

Report to the Department for Education and Employment

by the

International Research Foundation for Open Learning

**PLANNING AND EVALUATING SYSTEMS OF OPEN AND DISTANCE
LEARNING**

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Contents

Executive summary	3
Technologies for open and distance learning	4
1 The choice of technologies	4
2 Cost behaviour	9
3 Access	19
4 Quality	20
Organisational structures	21
5 The management of open and distance learning	21
6 Partnerships	26
Evaluation	
7 An evaluative framework	28
Bibliography	32
Annex A: Terms of reference	33
Annex B: Indicators of quality of open and distance learning	34

Executive summary

The design of effective systems of open and distance learning demands decisions on technologies, considering their consequences for cost, access and quality, and on organisational structure. Research has consistently shown that there are no significant difference in the effectiveness of different media so that these same criteria, of cost, access and quality, can guide the choice of media. There are advantages in using several media for teaching, rather than one, and for linking mediated communication with opportunities for face-to-face learning.

The costs of lecturing provide a basic point of comparison for the cost of open and distance learning. Lecturing costs generally vary with the number of students, while open and distance learning may allow economies of scale. Open and distance learning costs generally rise, in terms of cost per student learning hour, as we move from print, through broadcasting, to videoconferencing and the use of computers. Some uses of computers also shift significant costs from the teaching institution to the individual student.

Access to programmes of open and distance learning is of critical significance at the stage of student recruitment. The choice of location, the existence of a structure for progressing through learning opportunities, easily accessible information, and cost all have a bearing on access. The quality of open and distance learning has often been questioned, especially because of its history of inefficiency, as measured by completion rates, and because it is marked by association with rote learning. Measures to assess quality have been developed. In general, educational quality and effectiveness is likely to be increased with generous staffing ratios, good opportunities for interaction with a tutor, and an appropriate choice of media; trade-offs are needed here as these measures tend to increase the unit costs of open and distance learning.

Effective programme of open and distance learning require a structure for six functions: materials development and production, distribution, student recruitment, tutoring and counselling, student records, and assessment or accreditation. These functions may rest with one institution or be shared with partners. In some cases one agency provides funding for open and distance learning but leaves all the other functions to executing bodies. While it is necessary to develop appropriate structures for all these functions, three issues of particular significance in managing open and distance learning require emphasis as they have often been neglected. Some programmes have not put in place effective arrangements for disseminating materials or recruiting students. Tutoring and counselling that matches the needs of students is usually necessary: stand-alone materials may do just that but not teach. In the development of teaching materials difficult issues of intellectual property need to be resolved at the outset.

Examples of different approaches to organisation are provided by the Open University, a freestanding institution undertaking all six functions; Wye College of the University of London which teaches in two modes, conventionally and at a distance; the National Extension College, a charitable nongovernment organisation which undertakes all functions except the examination of students; and the Open College of the North West, a consortium of institutions of further and higher education. Partnerships of various kinds have been formed to run open and distance learning. Their effectiveness appears to depend on five factors: a clear purpose; active roles for staff at various levels within all partners; a governance and funding structure that fits the purpose; benefits for all partners; a commitment of resources from all partners.

An evaluative framework is proposed which asks about evidence of demand, sustainable structure, choice of technology, evidence of funding, and about roles, funding and governance for partnerships.

Technologies for open and distance learning

This paper is designed to help make choices for open and distance learning. It has three parts: looking at the available technologies and their consequences in terms of cost, access and quality; considering, with a small number of examples, organisational structures for open and distance learning; and proposing a framework for evaluating proposals.

The choice of technologies

1.1 Open learning (minimum constraint on access, pace and method of study) and distance learning (information technology to bring students and teachers together) depend on technology. They use print, sometimes in the form of correspondence courses, broadcasting, recorded sound or vision, or computer links, often in association with some face-to-face support. While much recent attention has focused on computer-based technologies, much open and distance learning still relies on print, and conventional ways of linking students and tutors.

1.2 For more than 60 years, researchers have compared the effectiveness of media in terms of their learning effectiveness. The overwhelming conclusion of this research is that there are no significant differences in terms of effectiveness. Two, of many, studies echo the discussion. Trenaman (1967: 38), who compared the effectiveness of teaching the same material through a variety of media found that, 'the difference between one programme and another, and differences between the occupation [of learners] are very significant indeed, and account for far more variation than any differences between one medium and another'. More recently Clark (1983) concluded that 'media do not influence learning under any conditions' and that any learning gains are the result of improved teaching methods and of a Hawthorne effect. (There are summaries of the research in Chu and Schramm 1968, and Moore and Kearsley 1996: 62.)

1.3 There is some evidence to suggest that there are merits in combining media in order to benefit from their particular strengths and weaknesses: print is convenient and permanent; television and computer simulations can dramatise information; radio can encourage. If individual learners have different learning styles, so that any one individual learns most effectively from a particular medium, there are arguments for using them in combination. Mixed-mode courses are thought to have lower dropout rates than those that use a single medium. (There is surprisingly little research on this.) Many open and distance learning programmes have combined mass media with individual tutoring offered face-to-face, or through correspondence marking, or by computer link.

1.4 In designing a course or programme, to be offered through open and distance learning, we cannot, then, find a simple equation like 'audio is better than print' or 'computer technology always has the edge on interactive video'. The choice is likely to depend on such factors as convenience for users, cost, access, funding opportunities and even fashion. A rational choice of technologies would examine their suitability in terms of their likely consequences, especially for cost and access, and of the educational purpose for which they are being used. They differ in their cost structure, the role they require of tutors, and the opportunities they offer for communication between tutors and students or among students. Increased interest in computer communication has focused attention on the difference between synchronous and asynchronous communication - asking about the advantages and drawbacks of the, usually costly, arrangements needed for synchronous communication and immediate feedback.

1.5 Various frameworks have been proposed to analyse learning and to apply that analysis to the selection of technologies. Bloom's taxonomy stressed the distinction between cognitive, affective and psychomotor learning. Gagné (1968) proposed an analysis in terms of a hierarchy and stressed the importance and effectiveness of learning at the higher levels,

involving problem-solving. In considering methods for open learning Lewis (1973) sought methods of course design that would develop higher-order problem-solving skills. Stenhouse (1975) suggested that we should distinguish between training, concerned with skills, instruction, concerned with information, initiation into social norms and induction in which students are introduced to thought systems enabling judgment. Laurillard (1993) has recently proposed a structure which locates technologies according to the type of activity they allow by student or by tutor.

1.6 It would not be reasonable to assess a proposal for work in open and distance learning according to their match with one or other of these theoretical positions. Two simpler approaches are suggested. First, a simple typology appears in table 1 which makes it possible to ask whether a particular technology appears to match the purpose for which it is proposed. It demonstrates that, in choosing technology, we need to consider not only learning effectiveness but also questions of quality and access. Second, both the literature and the everyday practice of those working in open and distance learning suggest that critical questions cluster around issues of contact between tutor and student, of the teaching of practical skills, and of teaching that promotes higher levels of learning, whose outcome cannot be specified in advance. The recommended criterion is that any proposal should have examined issues of this kind and be able to justify the choices made.

1.7 Open and distance learning often uses a mix of technologies and yokes mediated learning with opportunities for face-to-face tuition. This paper examines five groups of technology: print, the use of audio and video recordings, broadcasting, videoconferencing, and computer-related learning. They need to be seen in relation to face-to-face education because this provides a useful point of comparison and because the most effective systems of open and distance learning are likely to be those that mix mediated with conventional teaching.

1.8 Print has been a staple of education since its invention. It remains the basis for most open and distance learning. Correspondence lessons, or tutor-marked assignments, are a well-tried method of providing tutorial guidance to students. These methods are, for example, central to most Open University courses. Changes in technology have affected the cost of print, and ways of distributing printed material and dealing with assignments: the main effect has been to increase the flexibility of the medium. Desk-top publishing and just-in-time printing have changed the relationship between fixed and variable costs of print with the consequence that short print runs, which used to have high unit costs, can now be produced.

1.9 Audio and videocassettes are used on a modest scale in open and distance learning. They have particular value for teaching languages or, in the case of videocassettes, where simulations and illustrations are critical. They allow learners to use them whenever they choose but put the cost of distribution on to the teaching agency.

