</tr>
<tr>
<td>Resource based</td>
<td>M</td>
</tr>
<tr>
<td>Self managed work groups</td>
<td>M</td>
</tr>
<tr>
<td>LEARNING MEDIA</td>
<td>L</td>
</tr>
<tr>
<td>Video</td>
<td>L</td>
</tr>
<tr>
<td>Audio</td>
<td>L</td>
</tr>
<tr>
<td>Print</td>
<td>M</td>
</tr>
<tr>
<td>CML</td>
<td>M</td>
</tr>
<tr>
<td>CAL</td>
<td>M</td>
</tr>
<tr>
<td>Electronic conferencing</td>
<td>M</td>
</tr>
</tbody>
</table>
TABLE 6.1 (cont.) Estimated extent of impact of delivery process/location on physical resource variables

(EXTENT OF IMPACT L = low, M = medium, H = high, V = variable)

<table>
<thead>
<tr>
<th>LEARNING PROCESS, MEDIA, LOCATION AND FACILITY TYPE</th>
<th>PHYSICAL FACILITY ISSUES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FURNITURE/EQUIPMENT</td>
</tr>
<tr>
<td>On campus</td>
<td>V</td>
</tr>
<tr>
<td>Industry</td>
<td>L</td>
</tr>
<tr>
<td>Home</td>
<td>L</td>
</tr>
<tr>
<td>Community</td>
<td>L</td>
</tr>
<tr>
<td>FACILITY TYPE</td>
<td></td>
</tr>
<tr>
<td>Mobile unit</td>
<td>M</td>
</tr>
<tr>
<td>Learning centre (practical)</td>
<td>H</td>
</tr>
<tr>
<td>Learning centre (theory)</td>
<td>LM</td>
</tr>
<tr>
<td>Resource centre</td>
<td>LM</td>
</tr>
<tr>
<td>Support centre</td>
<td>MH</td>
</tr>
</tbody>
</table>
TABLE 6.2 Estimated Impact of Delivery Mode on Equipment

(EXTENT OF IMPACT  L = low, M = medium, H = high, V = variable)

<table>
<thead>
<tr>
<th>LEARNING APPROACH</th>
<th>NUMBER</th>
<th>AVAILABILITY</th>
<th>DEPRECIATION</th>
<th>SHELF LIFE</th>
<th>REAL</th>
<th>SIMULATED</th>
<th>LOCATION</th>
<th>STANDARD</th>
<th>USE</th>
<th>STORAGE</th>
<th>DESIGN SPACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance/print</td>
<td>L</td>
<td>L</td>
<td>M</td>
<td>M</td>
<td>-</td>
<td>-</td>
<td>ALL</td>
<td>H</td>
<td>V</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>Self-paced</td>
<td>LM</td>
<td>M</td>
<td>L</td>
<td>V</td>
<td>Y</td>
<td>Y</td>
<td>ALL</td>
<td>H</td>
<td>H</td>
<td>MH</td>
<td>LM</td>
</tr>
<tr>
<td>Traditional face to face</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>LM</td>
<td>Y</td>
<td>Y</td>
<td>ALL</td>
<td>MH</td>
<td>MH</td>
<td>MH</td>
<td>M</td>
</tr>
<tr>
<td>Work-based</td>
<td>L</td>
<td>L</td>
<td>LM</td>
<td>L</td>
<td>Y</td>
<td>N</td>
<td>I</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Action learning</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>V</td>
<td>Y</td>
<td>Y</td>
<td>ALL</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>Industry wide learning</td>
<td>L</td>
<td>L</td>
<td>LM</td>
<td>L</td>
<td>Y</td>
<td>N</td>
<td>I</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Resource based</td>
<td>M</td>
<td>H</td>
<td>H</td>
<td>LM</td>
<td>Y</td>
<td>Y</td>
<td>ALL</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>MH</td>
</tr>
<tr>
<td>Self managed work groups</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>Y</td>
<td>Y</td>
<td>ALL</td>
<td>H</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>LEARNING MEDIA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video</td>
<td>V</td>
<td>M</td>
<td>V</td>
<td>L</td>
<td>N</td>
<td>Y</td>
<td>ALL</td>
<td>MH</td>
<td>MH</td>
<td>LM</td>
<td>L</td>
</tr>
<tr>
<td>Audio</td>
<td>V</td>
<td>M</td>
<td>V</td>
<td>L</td>
<td>N</td>
<td>Y</td>
<td>ALL</td>
<td>MH</td>
<td>MH</td>
<td>LM</td>
<td>L</td>
</tr>
<tr>
<td>Print</td>
<td>L</td>
<td>L</td>
<td>M</td>
<td>M</td>
<td>-</td>
<td>-</td>
<td>ALL</td>
<td>H</td>
<td>V</td>
<td>H</td>
<td>M</td>
</tr>
<tr>
<td>CML</td>
<td>M</td>
<td>H</td>
<td>MH</td>
<td>M</td>
<td>N</td>
<td>N</td>
<td>ALL</td>
<td>M</td>
<td>H</td>
<td>V</td>
<td>M</td>
</tr>
<tr>
<td>CAL</td>
<td>M</td>
<td>H</td>
<td>MH</td>
<td>M</td>
<td>N</td>
<td>Y</td>
<td>ALL</td>
<td>M</td>
<td>H</td>
<td>V</td>
<td>M</td>
</tr>
<tr>
<td>Electronic conferencing</td>
<td>LM</td>
<td>H</td>
<td>MH</td>
<td>MH</td>
<td>N</td>
<td>Y</td>
<td>ALL</td>
<td>H</td>
<td>MH</td>
<td>L</td>
<td>M</td>
</tr>
</tbody>
</table>
TABLE 6.2 (Cont.) Estimated Impact of Delivery Mode on Equipment

(EXTENT OF IMPACT \( L = \) low, \( M = \) medium, \( H = \) high, \( V = \) variable)

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>LEARNING PROCESS, MEDIA, LOCATION AND FACILITY TYPE</th>
<th>NUMBER</th>
<th>AVAILABILITY</th>
<th>DEPRECIATION</th>
<th>SHELF LIFE</th>
<th>REAL(^1)</th>
<th>SIMULATED(^2)</th>
<th>LOCATION(^3)</th>
<th>STANDARD</th>
<th>USE</th>
<th>STORAGE</th>
<th>DESIGN SPACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>On campus</td>
<td></td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
<td>V</td>
</tr>
<tr>
<td>Industry</td>
<td></td>
<td>L</td>
<td>L</td>
<td>LM</td>
<td>L</td>
<td>Y</td>
<td>N</td>
<td>I</td>
<td>H</td>
<td>H</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Home</td>
<td></td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>-</td>
<td>Y</td>
<td>OFF</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Community</td>
<td></td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>-</td>
<td>Y</td>
<td>OFF</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FACILITY TYPE</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobiles</td>
<td></td>
<td>L</td>
<td>L</td>
<td>M</td>
<td>M</td>
<td>Y</td>
<td>Y</td>
<td>MOB</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Learning centre (practical)</td>
<td></td>
<td>MH</td>
<td>H</td>
<td>MH</td>
<td>V</td>
<td>-</td>
<td>-</td>
<td>ALL</td>
<td>H</td>
<td>H</td>
<td>MH</td>
<td>M</td>
</tr>
<tr>
<td>Learning centre (training)</td>
<td></td>
<td>LM</td>
<td>H</td>
<td>V</td>
<td>V</td>
<td>-</td>
<td>-</td>
<td>ALL</td>
<td>H</td>
<td>H</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Resource centre</td>
<td></td>
<td>M</td>
<td>H</td>
<td>LM</td>
<td>LM</td>
<td>Y</td>
<td>Y</td>
<td>ALL</td>
<td>M</td>
<td>V</td>
<td>MH</td>
<td>M</td>
</tr>
<tr>
<td>Support centre</td>
<td></td>
<td>MH</td>
<td>MH</td>
<td>MH</td>
<td>M</td>
<td>Y</td>
<td>Y</td>
<td>ALL</td>
<td>H</td>
<td>V</td>
<td>H</td>
<td>M</td>
</tr>
</tbody>
</table>

