Chapter 11 Education at a Distance

By Clive Ferguson

Historical Origins of Distance Education

Distance education was forged on the frontiers of North America and Australasia towards the end of the nineteenth century. It was more than simply a response to the vast size and sparse populations of these countries. The harshness of life in the new settlements developed a more democratic society than the Old World where education facilities for country dwellers were largely ignored and advanced education was reserved for the affluent or fortunate. Also, the strong interest in primary production and the political power of the rural interest groups in the newly developing countries created a demand to remedy the imbalance in the provision of educational facilities between city and country. Although distance education (initially known as correspondence education) is founded on the technology of printing (mid 15th Century) it also required the infrastructure of railways for fast reliable mail delivery. By late nineteenth century both the USA and Canada had transcontinental railways and each of the colonies of Australia had significant railway systems radiating from the major seaboard cities.

Some of the earliest experiments in correspondence education were for adult education. In 1890 the International Correspondence School began in the US teaching mainly business and technology. It developed to provide courses to prepare students for examinations by professional bodies and still delivers distance-based continuing education today as ICS Learning Systems. The following year a correspondence course in agricultural science was offered by an institution at Madison, Wisconsin for those unable to attend campus. However the main initial thrust of correspondence education was for primary education. The Calvert School at Baltimore, USA is usually credited with the first experiment in education of children at home by correspondence in 1905/6 (Bolton, 1986) and by 1909 correspondence education was established in Victoria, Australia, to provide for children remote from primary schools. By the early 1920s each Australian State had established similar facilities and the western and central Canadian provinces followed between 1919 and 1927 with South Africa and New Zealand a little later. Primary level correspondence education relied on the labour of the children's mothers, few of whom had previous teaching experience and many had limited formal education. It was designed for the rural minority whose educational expectations were not especially high. At the adult education level, correspondence courses to allow Australian teachers in remote areas to complete their qualifications at a distance were introduced in 1910. In 1911 the University of Queensland became the first Australian university to enter the correspondence education field. During the 1920's and 1930's several Commonwealth universities provided external tuition using the same methods as those used for primary school correspondence education. The main clients were itinerant or remotely based schoolteachers and civil servants working for bachelor degrees. In Old World countries such as Britain, correspondence education developed only in the private provision of adult vocational and professionally related education. Pitman was probably the oldest provider but the British Institute of Engineering Technology was significant in preparing many engineers for the corporate membership examinations of the professional engineering institutions.

Compared with on-campus learning at even the most remote schools or universities, correspondence education was clearly second best - but preferable to no education at all. One
problem was the delay inherent in correspondence communication which restricted dialogue and the flexibility to provide the timely response to individual differences in student knowledge base inherent in good proximal (classroom) teaching. However, since the early days of correspondence education, distance education has embraced a range of developing technologies to support learning.

In 1926, the Reverend Doctor John Flynn, founder of the Royal Flying Doctor Service, suggested the use of a two-way radio to support "inland" children with their schooling but it was not until 1951 that the first School of the Air was established at Alice Springs to deliver lessons as student support for correspondence education programs. In addition to radio programs with live talk back, the Schools of the Air developed educational programs which provided a variety of experiences such as home visits, and workshops and camps. They went a long way towards providing the mix of individual and group learning on which the pedagogies of conventional schooling are based.

The take up of technologies in distance based higher education was initially slow. Probably most significant was the creation of the Open University in the UK in the late 1960's which initially delivered its lectures and demonstrations entirely by national television supplemented by printed study notes and tutorials held outside normal working hours at technical colleges throughout the country. It heralded a start to the uptake of technology that accelerated rapidly toward the end of the 20th Century to make distance based education the most dynamic aspect of higher education. Print is still the main medium used to present core teaching material. For the student it is easy to access, notate and cross-reference, is portable, robust and does not require additional technology to use. However online course delivery is now also significant. The range of technologies now used to supplement text includes video and audiocassettes, television, tele- and video conferencing, computer-based learning, and computer-based communication strategies. The main limiting factor in the use of technology in distance education is student access to enabling facilities and the associated equity issues.