1.10 Broadcasting, in radio and television, has been available to the Open University and, from time to time, to other agencies working in open and distance learning. The National Extension College pioneered the use of broadcasting with print and face-to-face teaching in

Table 1: Technologies for open and distance learning

Medium	Educational strength or weakness	Type of communication	Implications for access	Cost implications
Face-to-face study	Adaptable; may allow immediate individual response to learner; can be highly motivating	Simultaneous, two way, communication is possible	Requires attendance at fixed time and place	Costs generally rise in relation to student numbers
Print	Provides convenient permanent record Limited in its effectiveness to motivate students May be of restricted value for some practical subjects	One-way communication Two-way communication possible where correspondence assignments are designed and returned through mail, fax or email	Generally no problems of access	Significant fixed costs in developing printed materials. Reproduction costs used who economies for large print runs but with digital, just-in-time, printing may no longer do so
Broadcasting (radio and television)	Can motivate, excite, dramatise, illustrate Ephemeral unless students record off-air	One way communication	No problem of access, with universal access to radio and tv, but timing of broadcasts may be inconvenient	Production costs generally higher than for print Television generally up to ten times as expensive as radio Transmission costs generally met by broadcasting authority
Cassettes	Similar educational qualities to broadcasts but not ephemeral	Generally one-way communication. Audiocassettes occasionally used for delayed response to tutors	Problems of access only if students do not have audio or videocassette player (79% of households had video 1995)	Production costs in principle as for broadcasting; costs in practice lower as lower quality is often acceptable Distribution cost falls on teaching institution
Videoconferencing	Allows up-to-date, live, two-way communication, giving a sense of immediacy. Ephemeral	Can be two-way synchronous communication, generally between two sites, or with many sites if one-way video and two-way audio	Access open only to those who can reach location with equipment	Significant investment needed in videoconferencing equipment ISDN line charges Cost a function of number of sites involved
Computer related learning	Allows simulations and activities that depend on computer capacity Can be used as communication medium	Allows two-way asynchronous communication	Major, but reducing, problems of access. 25% of households had PC (1995) but smaller proportion had Internet access	Heavy initial cost to develop computer-based learning material Significant personal investment needed for computer Cost of communication through Internet relatively low

the early 1960s. The Open College had access to airtime on Channel Four on its establishment. The advent of digital broadcasting may increase the availability of airtime for broadcasting. Its main significance may be as a shop window: the Open University transformed education and culture, as its founding mother Jennie Lee said it would, when its broadcasts proudly said, in millions of living rooms, 'This is the Open University'.

1.11 Institutions have begun to use videoconferencing as a way of reaching distant audiences. There is considerable experience outside Britain of distributing teaching by using one-way video and two-way audio so that students can react to a teacher in a distant classroom. (Typically, learners make little use of the audio feedback; it looks as if we like to know that it is possible to talk to a lecturer but seldom make use of the opportunity.)

1.12 We are always being dazzled by the figures on computer power. They are exceeded only by claims for its role in transforming education. Computers are being used in education for management, as a distribution system, and for various teaching and informational activities. We do not consider their use for management here. Computer links make it possible for materials to be developed in one place and sent in machine-readable format, to another. In principle individual students can download the teaching materials they need and a college can avoid the costs and inconvenience of printing, packing and postage. In practice, this tends to cause problems to students and gives them a lower quality of material.

1.13 Where computers are used for teaching and to distribute information they blur the distinction between conventional education and open and distance learning. Computers have been used, in the classroom or off-campus, for uses that can fall under five headings. One common feature is that each use generally requires software that is developed outside the institution.

1.13.1 Computer-based learning, where students are taught by, and interact with, a program designed to teach part of the curriculum: these vary in their sophistication - some are mechanised drill and practice some (e.g. LOGO) are designed to stimulate imaginative learning; some allow simulation of processes that would be difficult, costly or impossible without a computer.

1.13.2 Student activities that depend on the use of generic software: students may, for example, be asked to undertake an exercise that can be done only through the use of a spreadsheet.

1.13.3 Computer familiarity and capacity: here the computer is the subject of the curriculum; the content extends from giving students basic familiarity with computers, through the use of generic software, such as spreadsheets or wordprocessing, to computer science.

1.13.4 Computers as a source of information: students may be required to use information on the Internet as part of a course or may enrol on a course delivered electronically.

1.13.5 Student and tutor interaction: activities here vary in their sophistication from using email to send student assignments on a correspondence course to arranging computer conferencing as a means of student-tutor and student-student interaction. With the minor exception of videoconferencing, this is the only mediated technology that allows for ready tutor-student interaction.

1.14 The first of these uses has attracted much attention, interest and expenditure. Sceptics will note that the evaluation of the Teaching and Learning Technology Programme, much of

it addressed to this type of use, found that 'evidence of actual usage of TLTP materials is sparse' (Coopers and Lybrand et al. 1996: 413) and that there was little evidence of efficiency gains. That programme was addressed to on-campus rather than off-campus students. It is possible that computers will be more significant for open and distance learning as a means of distribution and communication than for computer-based learning.

Cost behaviour

- 2.1 Technologies differ in their costs and their cost structures, in particular in the:
relation between fixed and variable costs and so the appropriate scale for their use;
level of investment needed to start on their use;
staff time needed for initial development and for tutoring;
probable level of cost

Conclusions are drawn, from the literature and from our SOCRATES work, about the structure and possible levels of cost for each technology.

Cost-structures in open and distance learning

- 2.2 Open and distance learning is characterised by the fact that teacher and learners are separated for most of the time. This separation of teacher and learner makes it necessary to communicate by means of a medium or a technology. This leads to a shift in emphasis from direct personal interaction to pre-prepared materials or, in terms of cost structure, to a shift from *variable costs* towards *fixed costs*. This shift has an important implication: if the high up-front investment needed for distance learning can be spread over many learners, the average cost may fall below that of conventional education, with low variable costs and so achieve *economies of scale*. The *flexibility* of open and distance learning allows to reduce *opportunity costs* in forgone earnings and facilitates a higher integration of working and studying, which may be significant with a changing age structure of the student population, and a shift towards part-time studying. In this section we look at the most important media and technologies used in distance education and discuss their cost structure. For the theoretical reasons discussed above (para 1.2) this analysis concentrates on cost per learning hour.

Cost of lecturing

- 2.3 We start with the cost of teaching as a point of comparison for open and distance learning. The cost structure of lecturing is a variable cost since it is sensitive to student numbers: new lecturers have to be employed if the group is beyond the maximum acceptable size. Apart from group size (or the maximum acceptable number of students in a lecture or seminar), in order to calculate the cost per *Student Learning Hour* (SLH) of lecturing as means of delivering a course, we must agree about the value of a course in terms of SLH. This information is not always readily available.

- 2.4 The Credit and Accumulation Transfer (CAT) framework is beginning to provide a common standard for interinstitutional and international student mobility. CAT points can be related to student learning hours. The most widely accepted framework is based on 120 credits per level for a 1200 notional hour learning programme. (HEQC 1997:15) 'Notional learning time is a theoretical construct to ensure that curriculum designers consider, in general terms, the effort required by students to attain the learning objectives or outcomes of a module or, by aggregation, a programme. Notional learning provides an aid to the calibration and equilibration of student learning effort across modules and programmes.' (HEQC 1997:15) Thus the measure of student learning hours linked to CAT points is to be understood as normative rather than descriptive. It provides guidance for curriculum planners and course designers to adjust what they are doing with comparable institutions.

2.5 To estimate teaching costs we also need to know the cost per hour of a lecturer, taking account of salary and of working hours. We then also need to take into account the research commitment of staff, which appears to range from 35% to 50% in higher education. Overheads also have to be taken into account. We may use gross payroll figures including superannuation and national insurance to take into account personnel overheads or use a manpower rate to take into account institutional overheads or combine both.

Table 2: Lecturing costs Currency: sterling

		<i>Plain Payroll</i>	<i>PP</i>	<i>Manpower</i>	<i>All</i>	
			<i>+superannuation</i>	<i>rate*</i>	<i>overheads</i>	
<i>Research</i>	<i>Total hours</i>	28 000		34 440	57 400	70 602
0%	550	51		63	104	128
35%	846	33		41	68	83
50%	1100	25		31	52	64

(PP+superannuation is calculated as payroll +23%; *the CVCP recommends defining the manpower rate as payroll x2.05; all overheads is using the manpower rate on the PP + superannuation figure.)

The table shows considerable variation. Since the figures we got for open and distance learning courses are generally charged with overheads of some sort or the other, it is reasonable to take the £83 figure as per hour salary. For a 30 CAT point course, 45 teaching contact hours and a group size of 20 students the average cost per student then is £187.

2.6 In open and distance learning the cost of student support depends on the same parameters as teaching: tutor salary, tutor time and group size. It is a variable cost which we would expect to be lower in open and distance learning than in conventional education. For a 30 CAT point Open University course 8 contact hours are allowed with an hourly tutorial salary of £25. In addition to contact hours, 4 assignments have to be completed by 20 students attached to the tutor with a £12 marking fee. The total costs of student support per hour are about £60. It should, however, be noted that no overheads are included in this figure.

Print

2.7 Print is the most important technology for open and distance learning. More than 80% of distance education provided internationally is print based. Table 3 reflects the *development and production costs* of print in various countries. These costs include two main cost elements: authoring and design. (Much of the data in this and subsequent tables is drawn from a series of cases studies being undertaken, in association with colleges and universities in Britain and elsewhere in Europe, as part of a project funded by the European Union SOCRATES programme. In some cases figures have been made available to us in confidence and we therefore identify all case study data simply as, for example, Case 1, rather than Poppleton University.) If overheads are removed, the development cost of an equivalent to one unit (of 48 pages) is more often than not above £5 000.