\(^1\) Real/Simulated: Y:yes; N:no, for the provision of industry standard equipment.
\(^2\) Location: I:industry, ON:on campus, OFF:off campus, MOB:mobile, ALL: all locations.
The variability of recurrent costs

Recurrent funding is considered too variable to estimate, but needs to be accounted for during the costing procedure of a specific learning service. Table 6.3 provides some estimates for the types of costs that could be expected, including equipment, curriculum and staff development. Cost recovery is defined by the costs incurred directly by the client as a consumer of the learning service.

Table 6.3 Estimates for types of costs which could be expected

<table>
<thead>
<tr>
<th>ITEM</th>
<th>COMMENTS</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACCOMMODATION COST</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rental</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small high quality</td>
<td>per m² per annum</td>
<td>$300</td>
</tr>
<tr>
<td>(Less than 300 m²)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td>per m² per annum</td>
<td>$100</td>
</tr>
<tr>
<td>(Greater than 300 m²)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specialised</td>
<td>per m²</td>
<td></td>
</tr>
<tr>
<td>fit out</td>
<td>e.g. computer training room</td>
<td>$2 000</td>
</tr>
<tr>
<td>furniture &amp; equipment</td>
<td>loose installations</td>
<td>$1 000 to $5 000</td>
</tr>
<tr>
<td>running costs</td>
<td>e.g. security, rates, outgoings</td>
<td>$50 to $100</td>
</tr>
<tr>
<td>General Purpose</td>
<td>per m²</td>
<td></td>
</tr>
<tr>
<td>fit out</td>
<td>e.g. office</td>
<td>$500</td>
</tr>
<tr>
<td>furniture &amp; equipment</td>
<td>loose installations</td>
<td>$500 to $700</td>
</tr>
<tr>
<td>running costs</td>
<td>e.g., security, rates, outgoings</td>
<td>$50 to $100</td>
</tr>
<tr>
<td><strong>ACTIVITY COST</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumables</td>
<td>per student</td>
<td>$0.63 to $5</td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer</td>
<td>per package</td>
<td>$900 to $2 500</td>
</tr>
<tr>
<td>A/V equipment</td>
<td>one item</td>
<td>$700 to $2 000</td>
</tr>
<tr>
<td>Videoconferencing</td>
<td>per package</td>
<td>$8 000 to $10 000</td>
</tr>
<tr>
<td>Curriculum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Writing</td>
<td>development, contract for 200 hours</td>
<td>$8 500</td>
</tr>
<tr>
<td>Educational resources</td>
<td>development</td>
<td>$150 000 to $200 000</td>
</tr>
<tr>
<td>Management system</td>
<td>leased</td>
<td>$3 000 per year</td>
</tr>
<tr>
<td>Administration</td>
<td>one day release for teacher per week</td>
<td>$17 to $26</td>
</tr>
<tr>
<td>Staff Development</td>
<td>course or workshop</td>
<td>$130 to $500 plus per day</td>
</tr>
<tr>
<td><strong>COST RECOVERY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Client Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fee for service</td>
<td>one semester course</td>
<td>$100 to $1 200 plus per year</td>
</tr>
<tr>
<td>Equipment and supplies</td>
<td>one semester course</td>
<td>$100 to $500</td>
</tr>
</tbody>
</table>
Summary and Conclusion

The characteristics of flexible learning

- This study set out to examine the impacts of flexible learning on physical facilities. Flexible learning strategies identified during the course of this study possess the following characteristics.

- They are client-driven, rather than teacher-driven strategies for learning delivery, that is, they place less emphasis on teacher-centred instruction.

- They aim to empower people to be life-long learners; to develop a 'self-learning competency'(Nyhan, 1991) and, as a result, to become better managers of their own learning.

- Their major thrust is to open up access to learning by increasing the frequency and the quality of learning opportunities in workplaces, communities, campuses, and homes. They will achieve this through the development of learning programs which:

  - recognise prior learning,
  - cater for differences in students’ learning styles,
  - increase student choice of course content and times and places where learning can occur, and
  - provide flexible entry and exit points and flexible forms of assessment.

- They will allow a much closer fit to be achieved between industry training needs and vocational education and training provision by:

  - encouraging a far greater range of co-operative ventures between industry and educational providers with respect to development and delivery of learning, including joint use of training facilities,
  - allowing the student to study independently of place and time using a variety of learning approaches such as competency based learning, discovery learning, problem-based learning, self-directed learning, group and/or team learning, resource-based learning, self-paced learning, mixed mode learning (meaning mixed face-to-face and distance mode), integrated theory and practical learning, and integrated on-job and off-job learning, and
  - drawing upon the full range of available delivery technologies, including print, audio-visual resources, computers to deliver and manage learning, and electronic means of linking students, teachers and learning resources, including library databases.
They are strategies which teachers will use to change the nature of learning materials, for example to support individualised instruction.

They are strategies which will shift the role of teachers towards being facilitators of learning and managers of the process of opening-up access to learning.

In opening up access to learning materials, facilities and educational experiences, flexible delivery strategies will shift some of the costs of learning onto students, making them more discerning customers who will demand value for money more.

Conclusions

The two major conclusions of the study are: firstly flexible learning will have significant impacts on the management of physical facilities used for education and training; secondly the impact on the design of those facilities will be less. The latter conclusion is the result of the general trend of designing educational facilities for flexible use since the 1980s. For those instances where flexibility of use was difficult, or too costly, to achieve, the design solution was to build special purpose facilities. The trend towards making facilities flexible and adaptable has continued to the present time and includes the adoption of building designs where the building shell and the deployment of building services promote flexible use of internal spaces. A number of facilities were also developed particularly for flexible learning, and there was an increase in the number of community-based open learning access centres.

In parallel with these developments in the use of physical facilities, considerable advances have been in the last decade in the introduction of modular course designs and delivery approaches which allow greater control over the choice of times and places of learning. An important factor here has been the increased use of various communications technologies to break away from traditional teacher-led forms of instruction, and to break the barriers of geographic isolation.

