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THE COSTS OF PROVIDING ONLINE STUDENT SUPPORT SERVICES[1]

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Introduction

Distance educators have always been fascinated by the latest developments in technology. Indeed, a history of distance education might well distinguish four quite distinct phases of development - each reliant on a core technology:

- *Correspondence teaching* -reliant on cheap postal and print technologies, and dating from 1 840.
- *Educational broadcasting systems* pioneered in the 1930s and 1940s (as far as radio is concerned) and from the late 1950s (television).
- *Multi-media distance education systems,* dating from the 1970s.
- *Online distance education systems,* dating from c. 1985 when computer mediated communications (e-mail and computer conferencing) began to be used, and evolving into today's virtual institutions and ALNs (Asynchronous Learning Networks).

Initially, no one really worried how much distance education cost. Obviously, commercial operators sought to make a profit, but well into the 1970s distance education projects operating within publicly funded dual-mode institutions were rarely costed. In the late 1960s and early 1970s, however, the application of technology to education came to be seen as a way of lowering the costs of education (Jamison, Suppes & Wells, 1974: 57), and international agencies (UNESCO, World Bank, USAID) began to put large sums of money into the development of ETV (educational television) systems. The costs of institutions such as the UK Open University also became a matter of concern for the governments funding such projects. As a result analysts began to research into both the costing of educational technology and the actual costs of distance education systems (for an account of the early work done in this field, see Rumble, I 999).

The outcome of this research showed that the costs of a particular system depended upon the relative impact of a number of factors:

- The number of students enrolled
- The number of courses presented
- The frequency with which course materials are remade
- The media (text, audio, video, computer-based, face-to-face) and technology employed
- The cost structure of the chosen media/technology
- The quality of the materials produced (print quality, video formats, etc.)

[1] The printed version given here differs from the version submitted to ICDE and hence included on the IDDE CD-ROM in as much as it contains an additional section - What drives the costs of online teaching. A much fuller paper on this subject entitled 'The costs and costing of networked learning', which looks at both costing methodology and at the costs of developing online materials, online teaching, and online administration and overhead costs, has been accepted for publication - probably in June 2001 - by the *Journal of Asynchronous Learning Networks*, http://www.aln.org/alnweb/journal

- The working practices adopted by the organisation (course team models, author-editor models, use of third party materials favoured or excluded as options, in-house versus outsourced production, etc.)

- The way in which staff are employed (e.g. core versus peripheral staffing models) and remunerated
- The organisational structure (including single versus dual mode options)

Decision-makers often want to know how much distance education in its various manifestations will cost. Those who have analysed the costs of distance education tend to be cautious when it comes to giving definitive answers, but most would, I suspect, agree with Bates's (1995: 5) analysis of the costs of various media, which showed that print, audio-cassettes, and pre-recorded Instructional Television are the only media that are relatively low cost for courses with populations of from under 250 students a year to over 1000 student a year. In addition, radio is also likely to be low cost on courses with populations of I 000 or more students. However, even here one would urge caution. One of the perplexing aspects of the research is the evidence that institutions using the same technology actually experience very different orders of cost. The NBEET [1994: 36, 37) study, for example, found that in Australia the range of cost for a 30 minute videotape was from Australian $1 000 to $3 9,400, and that there were also significant ranges in the cost of print. It is clear that technology itself does not determine the costs of a particular system.

This runs counter to the view, commonly held in the 1960s, that 'the most important single factor that gives an industry a distinctive character is its technology' (Blauner, 1964: 6), and that this in turn determined the socio-technical parameters of the industry. Such a position is one of technological determinism, the view that holds that technology 'coerces social and economic organisations and relationships' (Grint and Woolgar, 1997: 11), and hence the cost structure and costs of an industry. Current research does not support this view (c.f. Grint and Woolgar, 1997). However, technological determinism continues to linger within distance education. Daniel (1996) suggests that the mega-universities *'operate differently* from other universities in many ways, not least in the way they have redefined the tasks of the academic faculty and introduced a division of labour into the teaching function' (p. 30, my italics). This does appear to be true, in as much as most of the mega-universities have adopted practices that have led to divisions of labour, but Daniel goes on to claim that *'changes in technology transform the structures* of industries' (p. 80, my italics). Further, he claims that this is a continuing process since 'it is clear that *new technologies,* such as computer conferencing and the Internet, will [in the future] *change* the format of university courses taught at a distance' (p. 130, my italics). The problem with these statements is that technology inself does none of this.