2.8 The costs can be classified in different cost pools and are sometimes grouped into *development, production, distribution costs* and *costs for student support*. All but the development costs are sensitive to student numbers and are therefore variable costs. We can illustrate this by reference to a course in one of our case studies. This was a course for 220 SLH and 30 CAT points. It was developed between 1990 and 1992 so that the major fixed costs, for course development and production, fell in those years and amounted to £636 644. (There are then modest fixed costs for course maintenance in succeeding years.) The variable costs, for student tutoring and support, were £105 per student. If we assume an annual enrolment of 1200 then the cost per student would be (636 644/1200) + 105 or a fixed cost of £531 together with a variable costs of £105 giving a total of £636 if all the

Table 3: Print Costs

<i>Print</i> (1unit =48pp equivalent)	<i>Case 1(b)</i>	<i>Case 1</i>	<i>Case 2</i>	<i>Case 3</i>	<i>Case 4</i>
	£	£	£	£	£
<i>Author</i>	i) 10 000 ii) 1 200	5 600	1 600	5 000	1 000
<i>Design</i>	4 500	900	300	550	700
<i>Total Dev</i>	i) 14 500 ii) 6 700	6 400	1 900	5 550	1 700
<i>Production</i> (unit cost)		1	1		2

Source: Own case studies. Case 1(b) represents benchmark figures for planning in institution Case 1i) relates to the Case 1 staff and includes overheads. ii) refers to consultant authors.

development costs were attributed to the first year, or if the course were to be run for a single year. If, however, the course were run over four years, with the same level or enrolment, then the fixed cost per student will fall to around £133, giving a total cost of £238. It was, in fact, proposed to run it for a period that would yield about 8000 students in total, bringing the cost per student down to £186.

2.9 The cost per SLH print can be calculated by dividing the fixed cost of developing the course by the number of SLH planned for the course. In this case the course was not exclusively print based but contained some elements of audio and video cassettes. The print input was about 11 units. A unit generates about 10 to 15 SLH. Dividing the fixed cost (£63644) by 150 we would get a cost of about £420 per SLH(print).

Broadcasting

2.10 Radio and television have essentially the same cost structure. Costs are generally grouped into *production* and *transmission* costs. The term production here absorbs all the developmental and conceptual work. In contrast with the cost structure of print, we have a shift away from the variable costs towards fixed costs as both production and transmission costs are unaffected by the number of students involved. Indeed, we have no medium-related variable costs at all. Such a shift signifies an increased potential for economies of scale. The level of up-front fixed costs may, however, require student numbers beyond those the market provides.

Radio

2.11 In Case 1(b) we found the cost of 20 minutes radio was £9 000 production costs and two academic staff days at a cost of £400 each. This gives a cost per hour for radio of £28 200. According to this, the order of magnitude of producing an hour radio programme is between £25 000 and £30 000. Even if we ignore transmission cost, these are relatively high fixed costs. Given the earlier calculation showing a print cost of £1 566 per learning hour, radio production costs are 18 times higher. If we use the alternative figure for print in the Case 1(b) the ratio is 1:32.

2.12 Bates (1995), however gives much lower cost figures for one hour radio based on Open University figures. The cost per SLH here is £11 247 (fixed cost per hour).

Table 4: Cost of Radio per Student Study Hour UK OU 1982

Student numbers over eight years	1 000	5 000	10 000
Academic time	997	997	997
Production (overheads)	7 993	7 993	7 993
Direct production	1 570	1 570	1 570
Total production	10 500	10 500	10 500
Transmission	747	747	747
Total	11 247	11 247	11 247
Cost per student	11	2.25	1.1

Source: Bates 1995 (based on table 7.1 deflated)

Television

2.13 In Case 1(b), we found that the production cost of 25 minutes television was £50 000, the academic input £2 000 or 10 academic staff days. This leads to a cost per hour for development/production of television of £124 800. Even if transmission costs might be ignored fixed costs are extremely high. From this case study the ratio of print to television cost is 1:80 while radio to television is 1:4. Bates (1995) gives lower cost estimates for 1983-1984 with a radio to television ratio of 1:10.

Table 5: Cost of Television per Student Study Hour UK OU 1983-1984

Student numbers over eight years	1 000	5 000	10 000
Fixed production	67 548	67 548	67 548
Programme budget	22 581	22 581	22 581
Academic costs	4 516	4 516	4 516
Total production	94 645	94 645	94 645
Transmission	20 229	20 229	20 229
Total	114 874	114 874	114 874
Cost per student	115	22	11

Source: Bates 1995 (Table 4.3 deflated)

In principle, both radio and television have the same cost structure which is marked by a shift from fixed costs to variable costs.

2.14 The BBC shifted much of the educational programmes produced in collaboration with the Open University from prime time television hours to late or very early hours - now called 'the learning zone'. This is assumed to be acceptable since video recording equipment has become more widespread among institutions and individuals. It can, however, be seen as an early example of a gradual shifting of costs to the students (if this has not been taken into account when pricing the new courses). The difficulty of finding the right time slot for programmers in prime time is said to have helped shift the role of educational broadcasting and to downplay integration between broadcasting and text. At the Open University this may mean that broadcasts are influenced by the interests of the wider audience of casual viewers who may be encouraged to enrol as students as a result of watching them.

Video/audio cassettes

2.15 The cost structure of video/audio cassettes, in contrast with broadcasting, has a higher proportion of variable costs and has a cost structure more like that of printing. Bates, (1995, p102) claims that the fixed costs are similar to those of the respective broadcasting media. Our case studies suggest that the ratio between the costs of audio, radio, video and television is likely to be of the order of 1:2:5:7. The costs of following broadcasting practice and working to broadcasting standards raises the development or production cost of either audio or video. There are, however, large variations in the cost of video production which depend partly on whether filming is done in the studio or on location... This is reflected in our data

where we found video costs per hour of £3888, £17 963 and £64 800. The reproduction costs of audio and video cassettes are modest. (Similar figures for the provision copies of video (£4.73) are given in Curran 1993.)

Table 6: Production cost of video and audio cassettes

Prod.cost of 60 min	Copying	Blank Cassettes	Total
Audio	£0.51	£0.33	£0.84
Video	£2.36	£0.56	£2.56

Source: Market prices

2.16 In terms of effectiveness, cassettes have a possible advantage as compared with broadcasting media as students can listen, reflect and replay the cassettes several times. For small numbers of students, the modest cost of copying cassettes makes their use economic. For larger numbers, broadcasting gives a lower cost per student. Bates (1995 pp 103, 153) calculates the break even point for video/television as 175 for one and 350 for a repeat transmission and for audio/radio as 450 and 900 respectively.

2.17 To compare the cost of media in terms of student learning hours (SLH) is problematic. It poses particular difficulties for CD-ROM which draws on a variety of media elements. Our summary data, including CD-ROM, appear in table 7.

Computer/networks

2.18 The different applications of the computer were discussed in para 1.13. We can distinguish equipment and programming costs (fixed costs) and online costs (variable costs). The high staffing cost, and limited size of the educational market, especially if programs are intended for a single institution, have constrained the development of dedicated software for further or higher education. However, if the computer is mainly used as a means of communication, the upfront programming costs are less important than online costs.

Communication via Internet

2.19 One of the few cost studies on the use of microcomputers in open and distance learning courses is Rumble (1989), a case study of the introduction of CoSy, a computer conferencing system used in an Open University introductory undergraduate course on information technology. This case constituted the first major case of an Open University course where the direct access to a microcomputer with network connection was necessary: for 20% of the 420 SLH of the course, the student was required to be online. It was subsidised by two government departments. The basic equipment for the student was a computer (£630), and a modem (£84) with a connection lead (BT socket £29). The average cost to students for BT line charges was £1.95 per hour. The equipment costs are variable as they increase with student number. The online costs are recurrent variable costs. Adding up these variable costs over the 1364 students in the course, we have over £1 million on equipment and £250 000 of aggregated online costs for student communication. (Total equipment costs are £630 + 84 + 29 or £743. For 1364 students this gives a total cost of £1 013 384. If all students had spent 84 hours online - a figure that was not achieved - total online costs would have been £233 423.) The use of the online conferencing however was only 11% of the stipulated time. Given the figure of £1.534 m as total course costs, the calculation shows, how dramatically costs are shifted to the learner where the learner has to meet online costs. Table 7, taken from Rumble (1989), suffices to demonstrate both the cost shift towards the student and the importance of the reception cost as compared with total costs. (Since the cost relating to the computer mediated communication technology is not separated from the general course costs, no cost/SLH can be inferred. Average costs are given as £474 and the average cost per hour online as £52.)

2.20 A more recent illustration of the use of computer mediated communication is an international (US/German co-operation) online seminar conducted over the Internet (Case 5).

The 10 week seminar (50 SLH) was offered worldwide and was addressed to professionals in the field. The budget break-down is given in table 8 . The cost breakdown shows that computing related costs amount to about 50% of the development costs. CMC cost amounted to £4 020 per seminar. It shows that, even in the case of a computer-mediated communication course where no specific educational program was developed and the software for constructing the Website was freely available, the computing-related costs (including maintenance) were 20% of the total costs of the project. The cost per student learning hour was £1 286, which could be regarded as distribution costs, since no new educational material was developed.

