

# Just How Relevant is E-education to Global Educational Needs?

GREVILLE RUMBLE

*Independent Consultant*

**ABSTRACT** *The development of e-education has enabled distance education to overcome the lack of interactivity inherent in earlier forms of distance education based on correspondence and mass media, but it looks as if it is also pushing up the costs of distance education. In the 1960s and 1970s, the cost structure of distance education, and its ability to lower educational costs, was seen as a distinct advantage in the face of the need to expand educational provision. With the world population forecast to grow by over three billions in the next 50 years, the need for cheap ways of educating people must be paramount. This article asks just how relevant it is to global educational needs to develop more expensive forms of distance education that, in the absence of public funding, place increased financial burdens on the students.*

## **Introduction**

Distance education has been with us for 160 years. For much of that time it has been seen as a poor substitute for classroom-based forms of education, not least because it fails to provide for substantial, rapid and easy dialogue between teacher and learners, and among learners. On the other hand, it has been seen as having certain distinct advantages—most notably the flexibility in respect of time and place of learning that makes it peculiarly attractive to those unable to get to a classroom. By the 1970s, however, another clear advantage was emerging: the substitution of capital, in the form of educational materials, for labour, in the form of teachers' time, enabled distance education to bring down the unit costs of education. Faced with the demands engendered by population growth and by the emergence of egalitarian philosophies intent on redressing past educational deprivation in both advanced industrialised and developing countries, distance education came to be seen as the only way of meeting frustrated demand for education, and of training/educating sufficient people to meet rising demands for trained human resources. As a direct result it is arguable that access became a key value in evaluating the utility of distance education.

Over the past 15 or so years, technological advances have enabled distance educators to address the perceived failure of earlier forms of distance education to provide opportunities for interactive dialogue. Currently, distance educators are, in common with many in traditional education, seeking to exploit the capabilities of

asynchronous learning networks. The question arises, however, whether the pursuit of this new goal is undermining distance education's pursuit of the goal of opening up opportunities for access to education, and if so, whether this is in fact a retrograde step. This article seeks to explore some of these issues through a focus on the values that underpin distance education.

## **Demand**

During the 1960s and 1970s it became clear that few countries could afford the costs of providing traditional forms of education for burgeoning populations of young people, let alone the emerging demand from adults for lifelong learning. Distance education provided an alternative and more cost-efficient way forward. However, although the distance education sector has grown enormously over the last 40 years, with 135 million children of primary school age currently not attending school, one billion adolescents and adults under-literate or illiterate, and two billion individuals requiring some kind of retraining and re-skilling in their lives (Dhanarajan, 2001, p. 67), there is still plenty to do. Indeed, distance education can only increase in importance as the world population moves beyond its current estimated 6.1 billion (US Bureau of the Census, 2001) towards perhaps 9.5 billion by 2050 (US Bureau of the Census, 2000).

## **Cost**

Traditional education is a labour intensive business. However, worldwide the public sector's ability to pay for education was by the 1960s and 1970s severely tested. Generally governments were looking for, and continue to look for, ways of reducing or at least containing the cost. One way is, of course, to pass the cost on to the consumer. Another is to use methods that reduce the unit cost of education. In the 1960s the application of mass communications technology came to be seen as a way of lowering the unit costs of education (Jamison *et al.*, 1974, p. 57; Eicher *et al.*, 1982, p. 40). The result was a flurry of interest by economists who set out to study the costs of particular systems—but most notably educational television (ETV) and open university systems, and to develop methodologies for studying the costs of educational technology (c.f. Rumble, 1999, for an account of this work). Fortunately experience shows that some forms of distance education can be more cost-efficient than traditional forms of education (Rumble, 1997, pp. 134–160).

Unfortunately, current developments in distance education, and in particular the development of third generation systems (c.f. Nipper, 1989, pp. 63–64), look as if they are pushing the costs of distance education up. Understanding this claim requires some knowledge of the nature and cost structure of e-education.

A fully 'e' education system would, I suggest:

- make learning materials available to students in electronic form;
- teach and support students online; and

- provide online administrative services, e.g. enrolment, billing, information and advice.

The costs of e-education would therefore embrace all of the following:

- (1) The development of e-materials.
- (2) Teaching students online.
- (3) Administering students online.
- (4) Providing the infrastructure and support within which e-education can operate.
- (5) Planning and managing e-education (Rumble, 2001).