**Intrinsic Values in the Delivery of Higher Education by Distance Education.**

From its modest late 19th Century beginnings, distance education in all its various forms is set internationally to become the dominant mode of higher education delivery of the 21st Century. The key advantages of distance education are the flexibility of time and place of study. Study material can be delivered by mail or online to anywhere in the world and can be studied when and where is most convenient for the student. As successful distance education study requires the higher level of self-discipline and motivation usually more evident in 'mature' students (defined in Australia as those over 21), most universities enrol only mature students into distance education courses. However, mature students provide the main growth area in higher education. They include not only those who did not have the opportunity to go to university when they left secondary school but also the increasing numbers changing career direction, studying for higher degrees or engaged in continuing professional development to update or broaden their education (Ferguson, 1998). Commercially, distance education also provides an easier mechanism into international higher education markets, and as government funding of universities diminishes, overseas markets become a critical income source.

Distance education enables students who have already embarked on a career to avoid career
disruption and loss of income. Ironically, many now live within easy commuting distance of the university. For those mixing part-time study with work or family commitments, it provides the convenience of time of study as well as the flexibility of geographical movement that may be necessary if the student or the student's partner changes work location. With increasing globalisation and casualisation of the workforce, this is becoming increasing significant. Distance education is still frequently considered second class education and yet for higher education it has its own intrinsic educational advantages as highlighted in Table 11.1.

**Imperfections in the Proximal Teaching Mode**

In the past there has been a tendency to focus on the few obvious disadvantages of distance education compared to proximal teaching, however proximal teaching has its own difficulties, including:

- Imperfections in either the teaching or content of the lectures. In distance education these are more easily monitored and improved by both the physical substance of the materials and the course team approach.

- Problems caused by sickness or family crisis of either the student or the teacher.

- In the second half of semester, many students skip lectures and tutorials to meet the assignment deadlines, resulting in a discontinuity in their study program.

- Timetable clashes.

- Practical difficulties in scheduling small group laboratory exercises synchronous with the study of the relevant theory.

- Often inappropriate for mature age students in pursuit of continuous professional development/ lifelong learning.
**Interface with employment**

The ability to combine study with work in the field of study provides ideal reinforcement of course content. It enables students to place the various areas of study into context and allows them to reflect on real experiences related to their studies. While "sandwich" courses are valuable in providing this through a period of suitable work based training at a suitable stage in the course, the ideal is better achieved by the combination of career-track work with relevant part time study. For most students distance education provides the most convenient way to achieve this.

**Independent self paced learning**

The physical separation from peers and teacher fosters an independent learning attitude in distance education students. Access to all the study materials at the start of each unit, gives them increased "user control" of the timing and order of study to suit their individual background knowledge. They can more easily recognise and redress any skill and knowledge deficiencies during the study program. This makes the study more meaningful for the student and has a positive effect on both motivation and self-confidence. It also provides the flexibility to cater for short periods of sickness, or exceptional family or work commitments. The distance education focus on learning has resulted in education being more student-centred with the lecturer seen as facilitator.

**Wider variety of stimuli**

The level of mental stimulation produced through each of the various communication mechanisms varies with the person and significantly affects their ability to learn. For example, some may better recall information delivered aurally, others may respond better to a class demonstration. Conventional teaching favours those who respond best to a particular rather limited range. Correspondence education greatly limited that range to just the printed word (with illustrations), but the increasing variety of technologies now used in distance education has opened up a much wider range of stimuli (e.g. audio, video, interactive computer programs etc.) than conventionally used in on-campus teaching. Frequently studies introduced by one mechanism are developed and reinforced by others. This increases engagement for all students.