Table 7: Cost of CMC

	Total cost	OU cost	Student cost	Tutor cost	DTI/DES*
Discounted capital costs					
Production	24 544	24 544			
Distribution	826	826			
Reception	334 764	44 218	148 308	3 059	139 179
Administration		0	0	0	0
Sub-total	360 134	69 588	148 308	3 059	139 179
		19%	41%	1%	39%
Recurrent costs					
Sub-total	475 666	310 394	161 365	3 907	
Total	835 800	379 982	309 674	6 967	139 179

Source: Rumble 1989, figures deflated to 1997 Summarised Annualised Costs (£) of DT200 computer mediated communication by constituency (*DTI Department of Trade and Industry/ DES Department of Education and Science)

Table 8: Cost of a seminar conducted via the Internet

	1996	1997	1998
Development cost	Management 10 050		
	Consultants 1 340		
	Computer related 10 050		
Subtotal	21 440		
Course presentation		Management 2 680	Management 2 680
		Admin cost 3 350	Admin cost 3 350
		Consultants 4 020	Consultants 4 020
		CMC moderation 4 020	CMC moderation 4 020
		Conference 6 700	
Subtotal		20 770	14 070
Maintenance/development			Software development 3 350
Other		Evaluation 4 690	
Total/annum	21 440	25 440	17 420
Total			64 300
Student number		45	45
Average cost/student			714

Source: Case 5

Presenting educational material via Internet

2.21 If one wants to present educational material on the Internet, then programming costs will increase with the complexity of the educational material to be presented. The range starts from the presentation of simple text to the creation of tailor-made hypermedia educational applications. Making text files available over the Internet involves only the Internet connection costs with a commercial service provider, once a computer, a modem and a telephone line are available. The service providers generally allow 5 MB space to keep the

proposed web page accessible at a monthly charge of about £12. Standard software can translate word files into html Internet files. (html (=hypertext mark up language) allows the creation of hyperlinks.) For simple text files no further development costs are incurred. Variable costs are reduced for the teaching institution if material is distributed by Internet rather than in print as printing costs are effectively transferred to the learner and distribution costs are covered by the payment to the service provider). The basic consumer equipment is generally already available within a teaching institution.

2.22 Distributing plain text via the Internet does not take full advantage of the potential the new technology provides. It is possible to use computers for more sophisticated presentation but this adds to the original development costs. A unit of 48 pages print costs about £5 000 to develop. To re-edit it with hyperlinks (6 hyperlinks per page seem to be considered as upper limit for one page) would require 48 hours (1 hour per page) to do. This would add 6 staff days or £1 200 on top of the general development costs. The more advanced features you want to add, the more additional staff time is required. The point can be illustrated by one of our case studies (Case 4). While the original authoring costs for a text of 107 pages was £2 000, the text was then re-edited for the Internet for £5 000. The re-working for the Internet included both inserting hyperlinks and developing multiple choice tests. Hyperlinks can provide internal document links, links to other course material or, in principle links to educational material available elsewhere on the web (Cunningham et al 1996 p 56). The hyperlinks provide references to other Internet addresses where the material can be immediately downloaded and selectively printed out.

2.23 A further stage in sophistication is to insert other media such as images, film clips, and sound recordings. However costs will rise both for development and to meet increased charges by the service provider. Even with still images, a storage space of 5 MB which is covered by the £120 per annum rental is quickly exceeded. More than 5 MB will demand additional connection fees and additional charges. Instead of £120 per annum about £1 000 will be required for the first year including setting up charges. Depending on the space required, the cost will rise by £100 per annum for each additional 5 MB.

2.24 The cost for the learner is considerable and includes costs for a computer and modem, for line charges, and for a printer. A computer plus modem costs about £1 000. The connection charges per annum may be between £110 and £120. Further the increased telephone bill due to Internet usage has to be taken into account with average online rates of between £2 and £5 per hour. Printing costs have to be taken into account. Almost certainly the learner will need to print out the downloaded material. A cost per hour for reception is difficult to estimate as this depends on the overall rate of usage. However, assuming that the equipment is bought for a degree course which is studied part-time over 6 years, for about 15 SLH per week, and assuming that Internet links are activated, for about a third of the time, we would arrive at reception costs of £2 or £3 per SLH. A laser printer costs about £500. The two main printer categories are inkjet and laser. However, they do not fall neatly in separable price ranges since they may vary in their capability (i.e. to reproduce colours and photographic images) and speed. If high image quality is required printer speed may slow down to a level not acceptable for many users. Inkjet printers start at a bit above £100 but can cost up to £1500 according to colour and speed and paper format. Laser printers range between £500 and £5000. A mid-range price would be a laser printer for £200 for a resolution of 600 dpi (dots per inch) and a very reasonable speed of 24 pages per minute.

Videoconferencing

2.25 Videoconferencing makes it possible to lecture, or run seminars, at a distance. It has a similar cost structure to that of lecturing but with a higher level of fixed costs as sophisticated and costly equipment is required. From a cost structure perspective, videoconferencing

combines the worst of both worlds: high variable costs and high fixed costs with little potential for economies of scale. However, reception costs to the individual learner are low as videoconferencing does not generally connect to individual learners but to campuses or learner centres. The high fixed costs are not due to development costs (there may be none) but to the equipment required and on-line costs involved. A fully equipped room based videoconferencing system (VCS) can cost £40 000. It consists of the VCS unit itself, equipment for the teacher station (document camera, whiteboard, whiteboard micro, control switches) a rostrum camera, ISDN connections and often a specially laid out and well isolated room. The site where the video-conferencing takes place is usually better equipped than the receiving sites but in some cases a symmetrical model is chosen to enable each site to be the location for the teacher.

2.26 There are three cost drivers: equipment costs, on-line communication costs, and personnel costs. The equipment costs have already been identified. Where three stations are connected, equipment cost could rise to £120 000 in the symmetrical case where all stations are equipped to the same standard. In the asymmetrical case, where receiving stations are less well equipped than the sending station, desktop or rollabout systems which cost about £10 000 to £20 000 each would be adequate. Equipment costs have to be depreciated over total usage time. If the equipment is fully operating, say for the whole academic year for five hours per day, the amortised cost per hour is likely to be about £20 per hour. Taking account of preparation times, the attributable equipment costs per hour of lecturing may be £30 or more. This hourly cost is extremely sensitive to the rate of usage. A large cost driver is the cost of the lecturer and the technicians involved. Assuming the same cost for a lecturer as for conventional teaching, similar size of classes at different sites, and each site staffed with a technician (at £30 per session) personnel costs for three sites would amount £240 per hour.

2.27 On-line costs depends on the network and the bandwidth used. Generally for videoconferencing dedicated networks like ISDN lines are preferable. ISDN 2 (=128 Kbps) costs about £9 per hour but if greater precision is required or movement involved, it is preferable to use ISDN 6 (=384 Kbps) which may cost up to £27 per hour. Further costs are involved in the case of multipoint connections where additional charges are incurred for access to the multipoint bridge to the various participants. Putting together the three cost elements for videoconferencing we get hourly costs of £30 for equipment, £240 for personnel, and on-line charges of £25 giving a total of slightly below £300. If we assume that there are four classrooms with 20 students in each the cost would be about £3.75 per SLH per student.

CD-ROM

2.28 We referred already above to CD-ROM in the context of hypermedia presentation on the Internet. Hypermedia presentation allows us to combine text, sound, still and moving images, digitise them and integrate them into an interactive programmed structure. If a CD-ROM is designed to make use of the full capability it is bound to be more costly than many simpler media. The information quantity which can be put on a single CD-ROM is impressive. On one CD-ROM 1000 books can be stored if one uses simple text format and still 600 when simple Desk Top Publishing features are allowed. However, the number decreases rapidly, if high quality images are to be reproduced (Cunningham and Rosebush 1996). The cost-structure of CD-ROM may allow for economies in distribution but there are high development costs. Cunningham and Rosebush calculate a mainstream budget, for the development of a CD-ROM, would be about £200 000 including the production and distribution of 1 000 discs. Reception costs are higher than for print as learners need a computer with a CD-ROM drive.

2.29 However, the difficulty of assigning costs to media is particularly significant for CD-ROM. First, it is an interactive medium which allows students to set themselves tasks and use browsing facilities to seek information. We cannot simply estimate the length of time it takes

students to work through a CD-ROM. Furthermore, as CD-ROM draws on all sorts of media technologies, the lack of specific benchmark standards in most of the media causes particular difficulties in estimating costs for CD-ROM. The creation of CD-ROMs for specific educational purposes is only beginning. The high up-front investment and the limited market mean that most institutions are cautious. However, the budget breakdown of a British further education distance provider for a CD-ROM development (Case 7; project ongoing) suggests the high proportion of programming costs involved: in a project budget for a CD-ROM to be used in further education colleges, programming costs were about £50 000 out of the £75 000 project budget.

2.30 Table 9 gives a summary of costs per SLH with respect to the different media. The data are mainly taken from own case studies. They have to be read keeping in mind the lack of benchmark references which allow for high variations in cost.

Table 9: Relation between SLH of media

Medium	Cost per SLH	Source	Ratio to print cost
Print	i) 500	Case 1	1
Radio	i) 27 000	Case 1(b)	x 50
	ii) 15 000	Bates	x 30
Television	i) 125 000	Case 1(b)	x 250
	ii) 90 000	Bates	x 180
Video	i) 84 000	Case 1(b)	x 170
	ii) 18 000	Case 3	x 36
Audio	17 000	Case 1(b)	x34
CD-ROM	20 000	Case 6	40

Source: Own case studies and Bates 1995 (one unit of print, i.e.48pp, have been treated as generating between 10 and 15 SLH).