None of this is meant to deny that technology enables new things to be done, may result in changes in the way in which the work force is organised, and may enable new organisational structures to emerge. However, the costs of a particular system will be determined by the structural and working practices that are adopted around the technology - and this is a matter of management choice. Since within any given technology the possible permutations are legion, it becomes very difficult to say how much a particular technological solution to the challenges of teaching at a distance will cost.

These introductory remarks need to be kept in mind when we turn to consider the costs of online learning, particularly given the current interest in whether online learning actually adds to, or reduces, costs.

Is online learning more cost efficient than other options?

A number of case studies comparing the costs of online learning with other options are beginning to emerge. This section attempts to summarise the information we now have. In approaching this issue it is worth bearing in mind that what constitutes an 'online' system varies enormously. Typologies have

their dangers, but they can also be useful in sorting out one's thinking - and the following typology is offered with this in mind:

a) Type A online systems offer Computer-Based Learning (CBL) involving textual, audio, and video course materials in electronic format. No student support is involved.
b) Type B online systems offer Computer Mediated Communications (CMC) supporting tutor-student and student-student interaction. This support may be offered in synchronous mode (Type B 1) or asynchronous mode (type B2).
c) Type A/B systems combining both CBT and CMC.

Comparing the costs of face-to-face and online instruction

Bates (2000: 127) suggests that the cost of providing 'Type B' online student-teacher and student-student interaction tends to be lower than the cost of providing traditional face-to-face teaching in a classroom because 'a good deal of the students' study time ... is spent interacting with the pre-prepared multi-media material, so the teacher needs to spend less time per student overall moderating discussion forums compared with the total time spent in classroom teaching' (ibid.: 128). However, 'the online costs still have to be added to the costs of prepared multimedia materials' (Type A costs) (p. 128), and this pushes the total costs of online systems above those of correspondence and multimedia systems, but not necessarily of classroom-based systems since (a) the direct cost per student of CMC is less than the direct cost of classroom teaching, and (b) there are still economies of scale to be achieved. The question is, what is the breakeven point at which Type A/B online systems become cheaper (in average cost terms) than classroom teaching.? Bates, based on his experience at the University of British Columbia, reports that

> 'We are fairly confident that a standard Web-based course, with a mix of pre-prepared Web materials, on-line discussion forums, and print in the form of required texts, becomes increasingly more cost-effective than face-to-face teaching as numbers per class increase beyond forty per year over a four-year period. This assumes that interaction between students and teachers remains high. Conversely, we tend to avoid developing distributed learning courses for fewer than twenty students per year. Between twenty and forty students per year per course, any cost differences are likely to be less significant than differences in benefits.' (Bates, 2000: 128-9).

Bates's break-even number if students is low when compared with Jewett's (1999) analysis. The latter looked at the relative costs of classroom versus asynchronous network courses, and suggested that, if the instructors spend the same proportion of their time supporting students (i.e. between 25% and 33% of their time), then one needs at least 450 students on an asynchronous network course before the average cost per student falls below that of classroom instruction on a course with the same number of credit units. However, if the instructors spend more of their time on supporting students (and they could be spending twice as much), then one will need at least 900 students before the average cost comes down below that of classroom instruction. Could such numbers be handled? Boettcher (1999) suggests that web courses can support from 25 to 65 students (at the upper end of the range) numbers that are 'far from the much larger numbers originally dreamed of by administrators and legislators'.

These reports are looking at the costs from the point of view of institutional teaching costs. What about the cost of the student's time - an important factor in training courses. Ravet and Layte (1997: 143-2) point to the very significant overall savings that accrue from training online, compared to face-to-face training. These savings come from reducing the costs of the time and travel spent in attending courses. Phelps et al (1991: 12-14) compared the costs of the on-line version of a two-week residential course for US Army reservists with the original version. They showed that while the conversion to computer-mediated communication format of a two-week residential course for US Army reservists involved additional staffing costs of US$152,300, and start-up costs of $73,100, the

running costs came down from $289,650 to $121,300. They concluded that the online version would have been about 20 per cent more costly if it only substituted for one presentation of the residential course, but total costs were halved when it substituted for ten presentations.