**Reduced discrimination and improved social dynamics**

Physical handicaps, the stigma of repeating a unit or differences in ethnicity, age, gender, physical appearance or socio-economic status can make students feel intimidated, insecure and isolated in a classroom environment; others may be naturally reserved in a large group. These factors have a significant effect on class participation. However, the use of text-based computer conferencing, which has evolved as a significant delivery mechanism in distance education over the last decade, creates a physical separation from peers and teacher, reducing or eliminating the effect of most discriminatory factors. The facility to compose and edit communications, to provide a considered response before posting them to the group, to reread and reflect on other peoples comments, and the degree of anonymity provided by the lack of physical presence, give greater confidence to participate in classroom discussions. The result is a potential for more inclusive participation, improved social dynamics, and higher quality of discussion.

**Reduced environmental stress**
Distance education students are spared the stress of studying in an initially unfamiliar environment and the associated travel.

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Facilitates inter-university collaboration

Inter-university collaboration facilitated by the provision of distance based engineering degree courses can exist at a number of levels:

1. A university (under license) can use materials and facilities, developed by another university.

2. Materials and facilities can be developed and used collaboratively by several institutions.

3. A university could prescribe distance education units provided by other universities to expand its range of elective units, or replace a core unit of its own when a specialist lecturer becomes temporarily unavailable. Suitable distance education units could also be prescribed to solve on-campus timetable clashes or for on-campus students who need only one or two units to complete a degree, thus freeing them to take on full time employment.

4. A degree course developed and delivered through collaboration between two distance education providers.

5. Provision of multi-university engineering degree programs with a wide choice of distance education study units from a large number of participating Australian university engineering schools.

The IEAust through its subsidiary Engineering Education Australia has facilitated level 5, however there is scope to develop greater co-operative activity at the other levels.

Depolarisation of proximal and distance education

Recognition of the educational and marketing benefits to be gained by the use of distance education technologies has resulted in the adoption of many of them in proximal teaching. Other technologies effectively enable face-to-face teaching over a distance. An example of this is the ‘industrial campus’ where video conferencing and on-site lectures are provided at the work site for groups of industry based off-campus students (Wong and Ferguson, 1996). Further, some of the technologies now used extensively in support of distance education were initially developed for proximal teaching. There are two distinct types of higher education distance education provider: autonomous providers which teach entirely by distance education, and ‘mixed’ or ‘integrated’ institutions which have both on-campus and off-campus students. Integrated institutions predominate in Australia and in these the same academics prepare and teach distance education courses concurrently with their on-campus equivalents. This facilitates quick adoption of off-campus materials or facilities into on-campus use whenever considered educationally advantageous. Similarly direct classroom feedback from the on-campus group is used to improve the off-campus program. Out of this depolarisation comes ‘flexible delivery’. The Flexible Delivery Working Party (1992, p. 47) defined this as an approach ‘which 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’. To meet the objectives of flexible delivery a course should provide:
• Flexibility of entry and exit point, program components, modes of learning, and assessment processes.

• Learner control and choice regarding content, sequence, method, time and place of learning.

• Application of learning technologies where appropriate.

• Appropriate learner support systems and learning resources.

Approaches taken in various flexible-delivery based courses and the degree of success in meeting these objectives vary widely. Delivery mode can vary from substantially on-campus delivery to fully off-campus delivery, however at both extremes the technologies and approaches developed in distance education are significant to meeting the objectives of flexible delivery. Adoption of flexible delivery has been notably high in the Technical and Further Education (TAFE) sector. Experience in the higher education sector in Australia and in the US has shown provision of full flexibility to have difficulties. In addition to staff workload problems, students prefer structure to their course, and flexibility to select assignment and examination deadlines results in extended programs and a higher rate of non-completion.

'Distributed learning' is a similar hybrid of distance and proximal education but without the full flexibility envisioned by 'flexible delivery'. It is rapidly gaining popularity in the US. Like flexible delivery, it can vary from (reduced) face-to-face contact enhanced by the use of a variety of multimedia technologies, to complete distance education. The Institute for Academic Technology of the University of North Carolina has defined distributed learning as:

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'a learner-centered approach to education which integrates a number of technologies to enable opportunities for activities and interaction in both asynchronous and real-time modes. The model is based on blending a choice of appropriate technologies with aspects of campus-based delivery, open learning systems, and distance education. The approach gives instructors the flexibility to customise learning environments to meet the needs of diverse student populations, whilst providing both high-quality and cost effective learning.'