Costing conclusions

2.31 While more work needs to be done, especially on the costs of newer forms of technology, we can summarise our conclusions on cost. The costs of developing printed material seem to be reasonably consistent over a number of cases, at least within higher education. Along with the costs of lecturing they form a base line for examining other costs. Print requires both fixed expenditure, for its development, and variable expenditure for its reproduction and distribution. Radio and television have fixed costs that are several times those of print, while having, effectively, negligible distribution costs. They may, therefore, be of particular significance for programmes aimed at large audiences and for publicity and student recruitment. Where audio or video material is distributed in cassette form, significant distribution costs are involved as well as production costs, with student numbers only in the hundreds open-circuit distribution, when airtime is available, becomes more economic. Videoconferencing allows for live, two-way or even multi-way, exchanges between tutors and students, but with high variable and fixed costs.

2.32 The use of computers in education may have three effects. First, the generation of computer-related teaching materials is likely to result in a marked increase in the cost per learning hour required to develop teaching material, as compared with other media. Second, if students are asked to download teaching material then this shifts costs from the teaching institution to the learner. Third, the small number of studies on the use of computer communication for interaction between students and tutors, shows that costs are likely to be relatively high, partly because of the staff time necessarily involved, partly because of line charges to be met. As with the downloading of materials, there are questions of equity and access involved where this technology is reducing cost to the institution but increasing it for the student.

Access

3.1 Choice of technology and its location have an impact on access, which is also affected by organisational considerations. If, for example, a course is to be computer-based we need to consider how students can have access to computers and what effect this will have on enrolment. Sargant (1997: 32) reports that in 1995 only 25% of households owned a computer.

3.2 Questions of access are of particular significance at the time when students are recruited on to a programme or course. Unfortunately, there appear to be little data on the effect that different means of student recruitment have on the audience reached. It seems probable, on the face of it, that we may recruit different groups of students through, say, using colleges of further education, or universities, or public libraries, or employers as the point of recruitment. There have been a number of experiments, ranging from setting up education shops to the use of a sports stadium to recruit students. Two clear conclusions emerge: first, word of mouth is all-important in encouraging recruitment and is identified as the largest single source of enrolments by a number of institutions; second, broadcasting can be effective in encouraging recruitment. It was of great significance, for example, in attracting the first cohorts of students to the Open College. Telephone helplines have also increased the effectiveness of broadcasting in interesting audiences in opportunities for education and training.

3.3 Educational structure also has a bearing on access. Students entering further education often need to see a route that will take them, possibly through a number of stages marked by formal qualifications, to their destination. The Open College of the North West has useful experience here, with an integrated programme of courses that start in further education but can lead into higher education. The presence of institutions of both sectors within OCNW facilitates this.

3.4 Access and costs are closely bound up: the higher the price, the fewer students can afford a course. There is one fiscal anomaly here which is restricting enrolment and likely to continue to do so. The cost of courses leading to vocational qualifications can be set against income tax. For many adult learners with few formal qualifications, GCSE courses are the most attractive, familiar, and potentially useful route towards employment or a change of employment. (Indeed, the adaptability of GCE, as it was, as a pre-vocational qualification was one of the reasons for its introduction and for its successful sweeping away of a huge range of specific prevocational qualifications run by professional bodies.) But these courses are not regarded by the Inland Revenue as vocational. If a new programme of courses is to be introduced, and to be made widely popular, there is a case for reviewing the definition of what is to be treated as vocational.

3.5 We recommend further work on the relationships between technologies used, location of study, and student enrolment.

Quality

4.1 As with any other form of education, systems to assess the quality of open and distance learning needs to be built into its structure. In doing so we can start from the criticisms and apparent weaknesses of it as an educational process.

4.2 The quality of open and distance learning has been criticised from three main standpoints. The first is one of fundamental opposition, arguing that it is necessarily inferior, lacking the human contact that is of the essence of good education, and failing to provide the

informal contacts and opportunities for learning that are open to students in the conventional system. There is great strength in this position: it would be difficult to claim that studying through the computer or by correspondence course can match the human experience of being a student at, say, Stanford, Oxford or MIT. But it does not lend itself to ready measurement.

4.3 Second, open and distance learning has often been inefficient. Many programmes have had high dropout rates, leading to dissatisfied students and costs per graduate that are much higher than costs per student. Systems with high dropout rates can also make money: if many are called but few are taught, expenditure on tutors' fees is minimised. High dropout rates are not, however, a necessary function of studying at a distance. Australian data, where universities typically have full-time on-campus, part-time on-campus, and part-time off-campus students working in parallel, show that successful completion rates are comparable for part-time students, regardless of mode of study, while, understandably, being lower than those for full-time students.

4.4 The third main criticism of open and distance learning is educational, that it lends itself to rote learning and provides few opportunities for dialogue that go beyond the material presented to students. It may offer limited opportunities for open-ended learning. Students are forced to rely on pre-recorded teaching materials and may not be stimulated into questioning and criticising them, developing the capacity for independent learning or for reflective practice. This criticism has been addressed to materials in the simplest and the most sophisticated systems. Correspondence courses have often tended to be over didactic while materials produced in the Teaching and Learning Technology Programme were criticised for focusing on the transmission of knowledge rather than its transformation (Coopers and Lybrand et al. 1996: 266).

4.5 We can address the latter two criticisms by examining processes for raising the quality of open and distance learning. Two approaches to the assessment of quality are proposed.

4.6 First, we need to consider some broad questions about the educational structure of a programme or course. If we want to maximise student completion rates, and provide as many opportunities for student interaction with a tutor, we are likely to want to increase the amount of student-tutor or student-student interaction and to look for the use of more sophisticated teaching media in order to keep up the enthusiasm or motivation of students. Both these, however, are the elements that tend to increase the variable cost per student. Tutor contact, whether for face-to-face sessions, or for marking assignments, or for computer conferencing, does not show the economies of scale that can be achieved by developing and distributing print or broadcast materials. Sophisticated technologies, relying on electronic communication, tend to have higher costs than print. For any one course, therefore, there is likely to be a trade-off between quality and cost, as shown in figure 1. To raise quality, one will tend to look for a course design towards the top left corner, with a generous staffing ratio, ample individual contact between tutor and student, and as sophisticated teaching media as is appropriate for the subject and audience. To minimise costs, however, one will seek the opposite corner, cutting staffing ratios, minimising tutor-student contact, and using the simplest media.

4.7 There are, therefore, trade-offs between cost and quality. There are likely to be similar trade-offs in relation to access. To take a simple example, managers who find that their programme would benefit from computer-based interaction with students, need to recognise that this is likely to limit access to the course. A decision to seek a broadcast element to a programme is likely to increase its costs while it may widen access to it. Generally speaking, while little is known in detail about the elasticity of demand for education and training, we can assume that where measures to raise the quality of a programme increase its costs, they will tend to restrict access.

4.8 Once the main elements of course design have been determined we can go on to consider measures to be incorporated in order to assess and assure quality. A number of schemes have been produced that assess both broad decisions at the level of programme planning and measures designed, for example, to make learning materials effective. An Australian national working party, for example, have developed a framework setting out areas of concern and recommended indicators under four headings: policy development and management, staff development, service provision, and processes of distance education (Nunan and Calvert 1992). While their structure is developed for higher education, within dual mode universities, it could form the basis for examining quality issues in open and distance learning more generally or for assessing new proposals. It suggests that a quality review will begin by asking whether the policy of the institution is consonant with the running of open and distance learning, so that there are structures for sound decision making, arrangements for the employment of adequate staff, and for rewarding them. Indicators of staff development are relevant both to specialist open and distance learning staff and the regular staff of the institution. Measures of service provision indicate how effectively the institution is distributing materials, publicising its work and responding to students. The measures recommended for process provide norms against which one can assess teaching materials and tutorial activity. (See Annex B.)

4.9 The Open University, similarly, has an internal guide to quality assurance which identifies the procedures used to assure quality in all aspects of its work, though without attempting to reduce them to a summary set of indicators as in Annex B. The guide looks at quality issues as they affect governance and structure, academic and course planning, staff, student learning, and issues of validation, examinations and credit transfer. We have not identified an overview of quality assessment structures for open and distance learning, that draws on world experience, and recommend further research on this.

Organisational structures

Until the establishment of the Open University open and distance learning was, with rare exceptions, managed as a commercial activity. Since 1969 it has moved towards the mainstream of education. Many different organisational structures have been developed for it. Some of these are freestanding; others depend upon partnerships.

The management of open and distance learning

5.1 To assess the viability of proposals for open and distance learning we need to consider the functions that have to be undertaken. Open learning generally requires six functions, which may all be undertaken by a single agency or shared between a number of different agencies. (To these one might add funding and quality control, activities common to most social enterprise and not particular to open and distance learning.) The six are:

- materials development and production
- distribution
- student recruitment
- tutoring and counselling
- student records
- assessment/accreditation.

5.2 We can illustrate by example. At one extreme, the Open University undertakes all six functions: it develops its own materials with a minimal use of any prepared elsewhere and distributes these, physically and electronically. It recruits students and employs tutors to guide their work. It maintains its own record system and awards its own degrees. The National Extension College operates in more than one way. For many of its courses, it undertakes the first five functions but, as it has no power to award credit, prepares students for qualifications of public examining bodies. But, in a company-degree programme run in association with Coca-Cola Schweppes and the University of Bradford, functions are divided: it develops and distributes teaching materials, students, who are all company employees, are recruited by the company. Tutoring is shared between NEC and the University of Bradford, while examination and accreditation rests solely with the University of Bradford. Responsibility for student records has to be shared as they involve NEC (as teaching institution) the company (as the employer) and the university (as the accrediting agency and an institution of which the students are members). Many publicly funded programmes of open and distance learning have concentrated heavily on just the first of these functions: the Open Tech funded the development of materials without asking the hard questions about distribution or student recruitment that would have led to a search for ways of maximising their use.