Whalen and Wright (1998: 40) provide a cost comparison of a traditional two day face-to-face training course with various kinds of web-based courses (Table 1). They suggest that the web-based courses are more cost-efficient than traditional training courses. In particular Whalen and Wright (I 998: 3 5) argue that studying a web-based course is more efficient in use of student time - so that the content that in a classroom is put over across 12 hours, actually takes only 4 hours to cover on a synchronous web-course, and 2.5 hours on an asynchronous web-course.

Table 1: Per-student cost of classroom and 4 different formats of a Web-based course
Source: Whalen and Wright (I 998: 40)

Per student cost, Canadian $

	Class-course	**Web-course**			
Type	Synchronous	Asynchronous	Asynchronous	Asynchronous	Synchronous
Annualisation of development costs (years * students)	5 * 200	5 * 200	5 * 200	5 * 200	5 * 200
Learning platform	N/a	WebCT	Mentys	Pebblesoft	Symposium
Course development	143	660	660	434	53
Tuition	600	-	-	-	-
Travel	70	-	-	-	-
Server	-	25	25	25	25
Learning platform	-	0.14	7	8	3.50
Student time	614	110	110	110	176
Instructor time	-	-	-	-	66
Total	**1427**	**795**	**802**	**577**	**324**
Savings per student over classroom delivery	N/a	632	625	850	1103

Whalen and Wright's (1998: 42) conclusion is that while asynchronous web-based courses have higher fixed development costs than classroom instruction, these are offset by lower variable delivery costs. A significant proportion of this saving derives from course compression (the fact that in a web-course it takes less student time to study a given body of material than is the case with classroom instruction). Obviously, where the opportunity costs of student time is an important factor - as in in-company training - this is an important cost consideration. This would not apply outside the training situation where student time is 'free' as far as the provider is concerned.

Arvan, Ory, Bullock, Bumaska and Hanson (1998) looked at the time it took for the SCALE Efficiency Projects to achieve savings. All the projects had incurred development costs, and these were spread across each presentation of the course (a process akin to annualisation). Two scenarios were explored, one involving no discounting, and the other where future benefits were discounted at the fairly conservative (i.e. expensive) interest rate of 9% per annum. All nine of the projects they looked at succeeded in lowering expenditure per student without compromising quality. The savings achieved depend in part on the way in which faculty salary costs are calculated on the ALN (asynchronous learning network) and classroom-based versions of the course, but the savings per student on an economics course ECON300 ranged from a 'worst case' calculation scenario of US$55 (150 students) or $71 (180 students), to a 'best' case of $181 (150 students) or $209 (180 students).

On this basis, the investment in developing the ALN version of the course would be recovered within one to three years.

Comparing the costs of print-based versus online education

Inglis (1999) compares the costs of an introductory course on photography offered by the RMIT University in Australia. The print-based version comprised some 200 pages of printed material, a textbook prepared in Word, made-up in Adobe, and Xeroxed in looseleaf format before being express mailed to the students, a broadcast tele-series, assessment by a series of projects, and by a reflective piece of work undertaken under controlled conditions. Student support was offered over the telephone. Assignments were mailed, with local invigilation for the examination. For the online version, the printed material was converted into HTML and made available to students via a website, from which students could download. Student support was offered through e-mail. There was no change in the handling of the assignments and examination, nor of the tele-series, which was broadcast.

In costing the programme, the ISP costs were treated as an institutional rather than a student cost. The same design and delivery costs (basically salary costs) have been attributed to both versions of the course. The average cost per student is shown in Table 2 below. As the Table shows, the online version of the course is less cost efficient at all levels of enrolment - and in both cases such economies of scale as there are have been more or less obtained by the time enrolments reach 150. The detailed figures provided by Inglis (1999: 233) show the costs of student support to be higher in the online version of the course, so that overall the cost savings arising from not printing the materials ($18.62) are more than obliterated by the increased costs of delivering and supporting students online ($63.59). The largest components of these increased costs arise from the charges paid to the ISP provider ($29.93) and the doubling of the time spent supporting students in electronic written as opposed to telephonic spoken form ($46 rather than $23).

