PAPER 9

THE COSTS AND COSTING OF DISTANCE/OPEN EDUCATION

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CONTENTS

1. INTRODUCTION

1.1 This report deals with the purpose, problems and experience of costing distance and open education projects.

1.2 The purpose of costing is

- to make explicit the costs involved or likely to be involved in the project or activity and the differential cost arising from any changes in that project or activity
- to enable cost-efficiency comparisons\to be made between different ways of effectively achieving a given end.

1.3 Identifying the costs of an activity or project should help decision-makers choose between alternative courses of action. Problems of choice include:

- decisions on capital expenditure
- decisions on whether to do something oneself (eg. print texts) or pay someone else to do the job for one (eg. a printer)
- selection of media (eg. radio vs. audio-cassettes, television vs. texts)
- selection of distribution channels.

Cost will not be the only factor governing choice.

1.4 Unless the fundamental variables affecting the costs of a distance or open education system are identified, and the relationship between costs and volume of activities understood, there is a real danger that:

- the costs of a project may escalate because, for example, the choice of medium is inappropriate to the volume of students, or the infrastructure costs too great for the project to carry and remain cost effective. There may be cheaper (more cost-efficient) ways of achieving the same end as effectively.
- the resources available may be critically insufficient in kind, amount and timing to support the defined objective(s) of the institution or project, with consequential serious implications for it.

1.5 It is obviously much better to identify the costs involved in a project and the way they behave relative to volume and activity before one commits oneself to implementation. Costing can help here.

1.6 There is nothing intrinsically difficult about costing. Any project or activity can be costed. Unfortunately:

- quite often people prefer not to cost a project or activity, usually because they are afraid that publication of the 'real' costs of their activity will show up their inefficiencies, and thus precipitate budget cuts

- the way projects are costed in practice is frequently confused, ill-defined and inconsistent

1.7 This report assumes that those planning or managing a distance or open education project want to cost it properly. The next section outlines a framework for doing this.

2. FRAMEWORK FOR COSTING

2.1 There are two basic approaches which can be taken to costing: one is an economic approach, the other an accountancy approach.

2.2 The *economist's approach* distinguishes between variable and invariable or 'fixed' costs, and takes account of the capital costs of the project. Capital costs are generally annualised or amortised over the life of the equipment; and in some cases account is taken of the cost of depreciation and the opportunity cost of interest foregone.

2.3 The *accountant's approach* distinguishes between capital (or investment) expenditure and operating or recurrent expenditure, but investment expenditure is usually treated as a sunk cost. It is not normal budgetary practice (at least in the case of public funds) to include amortization charges in the operating expenditure budget. The approach taken in this report is orientated towards accountancy rather than economics, for reasons explained below, but the accountancy approach is modified somewhat to take account of the impact of capital on the cost of projects.

2.4 Appendix 1 discusses the economist's approach to costing in greater detail.

2.5 Appendix 2 outlines a modified accountacy-based approach to the costing of distance and open education. This is the method recommended in this report.

3. WHAT DOES DISTANCE AND OPEN EDUCATION COST?

3.1 A large number of cost studies have now been published on the relative costs and efficiencies of individual distance and open education projects. Of particular relevance, in that they provide abstracts, resumés and reprints of a number of studies, are:

- Jamison, D.T.., Klees, S.J. and Wells, S.J. (1978) *The costs of educational media. Guidelines for planning and evaluation*, Beverly Hills, Sage Publications.
  Contains sections on (1) the methodology of costing (pp.23-69) and (2) the costing of instructional technology projects using radio and television (pp.71-120), as well as (3) case studies (pp. 71-120) on the Nicaraguan Radio Mathematics Project, the Radioprimaria and Telesecundaria projects in Mexico, Instructional Television systems in El Salvador, Stanford University (USA), Hagerstown (USA), and the Korean Elementary/Secondary School Project.

- UNESCO (1977) *The economics of new educational media*, Paris, The Unesco Press (volume 1 of 3).
  Contains (1) bibliography (pp.46-63); (2) abstracts of a wide range of studies (pp.66-93), and (3) case studies of Mexico's Radioprimaria*, Instructional Radio in Nepal, the El Salvador ITV System*, Mexico's Tele-secundaria*, a

programmed-instruction project in Central Africa, and a Swedish resource-based learning system. (Case studies marked * are extracts or abstractions from Jamison et. al (1978) - see above.)