5.3 It may be useful to distinguish between:

5.3.1 funding agencies (e.g. SOCRATES, Open Tech) which finance work in open and distance learning, generally for the development of teaching material, but are not involved in running it;

5.3.2 dedicated open-learning institutions (e.g. Open University, National Extension College) whose sole or major activity is to run programmes of open and distance learning;

5.3.3 bimodal educational institutions: increasingly, universities and colleges of further education are adopting flexible learning in which teaching materials are used by on-campus and off-campus; a 1994 study found that half of all (then) British universities were involved in open and distance learning in this way;

5.3.4 employers: in some cases employers are using open-learning techniques for their internal staff training; in others (e.g. BAA) they are working with a university to develop a degree or diploma programme cooperatively;

5.3.5 professional associations and trade unions have a long history of using open and distance learning, either directly or through formal or informal partnerships (e.g. UNISON has a well-established distance-education unit; one private company, Foulkes Lynch, used to have a near-monopoly of accountancy education but the ACCA has now developed its own distance-teaching programme);

5.3.6 publishers have, increasingly, been producing materials in self-learning formats and have published books and multi-media material that can be used within programmes of open and distance learning;

5.3.7 partnerships of various kinds have been set up, involving different combinations of these parties.

5.4 In table 10 we locate the functions required for open and distance learning for a selected group of models.

5.5 There are many guides to the management of open and distance learning (e.g. Dodds 1983; Perraton 1991, Rumble 1992a). Advice from them needs to be fitted to the educational task being undertaken and the nature of the agency or partnership that is working on them. Experience suggests that three issues are critical to success but are repeatedly neglected.

5.6 The first is a set of issues about student recruitment and about the distribution of teaching material. Three publicly funded programmes (the Open Tech, the Open College and the Teaching and Learning in Technology Programme) concentrated their energy and funding on the development of teaching materials rather than on ensuring that the materials would be used. The Open College aimed at recruiting over a million students but in due course abandoned its attempt at teaching students directly and became essentially a publisher of open-learning materials. The Open Tech was a funding mechanism for a decentralised project system; although most of the funds were used to develop teaching material there were inadequate arrangements for distributing and marketing this; one analysis notes that 'a lot sank without trace, and many institutions, it is claimed, simply took the money and ran' (Sargant 1997: 21). More recently the Teaching and Learning in Technology Programme hoped to overcome problems of distribution by arranging that any institution of higher education could have access to materials funded through it: the policy 'appears to have dampened the desire of a number of projects to put considerable efforts into dissemination in the UK because there are few returns to the investment' (Coopers and Lybrand et al. 1996: 912). In contrast, institutions as varied as the National Extension College in the nongovernment sector, the Open University as a single-mode university, and Wye College, as a mixed-mode university institution offering specialist courses, have from the outset seen the recruitment of students and distribution of materials to them as a centrally important activity.

5.7 The second issue concerns tutoring and counselling. Some learners - especially those who are already well-educated and highly motivated - will learn effectively from open-learning materials. Many need help: at the simplest level where a library holds open-learning materials, it is often difficult for the potential user to find them (Allred 1995: 18). Similarly 40% of the students attracted into the Open Learning Credits Pilot Programme needed guidance when they started looking for open learning materials (Crowly-Bainton 1995: 2.4.3). This is before students have begun work: once they begin, most will need tutoring. The notion that open-learning materials can stand by themselves, and replace the teacher, is educationally dubious and probably inefficient. Investment in tutorial services is likely to yield economic benefits in raising the successful completion rate. (A review of open learning in TECs found that the most cost-effective programmes had staff assigned with a tutoring and counselling function and that 'the level of support to learners from such individuals has been found to be more important to the success of open and flexible learning programmes than the quality of nature of the package or IT used' (Beaton 1995: 6.4.3). But the need for tutoring adds a complexity to the organisation of open and distance learning: it may require cooperation between an agency that is making materials and one that provides tuition; even where it does not, it requires structures that are like a factory, for making and reproducing materials (if they are in print or cassette), alongside arrangements for tutoring, that are of their essence individual and social.

Table 10: Location of functions for various models of open and distance learning

Functions	Open University	NEC	NEC Company degree (CCSB)	Open College of NW	OLA British Columbia	Wye College, University of London
Materials development	OU, but for broadcasting shared with BBC	NEC with external authors	NEC	Rests with individual colleges in the consortium	OLA with freelance writes	Wye College with freelance writers
Distribution	OU except for broadcasts	NEC	NEC	By central agency to member colleges	OLA either to individual students or to colleges within Province system Broadcasting by OLA through dedicated channel	Wye College
Student recruitment	OU	NEC	Company	Member colleges	Both OLA and colleges	Wye College, but there are franchising arrangements where associated university recruits
Tutoring and counselling	OU	NEC with external tutors	NEC with Bradford University	Member colleges	OLA for students enrolled directly; colleges for students they recruit	Wye College, except for franchising arrangements
Student records	OU	NEC	All three parties need records	Member colleges	OLA for own students Colleges for theirs	Wye College, except for franchising arrangements
Assessment or accreditation	OU	Public examining bodies	Bradford University	OCNW is an Authorised Validated Agency; some courses also externally validated e.g. by Lancaster University	OLA can award its own school graduation equivalency certificates and degrees	University of London, with actual examination arrangements for students outside Britain set up and supervised by University

5.8 The third issue is narrower but a source of continuing difficulty in the development and expansion of open and distance learning: intellectual property. Academic staff are used to retaining their own intellectual property, as they do when writing a book for an ordinary publisher. Institutions want to own intellectual property so that they have the freedom to use, distribute and sometimes market material that they have commissioned or developed. Where materials are developed by more than one person, or an editor or educational technologist has played a major role in shaping them, it may be unclear where the ownership of intellectual property does or should rest. Again, dissemination of materials developed under TLTP has been complicated because the ownership of intellectual property was not clarified at the outset.

5.9 Effective open and distance learning needs more than a simple resolution of those problems; they are highlighted because they recur so frequently and affect institutions and partnerships of all kinds.

5.10 There is no one best institutional buy for the effective management of open and distance learning. We can compare the advantages and drawbacks of four types of institution: the Open University, a bimodal university, a freestanding open and distance learning institution, a consortium.

5.11 The Open University has gained an international reputation for the quality of its work and has done more than any other single institution to legitimise open and distance learning. It is, too, operating on a scale that dwarfs the rest, with a total of over 150 000 students and a system that achieves graduation rates that compare favourably with other programmes of part-time education. Its materials are a model of quality and imaginative design. The Open University has benefited from its university status, giving it the freedom to undertake all six necessary functions for itself and to integrate them efficiently. Founded at a time of intense suspicion about open learning, it decided to undertake all its teaching activities for itself, buying in freelance part-time tutors and renting university accommodation, rather than building up formal structures of cooperation with other academic institutions. The University has established its adaptability in developing, for example, its Postgraduate Certificate of Education in an unusual and unprecedented partnership with individual schools. At the same time, the Open University's systems were designed to teach large numbers of students and are necessarily cumbersome and in practice relatively costly. In developing materials, for example, the Open University generally needs a lead time of at least two years and its costs for materials development appear to be markedly higher than those of other institutions. These may be justified, in terms of investment cost per student, because of its high enrolments.

5.12 A growing number of universities are becoming bimodal, teaching students on-campus and off. Wye College of the University of London, for example, offers specialist courses in agricultural development at a distance. This structure offers advantages of integrating work on and off-campus, with the same teaching materials being used in both modes. Students are working for an existing degree so that there is no question about its recognition or acceptability. In practice, many institutions have found it extremely difficult to get materials produced by their regular academic staff. There are two problems: first, academic staff have other pressures in terms of students they see every day and research they must complete; second, it is not easy to mesh arrangements to reward staff for writing with the regular measures of staff load in such terms as student contact hours with on-campus work. There are potential economic benefits to the bimodal approach which has led one commentator to see open universities as at a comparative disadvantage (Rumble 1992b).

5.13 There is a small number of free-standing open and distance learning institutions. The National Extension College is one, with charitable status, offering a range of courses that are

equivalent to courses available in both further and higher education. Its independence gives NEC a freedom to act and an ability to launch programmes quickly. It has no powers of accreditation so that any course that leads to a qualification requires cooperation with an examining or accrediting body or, at the least, requires it to match the necessary syllabus. NEC is also dependent on income from student fees and on project income so that its ability to move in new directions is limited by the need for capital. As a body with a single location, it needs to recruit tutors in other parts of the country. As a producer of open-learning materials, that can be used in various ways, it has developed cooperative structures with colleges of further education that provide face-to-face support.

5.14 Both in Britain and overseas a number of consortia have been set up to run open and distance learning. The Open College of the North West, for example, is a consortium membership scheme set up in 1975. Its members are mainly institutions of further and higher education. It coordinates the development of open and distance learning material which is generally done within member institutions. It publishes the materials and is also an Authorised Validating Agency, recognised by the Quality Assurance Agency. Thus OCNW members develop materials, it itself publishes and distributes them. Student recruitment and teaching is the responsibility of member institutions while some accreditation functions rest with OCNW. One of its major strengths is that it is embedded into the structure of further education and has been able to find a way of funding the development of open-learning materials within that structure. It is not, however, geared to the needs of students off-campus: most materials are used within class-based teaching and only two courses are available as distance education. While, as noted below, many consortia are fragile this has a relatively long history and appears to be bringing mutual benefits to its partners.