Typically, a range of distance education technologies may be used to present information, activities to reinforce learning and support discussion between students, whilst proximal activities are used to develop skills best practised in a face-to-face environment. A number of private 'for profit' universities and some public universities provide the face-to-face contact through a distributed network of small centres or 'branch campuses' each catering for 400 or so students. These are usually fully staffed with learning advisers but few other university facilities. Face-to-face teaching is often done to a script with limited degrees of interpretation to ensure consistency between campuses, although some public universities simply use broadcast video to each site. US industry is increasingly moving to this format for in-company training to minimise the cost of travel, lodging and training facilities.

**Technology in Delivery of Distance Education in Engineering**

Individual engineering units of study by distance education have been provided by mixed mode
Australian higher education institutions for some time, but until the mid 1990s the IEAust required off-campus students to complete the last two semesters on-campus. Reservations about the suitability of an entire engineering course of distance education study units were based on the approaches and technology commonly used until the early 1990s. However the ensuing rapid advances in distance education approaches and technologies in engineering courses led the IEAust, in July 1995, to waive the on-campus requirement. Instead, institutions were required to establish mechanisms to ensure off-campus students acquired engineering practice skills, professional awareness and social responsibility. By this time the IEAust commitment to the concept of distance education for engineering degree programs had been demonstrated by its establishment of a subsidiary enterprise, Engineering Education Australia, to broker distance based engineering units from IEAust accredited university engineering degree programs. Recognising the special practical and experimental content of engineering courses, early concerns of the use of distance education delivery for engineering education included:

- Inability to provide the physical demonstrations of concepts often provided in lectures.

- The extended time difference between studying the theory and performing associated laboratory experiments at an on-campus workshop dramatically reducing the effectiveness of the experiment in reinforcing theory.

- Lack of opportunity for discussions with lecturers, interaction with peers, and access to university services such as the library.

The need to address each of these concerns created the drive to explore the potential of numerous 'educational' technologies both old and new. The Australian government and various philanthropic bodies providing funding for this required a continuing focus on educational outcomes.¹

**Conceptual course components**

Video and television are often used in distance education to deliver concepts that cannot be adequately provided by text and still illustrations. They can also provide a human face and voice to the educational program. Both media have the potential to significantly improve on the lecture, as classroom practical demonstrations often disadvantage students who are not positioned directly in front of the lecturer. They are usually carefully scripted, produced and edited to ensure concepts are presented clearly and unambiguously and have the flexibility to show close-up and overview shots as required and in directions that best illustrate the concept. Unconstrained in location, they can switch views at will between (say) lecture theatre, laboratory and industry or display multiple views simultaneously, enabling ample scope for clarification and concept reinforcement.

Video is also used with great advantage in on-campus delivery. To justify high production costs a life expectancy of several years is usually required, so care should be taken to avoid including content that may quickly date. Videos have been used extensively in all education sectors and particularly in industrial training, so there is already a vast library of ready made educational videos available. Most are commercially produced.

The use of television in higher education predates video. The Open University in the UK,
and many of its earlier counterparts around the world, were founded on the use of national television to deliver its lectures before video recorders became common household items. Television has the disadvantage of inflexibility in time of study (particularly as they are screened at unsociable hours), so students now often video record the programs to enable them to view (and review) the programs at more convenient times. The Open University found the requirements imposed on it by the national television broadcaster to be constraining and so focused more on the alternative media of video and computer aided learning (CAL) programs.