- UNESCO (1980) *The economics of new educational media, volume 2: Cost and effectiveness*, Paris,The Unesco Press.
  Contains (1) cost studies on the Ivory Coast primary education by television, Acción Cultural Popular in Colombia, the Kent Mathematics Project and use of video tapes in a teaching laboratory at the University of Surrey (UK), educational television in Maranhäo and Ceara, Brazil, and on post-secondary distance education, (2) further abstracts (pp.257-275), and (3) a bibliography which supplements the one contained in volume 1 (pp.313-6).

- Perraton, H. (ed.) (1982) *Alternative routes to formal education: distance teaching for school equivalency*. Baltimore, John Hopkins University Press.
  Contains case studies (pp.31-249) on the Minerva and Madurez projects (Brazil), Malawi Correspondence College, Mauritius College of the Air, Korean Air Correspondence High School, in-service teacher training in Kenya, and Everyman's University (Israel). There is a conclusion (pp.253-69) which summarises the findings, and an appendix which discusses methods of cost analysis (pp.273-7).

- Perraton, H. (1982) *The cost of distance education*, Cambridge, International Extension College.
  Short discussion of costs and methods of costing distance education, coupled with summary of evidence drawn from a wide range of studies.

- Perraton, H. et al (1983). *Basic Education and Agricultural Extension; Costs, Effects, and Alternatives*, Washington DC, The World Bank.
  Discusses the effectiveness of traditional methods of agricultural extension and basic education.

- Wagner, L. (1982) *The economics of educational media*, London, The Macmillan Press.
  Discusses cost structures and factors affecting costs, drawing evidence from a range of studies.

3.2 Although the literature points to the existence of a wide range of studies, it is not easy to draw firm conclusions from them. There are a number of reasons why this is so:

- until recently, there was little agreement on methodology. Even now, and in spite of generalised guidelines on methodology contained in, for example, Jamison, Klees and Wells (1978: 25-62), Eicher et al (1982 : 41 - 53), and Fielden and Pearson (1978), there is no agreed methodology. Cost studies indicate, for example:

  - discrepancies in the use of projected (budget) vs. actual (final accounts) costs

  - differences in the treatment of costs - notably capital, which may be (a) ignored, (b) taken into account but treated as a sunk cost, (c) taken into account as an annualised cost, (d) discounted.

- problems in reflecting the 'true' costs of a system, and drawing valid conclusions from these. For example, some studies concentrate on institutional costs (those costs carried on the budget of the institution), while ignoring 'system costs' which fall on other people or institutions -for example, students, government where the finance is given to institutions other than the distance education institution. Many

distance and open education systems use the resources of other institutions at marginal cost (eg. the British Open University pays the marginal cost of transmitting its programmes on the national tv and radio channels of the BBC; the Universidad Nacional de Educacion a Distancia pays marginal costs for local centres). It is wrong to assume that similar costs will apply when a system is transferred from one country to another or from one setting to another.

- the costs of goods and services differ from country to country, making international comparisons difficult. Wage levels and the costs of imported goods can distort international comparisons.

- some institutions receive help in the form of international aid (technical assistance, goods or money). Such aid may enable strategies and technologies to be adopted which could never be supported using indigenous sources of staff, equipment and finance. Money may be available in the form of gifts or loans. Loans may be interest free or low-interest. The presence of such gifts or loans may distort international and inter-institutional comparisons.

- changes in price levels arising from (1) inflation within a country, (2) changes in exchange rates between currencies, and (3) relative movements in the inflation rates of two or more currencies all make comparisons between the costs of different systems difficult.

- there are wide variations in how any given medium is used (contrast the British Open University's broadcast quality television to the professional standards of the BBC with the standards found in TVI) and distributed. Consequently it is very difficult to draw conclusions about the relative costs of different systems.

- there are very few studies on the relative costs of different media choices. Perraton (1982 : 8-17) discusses some of the factors affecting costs of print, radio, audio-cassettes and television. Eicher et al (1982 : 55-64) summarise some of the main conclusions which can be drawn in respect of the costs of television, radio, computers and other media; Bates (1982:278-323) discusses options for delivery media, including the comparative costsof distributing 320 minutes of audio material at the British Open University through 'widespread' (i.e urban and rural) and 'metropolitan-limited' telephone conferencing, records, cassettes, flexi-discs, and radio, and van der Drift (1980) discusses the relative costs of various audio-visual media. But in general such studies only offer broad generalisations from institution-specific or country-specific studies, and are therefore of limited help in costing intranational and particularly international projects.