Partnerships

6.1 Many programme of open and distance learning, both in Britain and overseas, have been set up by means of formal or informal partnerships. The range of functions required for open learning is such that many institutions are able to undertake only some of them. Collaboration may be at various levels of complexity. One analysis suggests:

In an ascending order of complexity and institutional risk, collaborative projects may include exchanges of information, experience and consultants; collaboration on development, adaptation and evaluation of learning materials; establishment of credit-transfer arrangements; and creation of new management structure, both within and among institutions.

(Moran and Mugridge 1993: 3)

6.2 We are concerned here with partnerships at the upper end of this scale. Here, partnerships may allocate functions among their members in various ways. In doing so, one critical distinction is between sharing and dividing functions. In some cases, all members are capable of executing a particular function (e.g. developing materials) but choose to share the work between them. In others, members of the partnership have different capacities (e.g. one may be able to develop materials and another to accredit) and therefore divide the functions between them. Having made that distinction, work so far suggests that we can usefully distinguish five types of partnerships:

6.2.1 The first are membership schemes in which functions are generally shared. The Open Learning Foundation, for example, exists to enable member institutions to cooperate in the development and use of learning materials. There are clear benefits to all members in doing so, and reaping the consequent economies. But all contact with students remains the responsibility of member institutions, as does accreditation. Any member could, if it wished, also develop its own materials independently or, indeed, end its membership

6.2.2 Next there are many informal partnerships of educational institutions in which functions are divided with neither institution having, or seeking the capacity to undertake the functions of the other. The arrangements in which the National Extension College prepares students for external examinations is an informal partnership of this kind.

6.2.3 Third, formal partnerships of educational bodies have been created to run open and distance learning. In Canada, for example, the Open Learning Agency was set up as an umbrella body, within the Province system of education, to offer open learning at many levels and in many forms. It incorporates a television channel, produces and distributes teaching materials in various formats, enrolls and teaches its own system and has the power to award secondary and tertiary level qualifications. But at the same time it operates in partnership with other educational institutions in the province, so that its courses may be offered through other institutions. Thus, for different purposes, some of its functions are shared with partners and some divided.

6.2.4 Fourth, a number of cooperative schemes are being developed between employers and educational agencies to offer what is sometimes called a company degree. Here functions are divided between the parties. The British Airports Authority, for example is working with the University of Surrey to develop a computer-based programme for a business studies degree. Here responsibility for funding and student recruitment rests with the company, the teaching material comes from the university which is also responsible for assessment. Tutoring is the responsibility of the university but the company has undertaken some mentoring of students. Thus, in this kind of partnership, there is a clear division of functions between partners.

6.2.5 Finally, there are several examples of the centralised funding of programmes where all, or virtually all, the other responsibilities rest with individual institutions. In this case the funding responsibility rests with one partner and all the rest with another, generally with some quality-control measures built in. The Open Tech programme was run on these lines as is the Open and Distance Learning Action within the European Union SOCRATES programme.

6.3 Cooperation between educational agencies tends to be fragile. (They are not alone in this: proposed mergers between major British companies have failed in recent years, on occasion because of incompatible information systems and on occasion because of disagreement about who should get the top job.) Experience within Britain and overseas has suggested a number of conditions for cooperation between institutions to be successful. One analysis summarises:

1. High-sounding rhetoric is a waste of time as is a vague desire to collaborate.
2. The smaller the initial group of participants, the greater the chance of success.
3. Objectives of collaboration have to be clearly defined and probably not too ambitious, at least at the outset.
4. There has to be something in it for every participant.
5. There must be people in every institution who want and are in a position to make it work.

Mugridge as cited in Daniel et al 1986

6.4 International and British experience suggests that five conditions need to be met for partnerships to have a reasonable chance of success. (This analysis draws heavily on international experience summarised in Daniel et al. 1986.)

6.5 First, there need to be clear goals and a clear statement of purpose. (One of the reasons for the failure of the Open College was fuzziness about its aims and about the comparative importance of offering education to unemployed people or to those in work (Sargant 1997: 22).

6.7 Second, there need to be significant roles for administrative and academic staff in all member institutions. Some partnerships have been created because funding agencies required it, but action has in practice remained almost entirely with a single institution. This has been found, for example, both by TLTP within Britain and the SOCRATES open and distance learning action among European countries. Staff playing an active part have to be at the right level in the organisation: one organiser of a company degree programme commented that the scheme could not have worked without the support of a senior manager with the willingness to find a way round university procedures and the status to carry proposals through the necessary committee. Support at the top or bottom alone it not enough.

6.8 Third, there needs to be a governance and funding structure that fits the purpose. An analysis of American educational consortia that failed found that a governing body of academic presidents did not work because they lacked both time and commitment (Daniel et al. 1986: 8). The funding of the Open Tech project, which gave all the emphasis to production and none to distribution or marketing, provides a partial explanation of the fact that 'projects' combined estimates of their total market outstripped their combined registrations by a factor of more than 100' (Tavistock Institute 1987: 92). The funding arrangements need to be such that the partnership can continue - if its job still needs to be done - once pump-priming is no longer available.

6.9 Fourth, members of a partnership need to see that they have complementary roles and that there are benefits to all. It seems likely that partnerships where functions are divided, so that members do not have the capacity to undertake each others' functions, as in company degrees, are more stable than those where functions are shared. Traditions of academic autonomy, for example, mean that there has been a great reluctance for institutions that can each generate teaching material to share this. Despite the development of open and distance learning all round the world, and warm support for international collaboration from all three of its vice-chancellors, it took the Open University more than 25 years to use material developed outside its own walls.

6.10 Fifth, effective partnerships are likely to seek a commitment of resources from all partners. Some of these resources may be in kind, as in the preliminary work done by academic institutions in preparing for a company degree, while others may be by means of a subscription, as with the Open Learning Foundation or the Open College of the North West.

An evaluative framework

7.1 Experience gathered both within Britain and internationally makes it possible to define a set of requirements for viable open learning projects. They can be summarised under four headings:

- Evidence of educational/training demand
- Sustainable structure with agreed allocation of all six functions required for open and distance learning and credible machinery for executing them
- Choice of technology that is viable in terms of cost and appropriate for access
- Evidence of available and continuing funding (from student fees, employer or regularly budgeted public funding)

Conditions for successful partnerships include shared benefits, access to continuing funding, and defined roles in relation to six functions that are compatible with previous two conditions. Each set of requirements can be set out in terms of a series of questions, including the following.

7.2 The framework appears in table 11.

Table 11: An evaluative framework for proposed activities using open and distance learning

	Key questions	Reference in text	Comment
<i>1.</i>	<i>Evidence of demand</i>		
1.1	What evidence is there of a demand for the education or training proposed?		Increasingly institutions in public and voluntary sectors are drawing up business plans for new activities that identify market demand. Demonstration may be in light of previous experience of similar programmes, or sample survey, or economic or social demand. Some projects have been policy-driven rather than demand-led.
1.2	How sound is the evidence?		
1.3	Is there reason to think that the learners concerned would be prepared to use open and distance learning methods?		The acceptability and appropriateness of open and distance learning needs to be considered in relation to the educational background, needs, and attitudes of the learners.
1.4	Is the demand local or national? Is it temporary or long-term?		The scale and duration of demand will affect likely enrolment and therefore unit cost.
1.5	Is the proposed curriculum appropriate to the demand and the audience?		Curriculum may be pre-determined, where a project is designed to lead to an existing qualification, or there may be freedom to design or adapt it for a particular audience and purpose. There may be tensions between learner expectations, prescribed curriculum, and educational or training need
<i>2</i>	<i>Sustainable structure</i>	<i>5</i>	
2.1	Who will be responsible for:	5.1 and table 10	An effective structure required that assigns agreed responsibility for six functions:
2.1.1	materials development and production		Parties involved may include authors, editors, educational technologists and specialists in use of particular media such as broadcasting producers. Intellectual property issues to be resolved.
2.1.2	distribution	5.6	Distribution of materials may be physical or electronic. Unless distribution systems are in place, use of even excellent materials will be limited.
2.1.3	student recruitment	5.6	Active programmes of student recruitment are normally required. Detail of arrangements will depend on educational demand to be met (e.g. in-company training schemes are likely to need simpler machinery than programmes of general public education)
2.1.4	tutoring and counselling	5.7	Essential for any activity beyond self-learning Critical management issues turn on relationship between responsibility for this function and that of materials development.