A number of other important themes emerged from the study.

A more diverse range of clients, acquiring skills through open access to learning

Educational institutions will be required to cater for a wider age range of clients and respond to the multi-skilling and re-training requirements of award restructuring, as well as catering for conventional, face-to-face teaching. Skill standards will increasingly be set by national industry bodies and there will be an increasing focus on quality training to help firms reach international best-practice standards.

The trend towards opening-up access to learning opportunities will mean fewer age cohorts marching through educational institutions in lock-step formation. Face-to-face contact with students, in many cases, will be brief and to the point, perhaps addressing learning issues or how students will navigate through self-paced, modular programs, rather than holding them in classrooms for extended periods.

Catering for individual learning styles will require educational materials which
give users greater flexibility in accessing learning. A range of new ways of accessing learning already exists, e.g. accessing computers by voice or pen-stylus and textbooks which are in electronic and multi-media form. These may be on a CD-ROM disc which contains text and graphics, is displayed and manipulated by a personal computer and can be printed on an inexpensive dot-matrix printer.

Communications technologies can be used to form electronic classrooms which do not have a single physical location but provide access to digitised text, graphics and video to members of a networked educational community. There is great scope for greater use of communications technology to open up access to knowledge for learners and therefore to increase the amount of student-teacher interaction using telephone, facsimile, and audio, video and computer mediated conferencing.

Novel ways of handling teaching and learning problems will continue to be developed, such as virtual reality which exists now. Others are yet to be invented. The changes taking place in flexible learning make it important to continue to design flexible facilities, as well as to continue experiments with the best ways of blending physical facilities to allow innovation in flexible delivery.

Educational facilities will now be required to permit physical after-hours access to parts of buildings, to particular equipment, such as computers, and to educational resource materials, such as educational materials stored on CD-ROM discs or the like. Electronic access will also be needed from homes or workplaces, including telephone access to message equipment and computer access via modem to electronic information systems. Note that this type of access will also need to be provided outside normal working hours, e.g. late at night when shift-work ends. Strategies for improving access must take account of the need to secure valuable property and equipment without choking off access.

**Strategies for improving access**

The following strategies for opening up access can be adopted alone or in combination.

- Classrooms can be extended by use of communications technology e.g. audio conferencing, videoconferencing and computer mediated conferencing. However, it is not easy to extend practical workshops by such means.

- Classrooms can be changed from single to multi-purpose use.

- The demand for fixed facilities - classrooms, workshops, and libraries - can be reduced by
  - improving the utilisation of existing facilities which are committed to conventional face-to-face teaching so as to free up space for flexible learning, and by improving room scheduling procedures,
  - providing learning resources designed to be used off-campus, or in work-place settings, or instituting mechanisms to increase access to learning materials held at various locations,
  - increasing the variety of channels for the distribution of learning materials, e.g., television and radio broadcasts, and the use of fibre-optics links,
providing remote access to libraries and other databases, from homes, workplaces, or local community centres or telecottages, using appropriate communications technology.

- distributing all the learning resources needed for a particular module or course on accessible storage media such as CD-ROM for use in learning centres in industry or the local community, and

- keeping facilities open longer.

- The number of joint-use equipment ventures can be increased, where equipment in industry is shared for the purposes of conducting training programs. The number of joint-use facility ventures can also be increased, such as the co-operative arrangements which have been established between TAFE, the school education sector, industry and the universities.

- The amount and quality of vocational education research can be increased to enable better educational planning and the elimination of obsolete or irrelevant training which wastes resources. This should include the provision of improved planning support for industry training advisory bodies.

- Barriers to accessing learning such as fixed enrolment periods and lack of child care facilities, can be removed. Provision of assistance to students to acquire (buy, hire, or loan) the computers and communications technology they need for participation in certain courses would also remove barriers.

*The influence of flexible learning on the management of educational institutions*

The study has highlighted the importance of managing flexible delivery as a process which contains a number of key aspects. In adopting flexible learning, the management of educational institutions will need to be based on a culture which fosters innovation in the delivery of client-centred education and training. Improved strategic planning processes will be required if educational institutions are to remain closely attuned to the needs of the industries and primary sectors they serve.

Central to the strategic planning process for educational facilities is the need to ask what alternatives there are to a physical facility solution to a learning delivery need? Can use be made of joint venture partnerships or facility sharing arrangements with other providers or industry? Can learning centres in local communities be used which can incorporate information technology to create educational bridges between students and learning resources? The options of modifying existing buildings, leasing buildings, or using a facility designed for multi-use must also be considered.

It is essential for educational providers to plan for flexibility and adaptability of facilities, keeping a close watch on developments relating to the National Training Reform Agenda. These will include the setting of national priorities for vocational education and training and the development of state training profiles. Particularly important will be the conduct of research and evaluative studies to provide the data for industry and educational providers to improve the planning and policy formulation process.
A multiplicity of teaching methods can be adopted to meet learning needs. This, together with the increased use of multi-disciplinary teams and the need to encourage sharing of facilities across teaching disciplines, will require management to find a fair and equitable way to handle timetabling issues and to be sensitive to changes in work practices and associated industrial relations issues. The relationship between support staff and teaching staff will change as flexible learning is progressively implemented. Support staff are especially important for providing back-up support when multi-use classrooms and workshops are used.

The question of consolidation of core management services under one management umbrella will need to be addressed. For example, it may be advisable to retain a core of expertise in learning material development, even if it is contracted out resource development. This is to provide the knowledge necessary to maintain quality and to keep costs down.

Educational institutions will require comprehensive plans to enhance communications between staff. This will be important because of:

- the increased sharing of spaces and rooms within a particular facility by different teaching disciplines;
- the increase expected in the number of co-operative arrangements, including facility sharing and joint venture arrangements with other educational providers and industry; and
- the increased need to share expertise among teachers and professional support staff at local delivery sites and throughout the network of providers. This network will become increasingly state-wide and national in its membership, and international in respect of quality standards to be achieved for export competitiveness of Australian made products.

In flexible learning, the teachers’ role is expected to change to that of a resource person or facilitator of learning, with the duties of monitoring, encouraging, guiding and helping learners, as well as providing subject expertise for learning resource material design and development. Investment in staff training will be a continuing need, particularly to increase teachers’ skills in instructional design and in the use of communications technologies and computers. Training and induction programs will also need to cover:

- the operation of the facility, such as the multi-use of rooms/spaces for group and team teaching, and integrated theory and practical teaching;
- training to complement the enhanced roles of non-teaching support staff, including specialist staff such as counsellors, class support technicians, telecommunications technicians;
- training in the safe use of the facility (changes in space use may affect emergency exit routes);
- training in the operation of security devices which are necessary to allow after-hours access to certain rooms, equipment and resources; and
- training in the use of equipment for the development of learning materials.
The central management issues appear to be as follows.