So far as the costs of developing e-materials are concerned, Arizona Learning Systems (1998, pp. 13–14) found a wide variation in the costs of developing a three credit hours Internet course, of from US\$6,000 to \$1,000,000, depending on the approach used. Much of this is the cost of academic and technical labour. The cheapest approach involved the presentation of simple course outlines and assignments; the most expensive involved virtual reality. Costs escalated rapidly as soon as the course designers moved beyond text to the incorporation of audio, video, simulations and virtual reality. Obviously the costs can be contained by choice of media, but part of the advantage of e-education has to be its ability to deliver a rich spectrum of materials to resource-poor environments such as sub-Saharan Africa. The evidence is that the more that is built into the resource-library, the higher the costs of development.

Delivering materials in electronic form to the end-user's computer seems to bring the costs of delivery down sharply, as evidenced by a study of document delivery costs at the Library of Virginia, where the costs of providing a single copy of a four-page report in digital format is just 90 US cents, compared with \$19 to supply a surface-mail customer and \$12 to supply an on-site user (Roderick, 1998). Applied to course materials, online delivery to order could cut inventory, packing and postage costs enormously. However, students used to being given their course materials are likely to see their costs rise as they access materials online and print them off themselves.

The fixed costs of developing materials can, of course, be spread across the student body, so in principle there is no reason why one should not use expensive media provided the audience size is large enough to absorb the cost, and provided the cost of student support is kept low. Unfortunately, it is precisely in this latter aspect where costs seem to rise. Although there are those who believe that it takes less hours on average to support an online student, the consensus seems to be that online teaching is more labour intensive than face-to-face teaching in either a distance or a traditional educational setting (see Rumble, 2001, for a review of the evidence). This might explain both why Boettcher (1999) found that the average class size of an online course of from 12 to 20 students was less than the 30 or so students found in face-to-face classes, and why the American literature on the introduction of online classes is so preoccupied with labour-for-labour substitution (i.e. the practice of replacing expensive faculty labour with cheaper adjunct labour) (Arvan *et al.*, 1998; Arizona Learning Systems, 1998, p. 24).

In addition, the design and maintenance of a web site capable of supporting online teaching and administrative functions seems to have been largely ignored in the literature, as has the overhead cost of planning, designing and managing an e-education system, but the cost is not insubstantial. For example, a Gartner Group report suggested that e-commerce web sites are harder than expected to build, with costs of US\$1 million on average—and that this cost is likely to increase by 25% per annum over the next two years (Farmer, 1999). Certainly the cost of developing the Open University's web site to support online information and administrative functions has been many times this amount, and while there may well be benefits as the costs of transactions (for example, the cost of enrolling a student on a course, or changing a student's address) are brought down, it is not clear that the savings will be commensurate with the costs.

Given the unwillingness or inability of governments to meet the additional costs involved, the tendency is either to forego the expenditure, or to pass these costs on to the students. Both these strategies are evidenced strongly in the *Business Model for the [UK] e-University*. In talking about 'an e-version of programmed learning books', the report is suggestive of an approach that will not provide students with adequate support as of right (PriceWaterhouseCoopers, 2000, paragraph 52). Indeed, the report makes it clear that students will have to pay for access to online libraries offered by firms such as XanEdu and Questia, for tutorial support (Tutor.com), for guidance and advice, and for examinations and awards (paragraphs 79–80, 87–89, 107, 91–99). In effect, the learner will pay the providers of these services—often sourced out to commercially orientated firms—as they use them.

In addition, of course, there is the greatly increased cost of accessing e-education that falls on the student. Students will in the main be expected to provide their own PC, printer and software, and to meet the costs of running and replacing the equipment, and of logging on to the Internet. These costs are not insubstantial. In the USA the distribution of computers is highly graduated by income, race/ethnicity and educational attainment (Gladieux & Swail, 1999). In Third World countries, the ratio of the cost of purchase and running the equipment to annual income is much higher.

Local centres may, of course, mitigate student costs by providing access to machines, but they cost a fair amount in rent, equipment, furniture and staffing to set up—and generally accommodate very few students at any one time. This is not a solution to mass access to e-education—which is why the African Virtual University is such a limited project. Commercial Internet cafes cost money to use and are not necessarily ideal environments for study. In any case, in a country like Uganda, anything that uses a telephone line is extremely expensive.