Table 2: Average cost per student of print and online versions of a course
Source: Inglis (I 999: 23 1)

	Average cost per student: 1999 Aus$	
Volume of students	**Print version**	**Online**
50	169.84	217.71
100	125.38	171.63
150	110.56	156.27
200	103.15	148.59

Comparing the costs of online and broadcast-based distance education

Jung (2000: 228-9) reports on the costs incurred in presenting standard three credit courses using various technologies at the Korea National Open University (Table 3). The cost of producing and delivering the web-based courses was kept down because KNOU used existing video- and audio-clips stored in its digital library, together with CD-ROM and printed textbooks. The figures do not show the relative balance between the costs of production and delivery, while the reported reduction in production costs arising from using archive materials means that it would be dangerous to extrapolate

these figures. What is encouraging, however, is the improved retention rate, which impacts on differential between the average cost per enrolment and average cost per 'graduate'.

Table 3: Costs of distance education at the Korea National Open University
Source: Jung (2000: 229)

	TV-based course	**Radio-based course**	**Web-based course**

Rating			
Media	Textbook, TV programmes and face-to-face tuition	Textbook, radio programmes and face-to-face tuition	Textbook, video- and audio-clips, electronic tuition
Number of students	100	1000	30
Cost to produce and deliver (US$)	80000	35000	13000
Cost per student (US$)	80	35	434
Drop-out rate (%)	60	60	10
Cost per completed student (US$)	200	87.5	482

What drives the costs of online teaching?

To understand the costs of online teaching, we need to look at the costs of the component sub-systems rather than an overall comparison of the costs of one kind of system versus another. So far as the costs of online materials are concerned, the evidence (see Rumble, 2001) shows a wide variation in costs, 'reflecting the sophistication of the media used, and the way in which it is developed. But what about the costs of online teaching? Here we get into the costs of labour and the problems of student load. Bates (2000: 126-7) has suggested that in comparison with face-to-face teaching, online education will lower the costs of tuition because a good deal of the students' time is spent studying the material, and so the teacher needs to spend less time per student overall in class. Other analysts argue that students will also spend a great deal more time learning from their peers, and that this too will reduce the demands they make of their tutors. Certainly DiBiase, teaching for Penn State University's World Campus, found that he and his Teaching Assistant were spending less time supporting students on an online course (1.6 hours per student against 2.6 hours on a regular course) (DiBiase, 2000: 15-16).

However, the general consensus seems to be that online tutoring adds to traditional faculty workload (Arizona Learning Systems, 1998: 20; Arvan et al, 1998) given the enormous volume of messaging (Moonen, 1997) arising from increased interaction with students (Jewett, 1999: 37), with each message requiring more time to compose than is the case in verbal interactions (Inglis, 1999: 223). Moonen thinks that the increased load would be of the order of 5 to IO hours a week for a class of 60 to 120 students (Moonen, 1997). Jewett thinks tutors could well spend twice as much time tutoring on-line as they do face-to-face (Jewitt, 1999: 41). This raises the question of how many students an online instructor can handle. In classroom courses in the USA it looks as if people think they can handle from 25 to 30 students, working perhaps 10 to 12 hours a week. Boettcher suggests that experience indicates that a member of faculty can handle more students on a web course - in the range 25 to 65, but that this will require more time - so that although there are courses with 50 – 60

students on them, there are many courses where student numbers are deliberately kept down, somewhere in the range of from 12 to 20 students (Boettcher, 1999).

One way of coping with an academic's increased workload is to hire more staff but this, of course, costs more. However, the impact on labour costs can be reduced through 'labour-for-labour' substitution - that is, the substitution of cheap labour for expensive faculty labour. This cheap labour might be students (Arvan et al, 1998), teaching assistants, or clerks covering help desks (Arizona Learning Systems, 1998: 24). These options are much discussed in the US literature. However, hiring cheaper labour is not possible in small classes run by just one academic; it only works in large classes (Arvan et al, 1998). Also, labour-for-labour substitution has its critics. Traditionally PhD students have helped teach courses but student labour is not the cheapest labour on offer. Adjunct staff hired by the class is even less expensive - so much so that there is concern that their employment could damage graduate programmes by reducing the employment opportunities for PhD students (Turoff, 1998).