- The need to monitor developments in information technology. Developments in the field of information technology are already changing the way that learners access learning materials, databases and teachers. These new developments include the use of a national television network for the distribution of learning materials to homes or workplaces. Developments in opening up electronic access to learning materials will become more attractive if equipment and telecommunications costs continue to fall. Managers of educational institutions will need to monitor developments in this area continually to ascertain what repercussions these might have for the use and/or future adaptation of educational facilities, since these developments will alter the pattern of demand for, and usage of, facilities.

  Educational planners will find that the use of industry-based and community-based learning centres, including telecottages, will become increasingly attractive in the delivery of client-centred learning, especially when these centres are linked to sources of expertise (teachers/tutors), information (databases), and distribution of learning materials. For example, learning materials could be downloaded to local sites or computers for use in a learning program.

- The need for educational staff to be more flexible. Flexible delivery redefines the organisation and function of educational staff. The shift from teacher-centred to client-centred learning will require versatility among staff who specialise in flexible learning. Physical facilities will need to accommodate these changes for teachers and support staff.

- The need for instructional design teams with broad skills. To design educationally sound, cost-effective programs for flexible learning, the staff working in instructional design teams will need to know how each delivery mode and medium will impact on course design and physical facilities. They will also have to understand the cost factors involved in blending various modes and media before they can decide on the final mix for a flexible learning program.

- The need for staff development programs. Where a facility is substantially taken up the delivery of flexible learning, the users of that facility, staff and students, will have to acquire the additional skills necessary to use the facility effectively, efficiently and safely. Indeed, staff development and student orientation programs will have a major influence on whether flexible learning strategies are to be successfully implemented. Staff development programs will need to be directed at changing organisational culture as well as developing staff skills in instructional design, group and team learning, individualised learning, and the use of information technologies to communicate with students, especially the use of computer mediated learning and audio and videoconferencing.

- The need for easily adaptable facilities. Flexible delivery requires that educational facilities be easy to adapt to meet the changing needs of clients and of different learning methodologies, including group, team, and individualised learning. This means that facility design should be kept relatively simple which in turn will require careful placement of building
services. Building designs need to enable changes or upgrading to take place with minimal disruption to users. Buildings should be welcoming, friendly, safe, and place all necessary services in close proximity.

**Future research**

Some issues for further research are listed below.

- What is the best way to manage space allocation for flexible learning?
- What spatial layouts are best suited to group and team learning?
- How will the increased use of information technology in flexible learning impact on the design and use of physical facilities?
- What will instructional designers need to know about the relationship between course design and physical facilities?
- What types of co-ordination strategies and procedures are being implemented for physical facilities and resources associated with flexible learning delivery?
- What are the best ways to organise facilities for the production of cost effective learning materials?
- What are the 'best practice' models for facility management for flexible learning?


Chapman, G, and Holmes, A. (1990). The Implications of Competency-Based Learning for Facilities Design in NSW TAFE. Surveys and Evaluative Studies Division. NSW Department of TAFE.


Distance Education Centre (1992). Directory of Tertiary External Courses in Australia 1993. The University of New England, NSW.

Dovey, S. (1990). Evaluation of Computer Managed Learning Centre (CML) Facilities at Hamilton College of TAFE. Surveys and Evaluative Studies Division, NSW TAFE.


TAFE Courses. Northern Metropolitan College of TAFE, Carine, WA.


Planning Division (1987b). Report of the Workshop Flexible/Multi-Use in TAFE Colleges. NSW Department of TAFE.


<table>
<thead>
<tr>
<th>Location</th>
<th>Institution/Program</th>
<th>Contact Person(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW</td>
<td>University Centre (Consortium: UNE, Charles Sturt and Wollongong Universities)</td>
<td>Ray Hand</td>
</tr>
<tr>
<td>NSW</td>
<td>UNE, Northern Rivers</td>
<td>Lyn Greenop</td>
</tr>
<tr>
<td>NSW</td>
<td>UNE-NR, Port Macquarie</td>
<td>Elise Young</td>
</tr>
<tr>
<td>NSW</td>
<td>Computer and Information Services</td>
<td>Beth Hansen</td>
</tr>
<tr>
<td>NSW</td>
<td>Industry Training Division</td>
<td>Helen Corber</td>
</tr>
<tr>
<td>NSW</td>
<td>TAFE NSW</td>
<td>Barry Wilken</td>
</tr>
<tr>
<td>NSW</td>
<td>Open Training and Education Network (OTEN)</td>
<td>Sue Cullen</td>
</tr>
<tr>
<td>NSW</td>
<td>NSW UNE-NR. Port Macquarie</td>
<td>Mavis Barnes</td>
</tr>
<tr>
<td>NSW</td>
<td>NSW UNE. Northern Rivers Videoconferencing (UNELINK)</td>
<td>Peter Baldwin</td>
</tr>
<tr>
<td>NSW</td>
<td>Learning Centre of the Future</td>
<td>Graeme Dobbs</td>
</tr>
<tr>
<td>WA</td>
<td>Edith Cowan University (Joondalup)</td>
<td>Les Wilson</td>
</tr>
<tr>
<td>WA</td>
<td>North Metropolitan College of TAFE (Joondalup)</td>
<td>Wayne Muller</td>
</tr>
<tr>
<td>WA</td>
<td>Balga TAFE</td>
<td>Tom Goode</td>
</tr>
<tr>
<td>WA</td>
<td>Murdoch University/TAFE i.e. WESTLINK, Telecommunications and telematics centres</td>
<td>Gay Short</td>
</tr>
<tr>
<td>WA</td>
<td>WA Distance Education Centre</td>
<td>John Morriss</td>
</tr>
<tr>
<td>WA</td>
<td>State Information Technology and WESTLINK</td>
<td></td>
</tr>
<tr>
<td>WA</td>
<td>TAFE External Studies</td>
<td></td>
</tr>
<tr>
<td>VIC</td>
<td>RMIT</td>
<td>John Young</td>
</tr>
<tr>
<td>VIC</td>
<td>Richmond TAFE</td>
<td>David Robinson</td>
</tr>
<tr>
<td>VIC</td>
<td>Australian Chamber of Manufactures Training Centre</td>
<td>Fritz Rappold</td>
</tr>
<tr>
<td>VIC</td>
<td>Holmsen College of TAFE (Chadstone)</td>
<td>‘Weekend College’ program</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>VIC</td>
<td>Frankston TAFE College</td>
<td>Training/Learning Material Delivery (eg BHP, NISSAN, GMH)</td>
</tr>
<tr>
<td>VIC</td>
<td>Frankston TAFE College</td>
<td>Computer Aided Learning</td>
</tr>
<tr>
<td>VIC</td>
<td>Frankston TAFE College</td>
<td>Teleconferencing, NEC’s voicepoint</td>
</tr>
<tr>
<td>VIC</td>
<td>Western Metropolitan College of TAFE (Footscray)</td>
<td>Joint Ventures with CAL Centre (Victoria University of Technology)</td>
</tr>
<tr>
<td>VIC</td>
<td>TAFE Off-Campus Coordinating Authority (Victoria TAFE Off-Campus Network)</td>
<td>Flex. Learning Materials</td>
</tr>
<tr>
<td>SA</td>
<td>Australian Education Council</td>
<td>Setting-up Open Learning Technology Corporation; six previous consultancies discussed</td>
</tr>
<tr>
<td>SA</td>
<td>Tea Tree Gully College of TAFE</td>
<td>Learning material production</td>
</tr>
<tr>
<td>SA</td>
<td>GMH Training Facility</td>
<td>Rec Vehicle Delivery certificate</td>
</tr>
<tr>
<td>SA</td>
<td>Adelaide College of TAFE</td>
<td>Centre of Applied Learning Systems (CALS) Learning Material Production</td>
</tr>
<tr>
<td>QLD</td>
<td>University of Southern QLD</td>
<td>Distance Education Centre</td>
</tr>
<tr>
<td>QLD</td>
<td>Cunningham Centre</td>
<td>Rural Health Worker Training Programs (Doctors/Nurses)</td>
</tr>
<tr>
<td>QLD</td>
<td>TAFE (Toowomba)</td>
<td>General Joint Venture Programs</td>
</tr>
<tr>
<td>QLD</td>
<td>University of QLD (Gatton)</td>
<td>External Studies</td>
</tr>
<tr>
<td>QLD</td>
<td>Open Learning Centre (Network)</td>
<td>Establishment/Management/Coordination of OLC</td>
</tr>
<tr>
<td>QLD</td>
<td>External Studies (QLT)</td>
<td>Print based delivery</td>
</tr>
<tr>
<td>QLD</td>
<td>Australian Flying Arts School</td>
<td>Skills delivery via plane and car</td>
</tr>
<tr>
<td>QLD</td>
<td>Study Centre (USQ)</td>
<td>Student support-service 24hr Access Centre</td>
</tr>
<tr>
<td>QLD</td>
<td>QLD Distance Education College (QDEC)</td>
<td>Distance education/print based delivery Use of developer (Teacher ID) and imported learning materials Audio video support Teleconferencing</td>
</tr>
<tr>
<td>QLD</td>
<td>Open Training and Education Centre (OTEC of QDEC)</td>
<td>Program Delivery/Joint Venture Projects</td>
</tr>
</tbody>
</table>
Appendix B: Making facilities flexible