2.1.5	student records		An efficient student record system is essential for management. The location and management of record systems likely to be a sensitive issue in partnerships.
2.1.6	assessment or accreditation		Some formal assessment or accreditation is often demanded by learners and by potential employers. May be internal or external to institution(s) responsible for previous functions.
2.2	Is there an adequately staffed and cohesive management structure?	5.10-14	Alternative structures are discussed in text.
2.3	What experience and capacity do those responsible for the six functions have of working at the necessary scale?		Problems may arise here as projects move from pilot to full-scale operation.
2.4	Are the working arrangements appropriate for the audience and for the programme content?		
2.5	If these functions are shared, is there a viable management structure for cooperation between partnership members?	6.1-2	Sharing of functions between agencies may cause conflict so that means of resolution are necessary within partnership structures.
2.6	Have appropriate and adequate measures of quality assessment been built into the structure, with a clear statement about where responsibility will rest for questions of quality?	4.1-8 Annex C	Quality assessment may operate at least at two levels, reviewing the overall design of a programme or course (e.g. curriculum, management, choice of technology) and assessing its individual components (e.g. pedagogical design of print materials). Quality assessment procedures for conventional education may be in place but further procedures/measures may also be necessary, specific to the processes of open and distance learning. Exemplary indicators are identified for policy development, staff development, service provision, and processes of distance education
3	<i>Choice of technology</i>		
3.1	What technologies is it proposed to use?	1.3-14 Table 1	Technology choice is a function of convenience for users, access, appropriateness to presentation of subject matter, and cost.
3.2	Do course developers have experience in using the technologies chosen?		Experience required of transformation of material for presentation in appropriate medium in ways that will facilitate learning
3.3	Are the costs commensurable with the funds available and fees to be charged or funding to be obtained?	2	The wide variation in costs of alternative technologies make it necessary to assess costs against educational purpose and students numbers.
3.4	Are the technologies appropriate in terms of students' access to them and of the content of the programme?	3.1-5 4.7	Requirements in terms of technology may limit access. Choice of media for publicity is likely to affect recruitment.

3.5	Can the amounts of tutor-student and student-student interaction be justified both educationally and financially?	4.6-7 Fig. 1	Maximising opportunities for dialogue is likely to increase satisfactory completion rate but also increase cost.
4	<i>Evidence of funding</i>		
4.1	How will the development and setting-up costs be met?		Funding is generally needed for start-up costs before any income from sales or student fees.
4.2	How will the running costs be met?		
4.3	How will these be funded on a continuing basis?		If recurrent costs are met by grant in pilot phase, evidence is needed of source of continuing funds.
4.4	Are proposed fees consistent with what the target audience can pay?		Information on potential audience (1.1-2) is relevant here
5	<i>Conditions of success for partnerships</i>	6	Types of partnership identified in 6.2
5.1	Are there benefits for all partners and will these continue beyond any pilot phase?	6.9	Demonstration of benefits for all partners, and existence of support at appropriate levels within partners, are probably conditions for survival.
5.2	Do all members of the partnership have access to the funding necessary to their role and will they continue to have access?	6.10	
5.3	Are there defined roles in relation to the six functions?	5.11	Responsibility for the 6 functions identified above (2.1) needs to be agreed by all partners and to be consistent with each member's interests.
5.4	Is the governance structure of the partnership consistent with that definition?		A governance structure is required that will be appropriate both for continuing management and control and for resolution of conflict.

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Annex A

Terms of Reference

SCHEDULE 1

1. AIM OF THE CONTRACT

The purpose of this Contract is to inform policy and planning in the implementation of open and distance learning systems.

2. OBJECTIVES AND OUTCOMES

The Contractor shall produce a report that:

- reviews the evidence and summarises the state of knowledge on different technologies for learning, including:
 - organisational and cost implications; and
 - comparative effectiveness, and effectiveness in relation to context;
 - outlines some alternative models for the organisation of open and distance learning;
 - identifies the factors that are important in assessing the feasibility and guiding the design of open and distance learning systems, especially on a regional or national scale;
- and
- suggests a framework and checklist for evaluating the effectiveness of large scale open and distance learning systems, especially those that involve partnerships and cooperation.

3. METHODOLOGY

The Contractor shall review research, including that carried out by the Contractor under the SOCRATES programme, and assess information available on past major initiatives in open and distance learning. Key to this study shall be information on and models of cost-effectiveness and quality.

As witness the hands of the parties

Annex B

Indicators of quality of distance education

Policy development and management

Area under consideration	Applicability	Standard/benchmark or elaboration
1 Policy framework for distance education within an institution	institutions	<ul style="list-style-type: none">• existence of specific guidelines for disbursement of funds related to distance education activities• existence of a consolidated listing of policies related to distance education
2 Reporting achievements and developments in distance education	institutions	detail within annual reports of institutions (or similar) of developments in: <ul style="list-style-type: none">• external course development and production• technologies employed in distance teaching and learning• research and evaluation of distance education
3 Acknowledgement of expertise in distance education within promotion/tenure criteria	at institutional level	<ul style="list-style-type: none">• existence of institutional approval 'code of practice' in relation to teaching and appropriate recognition by this code of the practices of distance teaching and learning• application of the above criteria within selection processes related to promotion/tenure

4	Provision of release time for academic staff engaged in course writing and peer review	provision within schools/ departments	appropriate levels of support - eg 1/3 to 1/2 load release per semester subject equivalent to 1/6 full time student load
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Staff development

Area under consideration	Applicability	Standard/benchmark or elaboration
1 Conduct of professional development programs for academic staff	institution or distance education unit	formal document outlining the strategy for professional development to improve distance education available
2 Conduct of staff awareness program in relation to institutional distance education policy	institution and distance education unit	<ul style="list-style-type: none"> • existence of specialist induction program for new staff • recognition of this function within the role statement of a staff member of the institution
3 Access to expertise/ advice on materials design	provision within institution	<ul style="list-style-type: none"> • identified program of staff development directed towards materials design • course team membership of persons with specialist expertise in distance education during planning/development stages • availability of institutional 'guides' to materials design
4 Access to expertise/ advise on instructional media	provision within institution	<ul style="list-style-type: none"> • identified formal liaison mechanism between distance education unit and relevant service provider as a service provided by the distance education unit • identified mechanism

regarding approval of costs related to employing instructional media within the delivery process

5	Access to expertise/ advice on the use of computer/communication technologies employed for external delivery	provision within institution	<ul style="list-style-type: none"> • as above
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Service provision

Area under consideration	Applicability	Standard/benchmark or elaboration
1 Institutional responsiveness to student enquiries	distance education unit	existence of a published statement about the response time to contact students
2 Receipt of learning materials	distance education unit	number of late starting students/ subjects attached to schools/ departments
3 Timely pre-preparation of materials by academic staff	schools/departments	<ul style="list-style-type: none"> • published guidelines to staff on schedules for production • existence of targets related to the percentage of the total of course materials which are prepackaged in advance of the semester in which they are offered
4 Technical quality of learning materials	distance education unit/ Printing facility	number of student and staff complaints

Process of distance education

Area under consideration	Applicability	Standard/benchmark or
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elaboration

1	Availability and use of preparatory materials to assist students in their role as an external student generalised information related to the distance learner	distance education unit/study skills coordinator/student support services	<ul style="list-style-type: none">• existence of specific support mechanisms eg 'taster units'• counselling contact prior to course commencement available where needed
2	Review of 'instructional blueprints' by expert panel against academic and distance teaching criteria	schools/departments with distance education professional staff	<ul style="list-style-type: none">• adequate representation of subject expertise for content validation• adequate representation of subject expertise in distance education• review processes carried out against agreed criteria

Area under consideration	Applicability	Standard/benchmark or elaboration
3 Study materials and processes: <ul style="list-style-type: none"> • account for student background • appropriate materials and learning • interactions 	schools/departments and distance education unit	existence of: <ul style="list-style-type: none"> • clearly defined minimum • provision of a range of • clear starting points dependent upon student backgrounds • assistance to students in clarifying their own background knowledge and skills • enunciation of realistic learning objectives • identify and, where appropriate, provide necessary resource material • appropriate breadth and depth of learning activities to challenge each student intellectually • provision of opportunities for interaction with staff and other students • provision of academic support in regular and informative assessment and self assessment • demonstrable linking of assessment with the objectives of the topic of study
4 Perceived teaching quality	schools/departments	possible trial use of Course Experience Questionnaire - Indicator P1 Linke (1991) p58
5 Variety of interactions	schools/departments	during the period of student study the use of one or more of: <ul style="list-style-type: none"> • phone contact with individual students • audio/video conferencing of groups of students • fax, Email computer

- conferencing
- extended correspondence; journals
- on-campus schools/workshops

Area under consideration	Applicability	Standard/benchmark or elaboration
6 Lecturer availability to students	schools/departments	<ul style="list-style-type: none"> • notification to students of a variety of contact mechanism • notification to students of times that a relevant member of staff is available to deal with academic matters
7 Assignment marking	schools/departments	<ul style="list-style-type: none"> • existence of a published norm for turn around time for assignments • existence of guidelines for marker feedback to students including the incorporation of teaching objectives within the response to assignments • existence of policy regarding flexibility in extensions to submission dates
8 Student feedback on the quality of student support and administrative services supplied by the institution	institution, distance education unit, library	<ul style="list-style-type: none"> • existence of questionnaire or monitoring mechanism to enable collection of information on student satisfaction with learning support
9 Monitoring student	schools/departments	application, on a trial basis, of

progress and
achievement

- student progress rate

the use of Student Progress

Rate = $\frac{\text{passed subject load}}{\text{certified subject load}}$ - see
Linke
(1991) p70.

Source: Nunan, T and Calvert, J 1992 *Report of the project to investigate Quality and Standards in Distance Education*, Adelaide: University of South Australia/Geelong: Deakin University

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