Up to now I have been talking about the impact of CMC on the costs of traditional institutions. What about its impact on the costs of distance education delivery? Firstly, there is evidence that tutors spend more time moderating

and tutoring e-courses. Tolley, drawing on her experience as an Open University tutor, found that she spent more than twice as many hours tutoring the on-line version of *What is Europe?* as she did the 'traditional' version - 120 hours against 48 (Tolley, 2000: 263). She was not paid for the additional work, which also had a dramatic effect on her 'phone bill. Armand, from his perspective at Athabasca University, suggests that it is these costs that may in the end constrain the extent to which large-scale distance teaching universities can adopt on-line technologies (Armand, 1999: 20). Some institutions are trying to find ways of containing demands on tutor time by controlling student expectations and limiting the time for engagement on a particular topic; others, like the e-University, seem to be talking about putting the task of tutoring our to commercial ventures like Tutor.com, which will charge students for use (Price WaterhouseCoopers, 2000, paragraphs 7980).

Secondly, there are the costs of reception. Cost analysis tends to be bounded by the institutional budget. The costs students incur in acquiring and operating equipment is not generally taken into account - yet from the would-be student's point of view, these costs can have a major impact on affordability, and hence on access. In the USA the distribution of computers is highly graduated by income, race/ethnicity, and educational attainment (Gladieux and Swail, 1999). If owning the equipment is a necessary condition for participation, then expect to see more disadvantaged people being excluded on cost grounds.

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 - which is why the African Virtual University is such a limited project. Internet caf6s 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.

Some tentative conclusions

On the basis of these studies, it begins to look as if we might reach some conclusions about the relative costs of online systems as against other systems. For example, we might conclude that web-based courses have the potential to be more cost efficient (i.e. can achieve a lower cost per student) than television-based distance learning courses, but are less efficient than radio or print-based courses. We might also conclude that they tend to be cheaper than class-based courses - though as we have seen this is by no means proven with many people believing that web-based courses increase the workload (and hence the costs) of instructors.

Nevertheless, if online education is cheaper than face-to-face teaching, from a purely cost-driven point of view, it makes considerable sense for a traditional (i.e. face-to-face teaching) institution to adopt online teaching methodologies - but on the basis of the results available to date, and again from a purely cost driven point of view, it does not make sense for a distance learning system to do this. This is because 'interactive group communication technologies, like computer conferencing, de-industrialise the distance education process, and hence increase costs' (Annand, 1999: 47). Annand believes that this will significantly constrain the adoption of these technologies in the existing distance teaching universities. On the other hand, the benefits that are said to derive from using ALN technologies (increased interaction, lower student drop-out rates) might well outweigh these financial considerations.

In addition to these course-based benefits, we should note that there are said to be benefits to be derived from using the web for student administration and general support purposes (see Rumble, 2001). The use of Call Centre and Help Desk methodologies might also lower costs. In addition, an all-web-based system will have much lower buildings and accommodations costs than almost any other kind of system, particularly if it is assumed that not just the students and tutors, but also the academic staff designing the courses, work from home. Given this, there seems to be a real case for adopting online technologies within educational systems. But is this actually the case? Part of the problem with the existing cost studies is that they tend only look at the costs of developing materials and tutoring online. Very significant areas of cost are ignored including, for instance:

- The costs of decision-making - for example, the development and continual adaptation of a technology strategy
- The costs of developing a website (said by a recent Gartner Group report to be at least US$ 1,000,000 and rising by 25% per annum) (Farmer, 1999).

- The costs of maintaining and operating IT systems are considerable (see Leach and Smallen, 1978, 2000). These costs are generally higher than most analysts acknowledge. For example, most existing cost studies of online learning annualise IT equipment over a 5 year life notwithstanding that the evidence suggests that most IT equipment is actually replaced between 3 and 5 years. One to two years' difference in annualisation has a considerable impact on costs.
- The significant costs of accessing the technology necessary to learn online that are passed on to the students. These are endangering the social mission underpinning many distance education systems. For example, Gladieux and Swail (1999) point out that in the USA the distribution of computers is highly graduated by income, race/ethnicity, and educational attainment.
- The additional staff time involved. Most analysts believe that the time required to develop online materials, and to teach online, is greater than the time required to design a classroom session, or to teach in class. A whole rage of tactics are emerging to constrain these costs, including requiring staff to absorb the additional work; relieving staff of some of their other duties (release time); increasing staff compensations by making overload payments; hiring cheaper staff - either graduate students or even cheaper Teaching Adjuncts, etc. None of these strategies is without problems.

All this makes any comparison between one kind of system and another very difficult to draw at the present time, and underlines the fact that it is increasingly urgent to study the costs of online learning more fully so that policy making at every level (international, national, institutional, and departmental) can be better informed.

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