This appendix provides views from the literature on how to make facilities flexible.

The importance of planning

A major factor affecting the flexible use of major facilities is the lengthy construction time. Since the 1980s there has been increased awareness of the importance of designing buildings for flexibility of use, including the notion of ‘close-fit and loose-fit design concepts’ (Shabha, 1993). Close-fit designs presuppose that the more precise the specification of the users’ requirements, the ‘nearer to perfection will be the architectural outcome’ (Shabha, 1993, p. 89). Designing a loose-fit school building will increase the likelihood that the problem of change (both predictable and unforeseeable) can be resolved more effectively without the need for rebuilding (Shabha, 1993, p. 90). Paralleling these developments, the strategic planning of capital works programs for educational institutions has shifted to an emphasis on design of facilities for flexibility of use with minimal disruption and cost (Porter and Kravinskis, 1992).

Goode noted in a report on capital investment for alternative delivery strategies in TAFE, that the planning process for capital works used by most Australian states comprises three phases:

PHASE 1: Strategic planning which uses demographic information and other inputs from colleges and communities to establish a long term (five year) plan of the facilities.

PHASE 2: Development of a concept proposal which provides the justification for the project and an initial estimate of the cost. Associated with this is the development of architects’ briefs for the new facilities, and a profile of the course(s) to be offered.

PHASE 3: Approval of the concept proposal signals the final phase, building, planning and construction, and includes issues such as just-in-time staffing appointments.

Design strategies for new buildings

The concepts: flexibility and adaptability

When considering the ability of a building, or part of one, to be responsive to changing requirements, two terms have been used, flexibility and adaptability. These are defined below (Clynes, 1990):

- Adaptability refers to that quality of a building which facilitates adaptation. This, in turn, may require relocation, replacement, removal or addition of the elements, the services, or the finishes of the building. Adaptability essentially
refers to a large magnitude/low frequency change involving different degrees of alteration to the building and its fittings to give an arrangement which meets the specific needs of current use.

* Flexibility refers to that quality of a building which permits variations in activities, class size, and methods of work without the need for adaptation. Flexibility is essentially low magnitude/high frequency change, broadly predicted the design stage that involved a common denominator of likely requirements or utilisation trends.

**Views on the design of building structures**

The flexibility and adaptability of structures intended for educational purposes are following the fashion of various themes such as aesthetic design, engineering principles, planning stereotypes or specialised course delivery. Flexible delivery demands some level of spatial versatility, and one method of achieving this end is flexible and adaptable structural design (Clynes, 1990).

The following points, based on Wilks (1992), summarise some current thinking about design of building structures:

* Structures should permit as much internal reorganisation as can reasonably be achieved. Research into flexible building structures, such as removable partition walls, needs to be assessed for cost effective implementation.

* Structural materials should offer little resistance (i.e., be transparent) to internal and external telecommunication signals such as radio and other electromagnetic signals.

* Main services provided should include access to telecommunications throughout the structure, as well as (for example) power, lighting, gas, water and data networks. Power cabling should be adequately insulated from data and telecommunications cables. Access to all services should be possible from all spaces.

* All services provided within a structure should be capable of computerised control, where appropriate, in order to achieve optimum environmental standards and economy of operation. Smart buildings will be the norm.

* Small buildings, or small units within larger structures are to be preferred on grounds of flexibility of use.

* The design concept for educational buildings, even those seen specifically as schools, should allow for use by adults as well as children.

**Changes in the contents of a building**

The inclusion of fittings, furniture, equipment and decoration must enhance the overall building design. The interior presentation will need to convey the impression that the learning process they are involved with is 'theirs'.

The following points, based on Wilks (1992) summarise some changes taking place in the contents of buildings.
• Noise reduction procedures and design will be important within learning spaces and in common parts if a large proportion of clients are working as individuals or in small groups, as more movement throughout the day would be expected.

• A more open building in terms of time, age range and purpose will need reception areas to be more welcoming, and more space for administrative procedures, including clocking-in and clocking-out facilities or smartcard readers. An electronic notice-board updated by computer will be required to give information such as learning space availability, and perhaps linked to a learning-program or work-station booking procedure.

• If large, open-plan spaces are used for individual or small-group learning from computers, television, radio or telecommunications equipment, appropriate and effective psychological and acoustic screening will be required to avoid sound pollution across the whole space. Part of the acoustic problem could be solved by the use of portable tape recorders with light-weight headsets such as ‘walkmans’.

• Space should be provided for socialisation. Whether the building, or the unit within a building, is large or small, the trend away from whole-class teaching will lead to a shifting group structure. Carefully planned spaces and times will be needed to allow for that peer-group socialisation which is an important element in the educational process.

• Space and technical support will be needed for the different types of staff who will be working in the building. The space provision and location will be dependent on the individual project, and whether the support can be networked to other buildings or centres. In information technology terms, physical distance does not prevent immediate access or personal interaction.