The current generation of CAL programs uses multimedia in the form of text, computer graphics, animation and digitised audio and video clips to illustrate concepts, and interactivity to reinforce them. Interactivity allows the user to click on interactive links known as 'hyperlinks' in the form of text, a graphic or animation to access further information, indicate a response or control the order of presentation. CAL was first used to illustrate concepts in university level engineering education in Canada, the UK and the USA in 1962 but over the next three decades the number and quality of CAL programs were limited. They were not used in distance education, as they were impractical to use without proximal support. However during the 1990's advances in software, computer hardware and the development of multimedia technology had a tremendous impact on CAL.

The first major development occurred in the early 1990s when new multimedia authoring software became available enabling production of high quality user-friendly CAL programs using computer graphics, animation and hyperlinks to be economically viable for university use. Off-campus students initially accessed these through one or more high-density floppy disks and on-campus students accessed them through a university Local Area Network. Research at that time into the use of CAL programs to enhance engineering teaching (Ferguson and Wong, 1995) found:

• Appropriate use of graphics and animation are the most successful features of CAL. This is supported by previous research by Baek, (1988) which showed that in teaching a mathematical rule, graphics with text produced higher performance scores than just text, and the introduction of animation further improved the scores.

• A high proportion of first year students (93-100%) had played video games and nearly 40% were frequent players. This large budget industry has carried out considerable market research to find the most appealing features. The most relevant to the design and development of CAL programs include immediate feedback, reinforcement of correct response and user control. User control allows the users to take the most efficient path to content mastery by allowing them to organise the order of information presented. Relevance to the users is increased, resulting in improved motivation and self-confidence.

• Non-linear hypertext designed CAL programs allow students to discuss the programs with their peers. Although CAL was initially designed for individualised instruction, it was found that students who work together in small groups outperform students who work individually. This provides a major challenge for distance education.

Using the new multimedia authoring software, CAL programs became more amenable to continuous development than video, and depict complex concepts more precisely. However, the choice of animated graphics or video depends on detailed consideration of the specific educational objectives. Each mode has its merits and there is value in diversity of media format.
In the late 1990s compact disk read only memory (CD-ROM) drives which use optical disk technology became standard on personal computers to meet the explosive growth of storage demands of multimedia applications. This enabled the development of the current generation multimedia form of CAL described above by accommodating data files that take up huge amounts of storage space such as photographs, music, narration and even short digitised video clips, considerably enhancing previous limited multimedia capabilities.

Narration, for example, used to supplement other media such as text and graphics can greatly enhance understanding. The size of video files created the greatest challenge for multimedia developers but the development of video file compression software enabled video file size reductions of up to 95%. Access to CD-ROM quality multimedia CAL programs by video streaming direct from a web site cannot be adequately supported by the current narrow band Internet. However, the speed problem will soon be solved with the increasing availability of broadband Internet technology, discussed later. Until this is widely available at a cost affordable to most students, hybrid CD-ROM, in which content on the CD-ROM receives play commands through the web, will enable time dependent information to be readily updated at the web site, whilst retaining the multimedia quality of the CD-ROM.

The new generation of optical disk storage technology is the digital versatile disc (DVD-ROM). A double-sided dual-layered DVD-ROM disc can store 17 gigabytes. It is anticipated that within a few years personal computers will have a DVD-ROM drive as standard equipment and will enable the advantages of educational videos to be combined with the features of enhanced high quality multimedia CAL - including easy editing of the digital images through the multimedia authoring software.

Experimental course components

For off-campus students there are a variety of strategies to deliver the practical requirements of an engineering course. They include on-campus workshops, home experiment kits, video and CAL laboratory simulations and direct access to laboratory facilities via the Internet.

On-campus workshops

In Australian distance education, on-campus workshops are used to deliver the practical experiences essential for the development of a graduate engineer. They are usually scheduled for the inter-semester break or summer vacation period following study of the relevant unit but can be postponed to allow the practical requirements of several years of study to be completed in one visit. However the time delay between the student studying the theory off-campus and the practical work impairs its function of providing timely reinforcement of theories. The following strategies have been developed primarily to overcome this problem.

Home experiment kits

Home experiment kits are supplied with study packages although some home experiments simply require common household materials. They are designed to provide a practical demonstration of one or more concepts and have the advantage that they can be carried out at
the time the student is studying the related theory and thus provide immediate reinforcement.