Unfortunately it is not always clear whether comparative studies of the costs of e-education and, on the one hand, traditional classroom-based systems, and, on the other, first and second generation distance learning systems, take account of (a) the full institutional costs of the systems, including overheads, and (b) the full system costs, including those costs that have been passed on to the students. The likelihood is that the reported costs will only cover the costs falling on the institutional budget, and will either wholly ignore or else seriously underestimate the costs of maintaining

the network, and over-estimate the period over which computing equipment can be annualised (see Rumble, 2001, for more detailed information on this).

One approach is to substitute computer-mediated communications (CMC) for classroom teaching—leaving everything else unchanged. A study conducted at the University of Illinois found that unit costs came down on all nine courses in which asynchronous learning networks were substituted for face-to-face instruction (Arvan *et al.*, 1998). Bates (2000, pp. 126–127) also thinks that online university courses using just CMC, and involving no real e-materials development, will be cheaper than face-to-face courses. However, as soon as one begins to add in materials, the cost structure begins to change, at which point the student load becomes an important consideration. Bates (2000, pp. 128–129) suggests that a standard Web-based course, with a mix of pre-prepared Web materials, online discussion forums, and print in the form of required texts, is increasingly more cost-effective than face-to-face teaching as numbers per class increase beyond 40 per year over a four-year period. Under 20 students, it is not economically worth doing. Between 20 and 40 students per year per course, any cost differences are likely to be less significant than differences in pedagogical benefits. Bates' findings, however, will be critically influenced by whether or not he has got the costs of tuition right, and by whether the larger class size is feasible. Boettcher (1999) suggests that it might not be. Certainly, Arizona Learning Systems (1998, p. 24) found that the cost per course enrolment of an 'average' Internet course (US\$571) is higher than that of traditional classroom instruction (\$474), though labour-for-labour substitution might bring this down to \$447. However, much depends on the nature of the materials and their associated development costs which, as we saw, they estimated to vary from US\$6,000 to \$1,000,000 for a three-unit Internet course.

When it comes to comparing the costs of e-education with other forms of distance education, the findings of the few studies we have seem much clearer. In an Australian study, Inglis (1999, p. 233) found the online version of a course was less cost efficient at all levels of enrolment (50–200 students) than a print-based distance education course. Elsewhere, Jung (2000, pp. 228–229) compared the costs of presenting standard three credit courses at the Korea National Open University. The course involving textbooks, CD-ROM and electronic tuition was more expensive than the courses using textbooks, radio and face-to-face tuition, or those using textbooks, television and face-to-face tuition. However, drop-out was only 10% on the e-course, compared with 60% on the other two types.

## **Values**

The rush of distance educators into e-education raises very considerable questions about the values that we hold. Looking back at the development of the Open University in the UK, and of similar 'open' or distance teaching universities, colleges and schools in other countries, one can discern a remarkable consistency in the values that underpinned their foundation. Almost invariably these institutions were set up to enable access to education. Of course, exactly who the 'open universities', 'open colleges' and 'open schools' were designed to serve varied depending on the circumstances pertaining in a particular jurisdiction, but generally they included

school leavers whose wish to enter secondary or higher education was frustrated by a lack of sufficient places in the traditional system, and for whom the capability of distance education to provide more places at a lower average cost per student provided cash-strapped governments with a potential solution to the problem of frustrated demand; and those who, for a variety of reasons, wanted to enrol on a course of study, and for whom distance education provided a more flexible and accessible route to education.

Significantly, distance education has been seen as a way forward in both advanced industrialised, emerging industrialised and developing countries. Jurisdictions as diverse as the UK, Spain, the Netherlands, Germany, Costa Rica, Venezuela, Iran, Israel, India, Bangladesh, Thailand, Korea and Tanzania have set up distance teaching universities. Indeed, it is not even necessary to set up a distance teaching university: all that is needed is to diversify existing universities so that they too, as dual-mode institutions, embrace distance teaching methods. That this has happened with increasing frequency is a testament to the pressures on universities to expand, to seek new markets, and to lower their costs by embracing the combination of resource-based learning and independent study strategies that together make up distance education.

For many people, however, increased access to education through distance methods comes at a price—a decline in the quality of the educational experience. From its earliest days distance education was perceived as having a quality problem. Partly this arose because of its origins in the commercial correspondence college sector. Although there have been some excellent providers, far too many providers have been more interested in the economics of the diploma mill and of ‘drop-out money’ (Noble, 1999). This maximised profit at the expense of teaching quality, student success and ultimately of reputation.