- Teachers will not only be engaged in the process of instruction. They will need areas in which to prepare their work, to carry out the administrative procedures related to it and to produce or amend learning materials. Much will depend on decisions about central, regional or local production of materials, but ultimately the provider will need at least to be able to amend, or compile materials from outside sources to suit the needs of its students. This space will need adequate technological provision.

- Librarians and other information staff need similar provision.

- Technical support staff will need adequately equipped workshops both for routine maintenance and for modification of equipment to keep pace with technological changes.

- Administrative staff, including those in reception or other customer service work, will also need appropriately equipped space.

• Broader building utilisation, e.g. by the community or by children of widely differing ages, means that attention will need to be paid not only to the provision of furniture and decoration appropriate for different age groups, but also to the security of the work of different groups of students. For example, multi-use buildings may require generous storage.
provision to protect work projects, equipment and furniture between appointed uses.

The incorporation of communications technology in buildings

The implications of new technologies are difficult to predict in terms of associated preferences and design implementation. The revolution in electronic technology such as computers and communications, and the possible applications, can appear bewildering at times. However, proper evaluation of these technologies should ensure that current and future technological developments will enhance the flexibility of learning delivery.

The follow points emphasise some trends for technology.

- The footprint or desk space occupied by computer equipment will be smaller than it is today, particularly in relation to visual display units such as flat screen display devices, when voice recognition methods replace keyboards.

- Power services to reach a piece of equipment may be unnecessary if power storage facilities, such as rechargeable batteries, become lighter and more efficient. If this occurs, provision for recharging of batteries will be needed.

- Cable management is likely to become less of a problem within a particular learning space than it is today. This is because the ability to receive data from short-distance radio transmissions will permit unwired network connections. As the provision for wireless connections develops, there will be less need for network cabling within learning spaces. However, it will still be necessary for network cabling between learning spaces and throughout the building.

- Access to telecommunications systems from all learning spaces will be needed. However, it will depend greatly on the direction of development and the decisions taken for telecommunications policy. For example, developing cordless and microcellular radio telephones, and related development of suitable computer interface cards will make it possible to reduce the number of hard-wired telephone points in a learning environment for accessing electronic services, e.g. from microcomputers, fax or portable telephones.

- Access to broadband cable, related either to satellite broadcasting or to city-wide cable networks, must be hardwired. The positioning of the interface point (input/output) needs careful consideration during the design stage of a new or adapted building, particularly if equipment is to be attached to the system at various times and places to service different people.

- Health and safety matters will need constant attention as use of information technology increases. Issues such as lighting and heating, exposure to electromagnetic radiation, postural problems related to inappropriateness of seating and other furniture can all be dealt with by reference to experience in industrial and commercial circumstances. However, multi-use facilities, where a range of age groupings are serviced, will need careful attention to health and safety factors.

- Security systems will involve electronic surveillance systems such as security registered places for equipment, perhaps doing away with chains and window grills. In certain cases, a more frequently accessed facility may tend to reduce opportunities for break-in and theft.
Fully Adaptable Accommodation

The design approach for fully adaptable accommodation, according to Clynes, should distinguish between:

- the basic parts of a building which can be designed to be suitable for a range of broad uses and therefore need not change; and

- the supplementary parts which may vary depending on the needs of different activities; they should therefore be designed to be changeable.

Generally, the strategy is to design a flexible basic building 'shell' which will meet those requirements common to all potential users. This is then planned and fitted out in individual areas with adaptable elements to meet the needs of particular user groups. These adaptable elements can be relocated in the future as teaching and learning programs develop, and demand for the disposition and layout of spaces changes.

When designing for adaptability a regular module should be used as a planning discipline so that elements can be properly co-ordinated. Fixed elements will include the structural frame and floors, vertical circulation and fire compartment walls. Services which are used continuously should be distributed from a centralised source. These will include power, water, natural gas and drainage.

The adaptable elements need to be integrated with each other. Partitions which may later be moved should not have services or other items fixed to them or run within them. Furniture should be free-standing, although items can be locked to each other for stability. Service connections to furniture should not inhibit its mobility.

Less Comprehensive Adaptability

For less comprehensive adaptability where the density of servicing and specialised spaces will be lower, the following design principles should be followed:

- have small planning modules;

- use a structural frame rather than load-bearing walls;

- partition walls, whether demountable or not, should be non load-bearing and kept free of services and other fixtures;

- clear, direct routes for main services supply should be provided so that changes or additions can be made with least disruption to the use of the building:

- floor levels should be as continuous as possible;

- windows should be dimensioned and placed to allow rooms to be enlarged or reduced in size; and

- furniture and fittings should be free-standing and movable, not built-in.
Design strategies for improving the flexibility of existing buildings

The degree of improvement possible in any one instance will depend on such factors as:

- the structure and configuration of the building;
- the money and time available for the improvement work;
- the extent to which parts of the building can be free for the improvement work to be carried out; and
- the attitude of those using the building.

Any project represents a balance between time, cost and quality, and a close working relationship between the briefing, design and contracting team. The easiest and most cost-effective arrangement is for all the required work to be done as a single project. However, this is not often possible, either because the building or area in question cannot be vacated for the duration of the project, or because sufficient funding is not available for the scale of project involved. More commonly small modifications are made from time to time as money becomes available, too often with little regard to whether such action will improve or inhibit the flexibility or adaptability of the building as a whole (Clynes).

A long-term design strategy to which each later minor works project will contribute should establish priorities for improvement such as:

- Rationalising the zoning of activities and disposition of spaces. This can increase flexibility and offer more opportunities for the sharing of facilities. It may also be used for environmental reasons, such as the separation of quiet and noisy activities.
- Setting down main design criteria, such as what key planning dimensions are to be adhered to and how services are to be dealt with.
- Setting out in broad terms the types of components, fittings and finishes to be used.

The broad strategy should be flexible in concept, and not seen as a fixed master plan that must be carried through in detail come what may. That is, the strategy should establish main guidelines, but be capable of adjustment if circumstances and requirements change appreciably in the future. However, such adjustments should be made only after careful consideration of the consequences.

For free-standing facilities, leave the existing structure of the building as untouched as possible and provide some form of independent light structure within it. To this can be fixed service runs and a range of clip on fittings. For instance, prefabricated components can be assembled within a space to create a series of fully serviced work stations against which moveable work stations/benches are placed. Sections of overhead trunking are bolted together, linking all work stations back to a control unit which is the only part of the system that connects to the fixed services supplies and drainage of the building (Clynes).
Making buildings adaptable and flexible for educational delivery

For greatest flexibility, the design must align with a common denominator of likely requirements not only in terms of room sizes, but also in respect of floor loadings, clear spans, room heights and servicing provision. For adaptability, the changes are met by different degrees of alteration to the building and its fittings to give an arrangement which meets the specific needs of current use. At the simplest level this may mean that room layouts need to be changed. At the other extreme, spaces may change their size and function, involving the removal or addition of partitions, additions to or re-routing of services, or the incorporation of new equipment (Clynes).