**Video and CAL simulations**

Video and CAL simulations of laboratory experiments have been developed for off-campus use. One advantage of video is that it can document special events and processes that students are unlikely to witness in any other way. One example is an experiment using production equipment at a major car plant to examine the effects of various input variables on metal deformation during a deep drawing process. The video shows the test process and significant physical results linking them to the test results presented in the study notes for the students to analyse. In a CAL example, the student performs the classic materials tensile test in an interactive computer simulation.

**Direct Internet access to laboratory facilities**

This concept was inspired by two web sites that became active in 1994 to demonstrate Internet based remote control of robots. One was developed by Ken Goldberg (Goldberg et al., 1994) of the University of Southern California and the other by Ken Taylor of the University of Western Australia (Trevelyan and Dalton, 1999). The first application of this principle to provide remote access to undergraduate laboratory facilities, was a fluids flow-over-a-weir experiment that relates the height of water over the top of the weir with volumetric flow rate (Florance et al. 1997). A second facility provided off-campus students Internet access to computer controlled machine tools (a lathe and milling machine) within a flexible manufacturing facility funded by the Australian Federal Government's Committee for University Teaching and Staff Development, (Ferguson, 1997; Ferguson and Florance, 1999).

**Communication and access to university services**

Four of the five significant technological developments in distance education communications at the turn of the century are surprisingly old: the telephone and fax, the computer, and the Internet. The World Wide Web introduced in 1989 enabled more convenient use of the Internet. Supported by rapid advances in computers during the 1990s, the Internet now has the greatest effect on all levels of education including access to university services (e.g. library) and is facilitating the development of effective distance based engineering higher education. One of the most widely used and significant Internet application in distance education is computer conferencing, also called computer-mediated communication (CMC), which provides network-based, one-to-one and one-to-many interactive communication, supporting both independent and collaborative learning. The main communication medium is text, although it is anticipated that eventually voice and video will be become more widely available.

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**The use of technology to facilitate the delivery of professional attributes**

The new focus on developing professional engineering attributes in undergraduate engineering courses was discussed in Chapter 9. Chapter 10 investigated teaching strategies to develop these professional attributes. However most of these strategies would be unworkable in a distance education course, without the more recent developments in the use of the new educational technologies. Hands on experiences and activities to reinforce deep learning need
to be available at the time of study as provided by the use of home experiment kits, video and CAL simulations and direct Internet links to laboratory equipment. The more immediate forms of communication enable exploration and clarification of concepts and reinforcement by reflection. Deep learning in turn supports development of higher level competencies such as critical and creative thinking, analytical skills. These skills, together with information acquisition skills, are needed to support lifelong learning. A major problem in distance education is the use of group activities to effectively develop leadership and team skills and support innovation skills. The use of current communication technologies is restrictive but will be significantly improved when desktop broadband video conferencing becomes widely available in Australia.

A significant issue raised by a recent study (Lim and Lee, 2000) shows the level of basic information technology (IT) skills of Australian first year on-campus students to be 'variable'. While the use of computers in industry is widespread, there are also many mature age distance education students who lack these skills. To achieve successful learning outcomes, there is an urgent need to provide these students with access to basic IT training early in their course.

**Educational Technology in a Changing Education Environment**

**The global economical focus of higher education**

The decline in Australian government funding during the 1990s forced universities to gain funding from non-government sources. International education became a major source of this funding. In the late 1990s university administrations looked to distance education as the means of providing "economy of scale". The financial focus was more extreme in the US where a 1997 Coopers and Lybrand white paper (cited Farber, 1998) claimed that using packaged instructional software:

> a mere 25 courses (subjects2) would serve an estimated 80% of total undergraduate enrolment in core undergraduate courses.... Distributed learning involves only a small number of professors, but has the potential to reach a huge market of students.