By the 1970s there were signs that the dubious reputation of distance education was being overcome. The best providers, both public and private, wanted to offer accessible educational opportunities, based on quality materials, leading to reputable qualifications. Additionally, many wanted to do this at a cost to the student that would enable those from disadvantaged backgrounds to participate. It is to their credit that institutions such as the Open University and the National Extension College in the UK, and their counterparts in other countries, had a lot to do with the establishment of this ethos. In the process many hundreds of thousands of students who would otherwise have been denied a place have benefited from the opportunities that have been made available.

Nevertheless, distance education continued to be seen as second best because it separated the teacher from the learner, and thus cut out opportunities for dialogue to occur. The argument that it provided, through correspondence, opportunities for ‘guided didactic conversation’ (Holmberg, 1995, pp. 47–50) was never very convincing, but even those systems such as the Open University that built in some face-to-face tuition tended to weaken its impact, firstly, by making participation voluntary, and secondly, by getting tutors to more or less restrict themselves to the content defined by the materials. As a direct result distance education, at least at the higher education level, is seen to be deficient because it tends to over-emphasise

the package at the expense of serendipity, and because it fails to provide an environment within which social and cultural learning can take place (Escotet, 1980, pp. 11–19), and within which democratic discussion and argument can flourish (Harris, 1987, p. 142).

Of course, none of these criticisms is wholly fair. Conventional courses too are often highly structured. Campus-based universities are often far from perfect, given the prevalence of overcrowded lectures and the lack of opportunities in large institutions for students to know and hence to discuss their ideas with either their teachers or even their peers (Harris, 1987, p. 142; Ritzer, 1993, pp. 141–142). Still, it is this perceived deficiency in earlier forms of distance education that led to distance educators showing such interest in asynchronous learning networks, the defining characteristic of which is to provide ‘substantial, rapid, asynchronous activity with others’ (Mayadas, n.d.), in contrast to other, inferior, distance teaching models, such as the predominantly American models of synchronous audio or video presentations and conferences, and videotaped courses, and the basically European model of teacher-driven, mail-based correspondence courses.

There seems little doubt that it is the capacity of computer-mediated communications (CMC) and Asynchronous Learning Networks (ALNs) to support dialogue that is one of the reasons why these approaches are *also* being avidly embraced by those who work within traditional universities, so much so that there is for the first time a real rush from within the traditional university sector to enter (third generation) distance education. Early on in this development Harasim (1989, p. 60), working out of the Ontario Institute for Studies in Education, argued that CMC would enable *traditional* students not only to control the time, place, pace and nature of interaction, but also to access a *great deal more class time*, since this would no longer be confined by the finite time allocated to face-to-face classes. (Unacknowledged at the time was the impact this was likely to have on the time required of the teacher.)

Additionally, online interaction with their teacher and peers gets round the increasing irrationality of large campus universities where education can be ‘a de-humanizing experience’, and in which it is difficult for students to get to know other students and virtually impossible for them to know their professors (Ritzer, 1993, pp. 141–142). In these circumstances, and as ALNs increasingly move beyond textual messaging to audio and video messaging, so they can provide an experience that is better because it is both more immediate and more personalised, and also more social—thus opening up the possibility of group-based constructivist learning.

Of course, these pedagogically- and socially-driven values are not the only reasons why traditional universities are embracing CMC/ALN-based distance learning. Another reason is the increasing trend for higher education to be seen as just one more consumer good. To understand this we need to look at what has been happening in traditional higher education where, according to one US report, students ‘are bringing to higher education exactly the same consumer expectations that they have for every other commercial enterprise with which they deal’ (Levine, 1993, p. 4). What students want, the report suggests, is ‘a stripped-down version of

college without student affairs, extracurricular activity, residence life, varsity sport, campus chaplains ...', one that provides 'high-quality products but ... low costs', and one where education is close to home and operates 'during convenient hours—preferably round the clock' (ibid.).

Ritzer (1998, p. 154) argues that, to satisfy these students, universities will embrace technology because students are attracted to high-tech environments; technology promises to lower university costs; and because technology promises to deliver programmes both to satellite campuses near where they live, and, like Domino's pizzas, into their homes (p. 11). Convenience education, like convenience foods, is with us. Indeed, officials at the University of Northern Arizona specifically claim that their university is 'designed around the concept of convenience for the student' (Howard, 1996, p. 7). Integral to this is the delivery of distance and online education courses for home consumption. What is delivered is content and, possibly, interaction. Once this kind of education is provided locally, there is no reason why it cannot be provided globally. The possibility of capturing a global market thus adds to the attraction of e-education.