Factors to be considered in making educational facilities adaptable and flexible were summarised by Clynes as follows:

Structure. The structure should be framed, kept simple and within regular spans (at least six metres between columns). There should be the maximum number of floors and the load-bearing capacity throughout the building should be enough to meet the maximum requirements foreseen.

Placement. The site placement of the building should allow for expansion horizontally, if possible. There should be a clear height of at least 3.5 metres to the underside of the structure. [Note that this does rule out use of slab-on-ground designs, where appropriate]. The planning grid should be within the range 1.2 to 1.5 metres and consistent with the structure and window spacing. Climatic control issues should be considered, including the orientation of the building to sunlight and prevailing winds.

Core elements. Core elements such as lifts, staircases, ducts, toilets, and plant room, should not be expected to change during the life of the building and should be designed to meet the standard required by all potential users. They should be positioned either in the centre or on the periphery of the building. Specialised support spaces should be similarly sited.

Standard spaces. For the space type, four to six categories should be provided, say 20-30m², 60m², 90m² and specific large spaces. Standard room dimensions should be used wherever possible for the incorporation of associated services, fittings, furniture and equipment. A capacity to interchange spaces can be implemented by the location of rooms with demountable walls, and similar or multiple dimensions.

Service infrastructure should be provided on a grid consistent with that of the structure. The design should allow for a possible doubling of capacity. Major service routes should have access that does not disrupt educational activity.

Fit-out. Adaptable elements should be integrated with, and physically independent of, each other. The more frequent the likely change of use, the more interdependence is required. For instance, furniture should be free-standing, although items can be locked to each other for stability. Services connections to furniture should not inhibit its mobility and partitions should not have services or other items fixed to them or run within them. This approach, when followed comprehensively, provides a building that is highly adaptable throughout. This will be appropriate where a substantial proportion of technical work is carried out and where there could be a need to change office space to practical areas, or demonstration/practical areas to processing areas. It is also appropriate where
rentals are very high and sub-divisions of the floors frequently need to be altered to meet the precise requirements of changing tenants such as office areas.

Building materials. Decisions about materials and equipment should be based on the type and level of utilisation of a facility, with attention paid to factors such as robustness to general wear and tear, or expected life.

Cable Management. Cabling within and between buildings will become increasingly important as administrative and educational electronic networks are installed to link separate buildings. With the growth of information technology (IT) throughout educational buildings, cable distribution becomes a main technical consideration. Cable distribution can be considered in three levels (Clynes):

1. Primary: main supply and distribution about the building.
2. Secondary: distribution about a work space or group of work spaces.
3. Tertiary: distribution at the work place.

When a new building is designed the primary routing will be dealt with in the same way as for the rest of the building’s main supply services. Difficulties may arise, however, when introducing cabling within an existing building. Here the issues to be faced include:

- the capacity of the existing electrical distribution;
- data cable distribution and networking;
- the number and disposition of outlets required;
- how to deal with exposed cabling; and
- restrictions on layout that service distribution imposes.

The criteria for secondary distribution include:

- Will the system be able to cope with a large number of cables?
- Can it provide outlets to a wide range of locations, including high density outlets at special locations?
- Can locations of socket outlets be easily altered?
- Is the system prone to damage?
- Is it easy to maintain?
- Can it provide services to positions in the centre of the room?

The principal options for secondary distribution are:

- raised floors;
- floor trunking;
- suspended ceiling void;
• suspended boom; and
• perimeter trunking.

The need for tertiary distribution has been recognised in terms of the proliferation of cables at the workplace (cable management), and the advantages of cabling between work stations (avoiding expensive floor or ceiling connections at each work station).

The options here are more limited:

• loose cables;
• integrated furniture distribution: cables are run through the structure of the furniture;
• furniture-mounted trunking: cable ways are added to existing furniture; and
• screen or wall-mounted trunking: cables are carried in trunking on the walls and screens next to the furniture.

In general the last two options are preferred on grounds of cable management, flexibility and cost.

Building Services. Three major issues are involved in service provision: planning, skilled labour and time. As a general principle services should be planned and designed in the following manner (De’Georgio, 1987):

• They should not be located in or on operable/demountable walls.
• They should be considered as being independent of a demountable wall.
• Ventilation, air conditioning, evaporative cooling and so on should be capable of proper functioning with walls in position(s) or removed.
• Ventilation, air conditioning, evaporative cooling, lighting and fire protection are aspects of planning that can only be considered for change on a relatively long term basis.
• Services should be located in fixed components such as floors, walls and ceilings. Provision can be made for temporary connection to a predetermined outlet grid. The density of the service must be known beforehand and skilled labour and some allocation of time may be required to make the alterations.

Clynes makes the following statement about service needs.

• Services which will be required continuously by a wide range of potential users should be distributed from a centralised supply source. These will include power, water, natural gas and drainage. Other demands may be more economically met by localised sources. For example, independent units such as compressors or vacuum pumps, or special bottled gases.
Co-ordinate the main and secondary services distribution (ducting) with the structural framework and circulation pattern of the building. Provide sufficient duct space and good access to the ducts. The overall aim should not be to provide all services everywhere, but to allow for present services to be extended or new ones to be added easily. If it is designed as a ring main, involving separate fused plugs, the system will have the flexibility to meet a temporarily higher-than-average demand in any one part of the building. Locating the ring main within the spaces it serves will ensure that maintenance and alteration work does not interfere with or disturb work or alterations taking place elsewhere.

Check that the service grid provides for plug ins or mobile plug in units that can be wheeled in and out of a large storage space and connected for short periods of time or use.

Storage. One of the problems in fully utilising accommodation in a flexible/multi-use manner is provision for storage. The application of storage to such a learning environment requires the effective storage of equipment, work in progress (out of the work areas when some other course is being held), general furniture consumables for work. The concept of an appropriate discrete storage provision requires careful consideration when flexible or multi-use facilities are designed. When the flexibility of a facility is being planned, the following issues must be considered in the provision of storage (Sharpe, 1987; Le Bransky, 1992):

- The location, relationship and type of storage required, e.g. whether there is a need for fixed, demountable or portable storage space.
- Capacity of the storage area(s) to service areas of the facility, including efficient use of space through a compactus or shelving system.
- The need to expand, share or change the function of the storage area(s).
- The period of time required for storage - whether the storage of equipment and materials is transient or archival.
- The type of goods to be stored, and whether they have a defined life expectancy, such as perishable food items.

Walls. The following information is derived from a workshop on flexible and multi-use in TAFE colleges. The performance of the wall is largely dependant on how dissimilar or incompatible the adjacent activities are. Note that high acoustic performance for walls is very expensive to achieve but usually results in relatively inflexible available construction. The capacity of a wall to respond to changing usage - either for concurrent or sequential usage should be used as a measure of design performance. Note that a structural frame is preferable to a design requiring load-bearing walls. Partition walls should be non load-bearing.

Keep partition walls, whether demountable or not, free of services and other fixtures. Long term installations such as ventilation, air conditioning, evaporative cooling, lighting and fire protection should function unconstrained by wall position or use.
Options for increasing the flexibility of internal walls include walls which are: non-fixed, light-weight, demountable, and moveable, such as the concertina design. However, when you are considering using a demountable wall, note that planning time and the cost of skilled labour are the primary considerations. Issues here include the skill to demount the wall, availability of skilled labour, ongoing maintenance, durability (continued cycles of demounting/remounting), and whether there are services located in or on the walls. The planning rule is that services should be independent of demountable walls.