Financially motivated, US State and federal politicians, university administrations and computer and communications companies rushed into "online" or "network" education. The anticipated gains were not realised (Noble, 1998). Rather than achieving economies of scale, many online courses were vastly under enrolled. As well as the major financial losses, the computer-based commercialisation of education created industrial unrest in the US and Canadian higher education systems. Academics at York University in Toronto went on strike for two months against administration initiatives to implement instructional technology.

There were failures. A study of the failing and surviving 'virtual' universities reveals that the failing providers were essentially instructor free and isolationist in approach, while survivors created and maintained the human touch of 'attentiveness' and intermediation. It is now recognised that high quality online teaching requires smaller staff student ratios than proximal teaching. Students must feel that they are part of a learning community and derive motivation to engage in the study material from the lecturer. For quality distance education courses the cost to the university per student is higher than for proximal teaching, particularly when the high set-up cost of developing course materials is taken into account. The US lesson was quickly assimilated globally. The UK Open University introduced a residential requirement in courses. In the US the focus on online education is returning to andrology. Most now indicate an intention to employ combinations of delivery mechanisms eg: mixing proximal and online delivery, and
are putting more academic staff into distance education delivery. In Australia there was renewed focus on the need to ensure interaction between staff and student and more financial realism. It seems the anticipated productivity gains are elusive.

**Global competition**

Arrangements to deliver Australian higher education in the (mainly) Asian market take the form of overseas students studying in Australia, off-campus (distance education - increasingly online) or 'offshore campus'. The USA, France, Germany and the UK are historically the major suppliers to the various international higher education markets, however second only to Switzerland, international students in Australia now comprise the highest proportion of total higher education enrolments (approximately 11%) in the world.

The Asian economic downturn of the 1990s resulted in a loss of about 10% of Australia's traditional higher education market in Asia. But Australia's economic links with Asia resulted in an exchange rate more in line with its neighbours, resulting in an equivalent market gain from other countries. Affordability was further improved through offshore campus arrangements, enabling students to study part or their entire course in their own countries. Australian universities are also more geared to efficient articulation arrangements enabling students to study the first year or two of their degree locally. Working against these factors is the cost to obtain an Australian student entry visa compared with that for other main host nations and for students from China, India and Vietnam the time to get an Australian visa is considerable. The global nature of distance education has resulted in international competition and the substantial Australian expertise in flexible distance based higher education has provided competitive advantage. Asia continues to provide the largest overseas higher education market for Australia but there are also moves to secure markets further afield. For example, the APESMA MBA is not only delivered in a number of Asian countries, but is now expanding to several other countries throughout the world.

**Changes in Australian tertiary education**

The last few decades of the 20th Century saw the end of free higher education with students now required to contribute substantially to the cost, while the massive expansion in student numbers in the university sector has lead to a wider range of student abilities. This resulted in a shortage of academic staff, overcrowding of students and pressure for new buildings. In late 1989 six higher education providers were designated as Distance Education Centres (DECs) with special funding arrangements but the expectation of reduced staff requirements was not achieved and special funding was removed in 1993. Throughout the 1990s corporatisation of the Australian university sector and the adoption of the notion of student as client was driven by increased government demands for financial accountability, the need to commercialise activities for financial sustainability and pressure for full fee paying places alongside government subsidised places in undergraduate courses. Instead most universities focused on full fee paying coursework higher degrees and non-award courses usually taken by mature students combining study with full-time employment where tax deductions would make the course more affordable. Flexibility of distance education provides substantial advantages. From just six
DECs a decade ago now virtually all universities have some involvement.

**Continuing Professional Development**

Internationally this is the fastest developing education market and is principally targeted by corporate and private institutions of higher education world-wide, but particularly in the USA where employers are more focused on the competitive advantages accruing from a highly skilled and flexible workforce. Many students can substantially offset their study costs by employer sponsored tuition subsidies and tax breaks.