As a direct result of these developments, there are widespread pressures to move towards e-education from distance educators, those working in campus settings, trainers, and from new entrant firms such as Merrill Lynch, Banc One, and a host of venture capital groups who see Internet education and training as the next 'Killer App' (Peterson *et al.*, 1999).

## Disbenefits

A Canadian scientist, Ursula Franklin (1992, p. 124), wisely observed:

Whenever someone talks to you about the benefits and costs of a particular project, don't ask 'What benefits?' ask '*Whose* benefits and *whose* costs?' At times it helps to rephrase an observation in line with a perspective from the receiving end of technology.

I have little doubt that e-education has enabled distance educators and others to improve the quality of the dialogue available to students, and often to provide them with a richer spectrum of materials. For those students within the fold, the quality of their educational experience is being enriched. They have in effect gained a personal tutor, there to answer any query that they care to put forward. However, the potential for these additional services to be the subject of a separate charging system should give us cause for concern: e-education has the potential to disaggregate the overall product, and charge according to use. In such a system, the poor lose out.

More generally, I have little doubt that e-education is more costly than first and second generation distance education, but I also suspect that it may prove to be more costly than traditional education. In such circumstances three choices seem to be open to providers. Firstly, to severely restrict both the range and quality of the materials put online and the interactive experience open to students. To do this negates the whole purpose of moving into e-education. Secondly, wherever possible, to lower costs—most notably through degrading the work of, and casualizing the



employment of, the staff involved in developing the materials and teaching online. Thirdly, by putting more of the costs of distance education on to the students.

It is the third of these problems that most concerns me. The technology and business practices involved in e-education place additional costs on the learner. As societies and nations fracture across ever widening gaps in wealth, so the additional costs to the learner involved in e-education will fall most heavily on the poor. Currently there is widespread concern at the existence of a digital divide. As always, the solution is to seek to develop programmes that will at least allow some people among the disadvantaged sectors of society to benefit from the new developments, but in the face of the growing population, these measures increasingly look like palliatives. No doubt the costs of the technology will come down, but those who are not able to afford e-education are being written out of the game. Unfortunately this is most likely to be the case in developing countries (Perraton, 2000, p. 150).

Globalizing providers of distance education who exploit the capabilities of e-education to transcend frontiers will no doubt look to that part of the market that can afford to meet the costs of e-education. As they turn their attention towards the global market, so it will become easier for them to forget those sectors of the market (including the local market) that cannot afford the cost. The temptation to become increasingly commercial will grow—a temptation that is being fuelled by current approaches towards public expenditure. It is here that the crux of my concern lies: just how are distance educators going to respond to the increasing global need for cheap, affordable education to meet the needs of a world population that will on current forecasts grow by over three billions in the next 50 years? Is our current concern with e-education helping or hindering us in this? Or don't we care?

*Greville Rumble is an independent consultant in distance education. Address: Honeyhurst, Crowborough Road, Nutley, East Sussex, TN22 3HT, UK; Tel. + 44 1825 713291; E-mail: <greville.rumble@btinternet.com > .*

## References

- ARIZONA LEARNING SYSTEMS (1998) *Preliminary cost methodology for distance learning* (n.p., Arizona Learning Systems and the State Board of Directors for Community Colleges of Arizona).
- ARVAN, L., ORY, J.C., BULLOCK, C.D., BURNASKA, K.K. & HANSON, M. (1998) The SCALE Efficiency Projects, *Journal of Asynchronous Learning Networks*, 2(2). Available online at <[http://www.aln.org/alnweb/journal/vol2\\_issue2/arvan2.htm](http://www.aln.org/alnweb/journal/vol2_issue2/arvan2.htm)> .
- BATES, A.W. (2000) *Managing Technological Change. Strategies for College and University Leaders* (San Francisco, Jossey-Bass).
- BOETTCHER, J.V. (1999) *How many students are just right in a web course?* Available online at <<http://www.cren.net/~jboettch/number.htm>> .
- DHANARAJAN, R. (2001) Distance education: Promise, performance and potential, *Open Learning*, 16(1), pp. 61–68.
- EICHER, J.C., HAWKRIDGE, D., MCANANY, E., MARIET, F. & ORIVEL, F. (1982) *The economics of new educational media. Volume 3: Cost and effectiveness overview and synthesis* (Paris, The UNESCO Press).