Partition the nett useable space into defined usage areas, then define wall types, e.g. demountable, fixed, light-weight, concertina, or loadbearing when the wall is designed to be part of the building envelope (external), providing internal structural support.

When you are deciding on the required performance for a wall, its placement and whether it should be fixed or demountable, consider the following:

- fire rating (combustibility, spread of flame, smoke);
- acoustic performance - sound transmission rating and absorbability;
- impact resistance to equipment/furniture, accidents, or vandalism;
- security requirements;
- visual transparency, e.g. for monitoring of students and processes, or determining when equipment or work space is available for use;
- strength required, in general, and for the wall mounting of tools, equipment or plant;
- requirements for educational flexibility, including demountable displays;
- durability for continued cycles of demounting and remounting;
- the time allowed for demounting and remounting which can amount to minutes for operable walls compared to weeks for brick walls;
- whether damage to walls may result in an area becoming unusable;
- availability of skilled labour for ongoing maintenance;
- ventilation requirements (both natural and mechanical);
- reduction in light transmission (natural and artificial);
- ease of co-ordination and provision of services;
- construction costs, including the increased cost of fire protection as a result of creating separate areas, and the extension of time needed to complete the building program;
- reduction in nett useable area by the actual area occupied by the wall;
- increase in the actual distances travelled by users; and
constraints imposed on the future flexible use of the facility.

Environment issues. Building environment issues covered by Clynes included consideration of the requirements for heating, lighting, ventilation and other environmental aspects. These will apply to a building regardless of adaptability and flexibility. When designs are being prepared for these qualities three main points should be to the fore. They concern: zoning; the degree of control; and adaptability of the system and are covered below.

Zoning.

Any zoning in the planning of the building to allow partial use of the accommodation out of normal hours should be at least matched by similar zoning of the heating, ventilation and lighting systems. In this way unnecessarily wasted expenditure on fuel can be avoided. The control system should itself be flexible so that alterations to timings can easily be made. Sub-metering of areas that are likely to be used by outsiders should be considered. Administrative procedures should ensure that there is good liaison between those dealing with scheduling of accommodation and whoever is responsible for controlling the environmental systems.

The size of zones will be affected by a balance between what is desired and what can be afforded. However, in areas where a high degree of adaptability is likely to lead to the shapes and disposition of spaces being appreciably changed, it would be wise to aim for finer tuning of the environmental service systems. This can help to avoid later mismatches between zones and the types of space in them.

Controls.

Flexible space may itself lead to considerable changes in the environmental conditions in particular rooms, for example where heat producing equipment is installed in what had been a general classroom. It would therefore be a false economy to minimise the degree of control of heating that can be exercised by the building’s occupants in individual spaces. However, this should be done within agreed limits so that the balance of the system as a whole is not upset and minimum statutory standards are met.

Adaptability of environmental systems.

There should be some spare capacity to allow for increased loads, maintenance or repair.

Clynes concluded that good collaboration between all members of the design team will be essential to ensure that the environmental systems match, so far as is possible, the adaptability aimed for in other aspects of the accommodation as a whole. He adds that the safety officer should be consulted on health and safety issues when the design for a new project is initiated and again at the fitting-out stage. New technical solutions may need to be sought, or solutions adopted that are already in use in other types of building.
Appendix C: Facility types and floor layouts

The following floor layouts provide a selection of facility types that may be relevant to flexible delivery strategies. For special application, hypothetical layouts have been provided to highlight some of the major accommodation needs. The figures are not to scale. Note that these facility types do not represent best or worst practice, or a recommended spatial relationship or pattern.

Figure C.1: Simple E-shape layout for computer usage in TAFE NSW.
Figure C.2: Double U-shape computer room

Note: This type of layout requires more space than the simple E-type layout for 15 students (Figure C.1).
Figure C.3: Systems furniture layout for computer usage at Tea Tree Gully College of TAFE, South Australia (Bissland, 1993)

Figure C.4: Example of a videoconference room layout showing all participants equidistant from the panning camera so all are of equal size and focus on the screen.
Figure C.5: Example of originating room for two-way video conferencing by the US Navy (Simpson et al., 1991).
Figure C.6: Example of receiving room for two-way video conferencing by the US Navy (Simpson et al., 1991).
Figure C.7: Traditional furniture layout for open learning at Tea Tree Gully (Bissland, 1993)

Figure C.8: Typical (Open) Learning Centre, Queensland Open Learning Network (Gooley, 1992)
Figure C.9: Information Centre (hypothetical) based on common components of floor layouts used in TAFE library, excluding amenities such as toilets, staff rooms and delivery services.
Figure C.10: Trailer mounted mobile kitchen, TAFE NSW (Le Bransky, 1992).
Figure C.11: Beauty therapy salon, TAFE NSW (Guerin and Sadleir, 1992).

Figure C.12: Machine Shop (Training Centre of the Australian Chamber of Manufacturers, Victoria).
Figure C.13: Access Centre (hypothetical), based on typical accommodation provisions, excluding common amenities, used in various access centres in TAFE NSW evaluated by Prill and Lubimowski (1988).
Figure C.14: Administration Centre (hypothetical) based on common accommodation components provided in TAFE: excluding common amenities.
Figure C.15: Learning Resource Production Centre (hypothetical) based on typical accommodation components used in TAFE, excluding common amenities such as toilets, staff rooms and delivery bays.
End notes

1. A variety of terms cover the use of a computer to deliver an instructional program, such as computer aided (assisted) education, computer based education, computer based instruction, computer based learning and technology delivered instruction (Tical, 192). Recently, term technology delivered instruction has also been used to describe the incorporation of computers and other electronic aides in teaching and learning.

2. Cuskelley, E, and Dekkers, J, 1992, have produced a database of learning centres managed by various organisations (education, government and community agencies) which covers owner(s), users, accommodation type, equipment, capital cost, teaching methods, services provided and staffing levels.


5. Project Brief.

6. Pickette, R, Lundberg, D, and Hawke, G.


8. These are rooms used for remediation classes for students having difficulties.


10. The Value Management Manual and Guidelines for Economic Appraisal, published in 1990 by the NSW Government, are examples of procedures and strategies for the assessment, reporting and approval of capital investment, aimed at improving the effectiveness of capital works program management. Within the assessment framework, value management relates to the technical and functional dimension, and economic appraisal provides a tool for making resource allocation choices.


12. In ‘virtual reality’ a representation of reality is presented in three-dimensional space in a way that allows the participant, wearing a special headset equipped with a visual display device and/or sound to seem to enter and move around the space to a limited extent.

13. For example, NSW TAFE is currently testing two computer systems: one for recording information about class records to enable measurement of room utilisation, and another which records information about an entire facility including the actual floor plans in diagrammatic form and the location of that facility on a geographic map.