Concerns about large-scale influx into the Australian continuing professional education market resulting from the explosion of US ‘global’ private and corporate universities seem unfounded (Cunningham et al. 2000). Internationally, Australian providers have a competitive edge through leadership in distance and distributed education, focus on work-readiness and professional attributes, and cost effective and agile response to client needs.

**Australian Distance Education - the Future.**

Australia’s market share of the international distance education market is increasing rapidly against a highly competitive field with an increasing proportion studying off-campus or at an offshore campus. Much is due to well-established expertise in distance education and use of educational technologies, experience with part-time higher education students, established local partnerships and alliances, and a student centred customer focus. Good market research has enabled Australian providers adapt to the rich variety of cultures and economic conditions that demand different approaches to delivery, including different forms and levels of support. In spite of the problems of poorly mediated online education in the US there is an increasing demand for (well-supported) online delivery and there is also an increasing awareness of the need for internationalisation of content.

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Quality assurance issues are becoming critical in the international market place as fiscally motivated global competition along with the massification of higher education places a risk on the quality of educational process and continucity of educational standards. Currently each Australian university internally self-accredits its degree programs but internationally many countries, including the UK, USA, New Zealand and many European countries, are establishing rigorous national accreditation agencies. Driven by the concern to protect the Australian higher education export industry, the Australian Universities Quality Agency will commence early in 2001. Quality assurance of educational standards is particularly critical for professions such as engineering. In Australia the IEAust provides professional accreditation of engineering courses with international standing provided through international agreements to mutually recognise the substantial equivalence of accredited academic programs. (Washington Accord, see Chapter 5, p. 35.)

Nationally the technologies of distance education are also set to substantially change the face of on-campus teaching. Distance education is increasingly used in Australian secondary education to overcome specialist academic skill shortages in single subjects. This develops in these students some of the self-discipline, maturity and technical competency needed for off-campus study. This factor, combined with the increasing need for on-campus students to work part-time
to provide their only or major source of income (Cook and Couchi, 2000), and the greater range of abilities of our students, indicates the appropriateness of adopting some of the flexibility offered by distance education technologies in on-campus teaching. Availability of computer-based communications can also provide opportunities for increased peer support and interaction. As almost every Australian university now has facilities and expertise in distance education, their adoption to meet on-campus student needs is inevitable. In effect this is moving along the path towards providing distributed learning for traditional students and blurring the distinction between off and on-campus students.

Distance education that is well supported technically and with good lecturer interaction is now recognised to be more expensive for the providing institution than proximal teaching, but is more educationally efficient and facilitates continuing employment. This provides economic advantages for student and nation and is crucial for the viability of continuous professional development. The continuing move towards full fee paying courses in Australia could result in pricing differentials between on and off-campus delivery, as in the US. Recognition in the US of the need to ensure good interaction between lecturer and student led to the use of teleconferencing combined with computer-mediated communication as a favoured form of distance education delivery. This form of delivery is more problematic in science and engineering where mathematical, graphical, and diagrammatic concepts need to be explored by synchronous group discussion. Desktop video conferencing using broadband web access to enable group project work as well as small group technical tutorials for off-campus students should provide a solution. According to Bill Gates of Microsoft, broadband access in Australia is two years behind Europe and North America6 where its capabilities are already being applied both in education and industry. However, it is uncertain whether this will eventually fully support the development of the ideal engineering attributes without a continuing need to blend in aspects of on-campus delivery. In the past the special demands of distance based engineering education led to significant development of a wide range of enabling technologies. The attribute focus has now generated a new set of challenges.

Notes to Chapter 11

1. Examples of the use of media technology given in this section are from Deakin University.
2. The term "course" in North America is equivalent to a "subject" in Australia.
3. Based on a different definition of ‘distributed learning’ than given on page 98.
4. In the process new fully online and ‘hollow’ providers were created. Confusingly both are known as ‘virtual’ universities. The ‘hollow’ university is more established and is essentially a course broker for a number of distance education providers. Hollow universities now increasingly offer online courses.
5. There is an equity issue here. Those in lower income groups may no longer be able to afford the continuing education increasingly required to maintain employability.