- ESCOTET, M. (1980) *Tendencias de la Educación Superior a Distancia* (San José, Costa Rica, Editorial Universidad Estatal a Distancia).
- FARMER, M.A. (1999) Study: E-commerce sites pricey to build, CNET News.com. Available online at <<http://news.cnet.com/news/o-10007-202-343016.html>>.
- FRANKLIN, U. (1992) *The Real World of Technology* (Concord, Ontario, House of Anani Press Ltd).
- GLADIEUX, L.E. & SWAIL, W.S. (1999) The Internet: New engine of inequality? Paper presented to the EDUCAUSE '99 Conference. Available online at <http://www.educause.edu/ir/library/html>>.
- HARASIM, L. (1989) On-line education: a new domain: in, R. MASON & A. KAYE (Eds) *Mindweave: Communication, Computers and Distance Education* (Oxford, Pergamon Press).
- HARRIS, D. (1987) *Openness and Closure in Distance Education* (Barcombe, The Farmer Press).
- HOLMBERG, B. (1995) *Theory and Practice of Distance Education* 2nd edn (London, Routledge).
- HOWARD, E.G. (1996) Satellite Solution: Popping up like Dandelions, Satellite Campuses tighten Bond of Learning, Students, *Kansas City Business Journal*, 14, sec. 1, p. 7.
- INGLIS, A. (1999) Is online delivery less costly than print and is it meaningful to ask?, *Distance Education*, 20(2), pp. 220–39.
- JAMISON, D.T., SUPPES, P. & WELLS, S. (1974) The effectiveness of alternative media: a survey, *Review of Educational Research*, 44(1), pp. 1–67.
- JUNG, I. (2000) Technology innovations and the development of distance education: Korean experience, *Open Learning*, 15(3), pp. 217–232.
- LEVINE, A. (1993) Student expectations of college, *Change*, September/October, p. 4.
- MAYADAS, A.F. How the term 'ALN' came about?, <<http://www.alnorg/alnweb/aln.htm>>.
- NIPPER, S. (1989) Third generation distance learning and computer conferencing: in, R. MASON & A. KAYE (Eds) *Mindweave: Communication, Computers and Distance Education* (Oxford, Pergamon Press).
- NOBLE, D. (1999) *Digital Diploma Mills. Part IV, Rehearsal for the revolution*. Online at <<http://communicationucsdl.edu/dl/ddm4.html>>.
- PERRATON, H. (2000) *Open and Distance Learning in the Developing World* (London, Routledge).
- PETERSON, R.W., MAROSTICA, M.A. & CALLAHAN, L.M. (1999) *E-Learning: Helping investors climb the e-learning curve* (Minneapolis, Bancorp Piper Jaffray).
- PRICEWATERHOUSECOOPERS (2000) *Business model for the e-University*, Main report: available through <[http://www.hefce.ac.uk/pubs/HEFCE/2000/00\\_44.htm](http://www.hefce.ac.uk/pubs/HEFCE/2000/00_44.htm)>.
- RITZER, G. (1993) *The McDonaldization of Society* (Thousand Oaks, CA, Pine Forge Press).
- RITZER, G. (1998) *The McDonaldization thesis* (London, Sage Publications).
- RODERICK, E. (1998) More than just pretty pictures: A cost/benefit analysis of digital library holdings. A paper presented to the CAUSE '98 Conference, Seattle, December. Available online at <<http://www.educause.edu/library/html/cnc9804/cnc9804.html>>.
- RUMBLE, G. (1997) *The Costs and Economics of Open and Distance Learning* (London, Kogan Page).
- RUMBLE, G. (1999) Cost analysis of distance learning, *Performance Improvement Quarterly*, 12(2), pp. 122–137.
- RUMBLE, G. (2001) The Costs and Costing of Networked Learning, *Journal of Asynchronous Learning Networks*, <<http://www.aln.org/alnweb/journal>>. In press.
- U.S. BUREAU OF THE CENSUS (2000) International Data Base, estimate as at 10. 5. 2000: <<http://www.census.gov/ipc/www/worldpop.html>>.
- U.S. BUREAU OF THE CENSUS (2001) International Data Base, as at 1 January 2001: <<http://www.census.gov/ipc/www/world.html>>.