The costs of media

3.3 In spite of these difficulties, some general conclusions can be drawn in respect of the costs of media:

Print

There are four elements to the costs of print

- Development, text setting (fixed print), printing (variable print), and distribution.

- Development costs include the costs of writing, editing and graphic design.The costs can vary enormously. The most crucial decision here is whether one hires full-time academics to develop materials, or consultants who are paid on a contract basis. Full-time academics cost much more but Perry (1976 :91) argues that the results one obtains from them is superior to those obtained from consultants. The

arguments for and against full-time academics are rehearsed in Rumble (1986 c :127-9). Full-time academics may work as individuals or in teams. The latter approach is more expensive. Again, Perry (1976 : 91) argues that the team approach is superior to any other, though more expensive. Rumble (1986 c : 164-73) discusses the various approaches in detail, and the problems of teamwork in course development. Perraton (1982 : 12) makes the point that the cost of contract authors varies depending on 'supply'. In some countries, where a number of people might write a text, the cost may be quite reasonable, but in others, where suitable authors are hard to find, costs may rise enormously. Editorial costs may also be high. Use of contract authors, in particular, is likely to place a premium on editing. At the British Open University, for example, where the full-time academics are used for writing and preparing self-instructional texts, the input in terms of instructional design and text editing is fairly low. In systems using contract authors, editors may have much more to do.

- The costs of text setting vary depending on the method of printing used. Offset lithography from typed originals is generally cheaper than letter press printing from hot metal typesetting. Use of wordprocessors instead of typewriters makes the preparation of camera ready copy even easier, and can also affect authoring costs. Timmers (1986 : 18) comments that the use of word processors at the Open Learning Institute, B.C., Canada, cut the time taken to develop and prepare for production a page of text from 120 hours to 50. Where texts have to be handwritten, costs can escalate. The Allama Iqbal Open University, Pakistan, pays calligraphers on the same scale as university lecturer(Perraton, 1982 : 13). Some institutions prepare texts in more than one language, thus incurring the additional cost of translation (eg. the Sri Lankan Institute for Distance Education - now Sri Lankan Open University - prepared texts in Tamil, Sinhalese and English). Use of illustrations (adding costs of pasteup) can increase costs dramatically. Again, use of integrated wordprocessing, design and page setting packages can reduce costs here.

- The costs of printing also vary. Paper costs vary widely from one country to another, but there are also differences in the costs of printing. For example, the costs of the offset litho process are also affected by whether paper or metal plates are used. The former are cheaper but are only good for about 500 copies. The use of colour will also add to costs significantly.

- Distribution costs vary according to the amount of material being distributed, whether distribution is in bulk to local centres for collection by students or direct to the homes of individual students, and local circumstances. Variations in cost are so wide that is difficult to generalise.

Printing costs are susceptible to economies of scale. If a course has relatively few students on it, one way to reap economies of scale is to print sufficient copies to last several years. Of course, this makes it much more difficult to change the material in the second (and possibly subsequent) year of use without having the problems of (1) errata slips, (2) deciding whether or not to pulp unused copies and print a revised version. Also, the costs of warehousing needs to be taken into account where stocks are produced for several years use.

Television/Video-tape lectures/closed circuit television/film

There are two elements to the cost of broadcasting and video:

- Production costs of video-tape lectures and closed circuit television is much cheaper than broadcast quality television. Eicher et al (1982 : 55) suggests that the production cost of video may be as little as $160 per hour while that of broadcast quality television may be $50,000 or more (in 1980 prices). Broadcast

quality tv is more expensive for a variety of reasons. Some countries' unions have forced the rates of pay for broadcasting staff to high levels; the cost of equipment to produce broadcast quality tv is far more expensive than that used to produce video; and traditional companies and unions have argued that one needs more staff to produce broadcast quality tv than video. What constitutes broadcast quality television is itself the subject of debate. In the United Kingdom, for example, the television companies broadcast 3/4 inch Hi-band tape material. In the United States the Public Broadcasting Service broadcasts 3/4 inch Lo-band Umatic tape generated material, which is cheaper to produce. It is perfectly feasible to produce 'broadcastable' television material on Umatic cameras and tapew recorders at a production cost of less than $1000 per hour.

- TV/video transmission or distribution costs vary enormously. The costs of terrestial transmission over the air depends on whether a system has (1) to set up its own network, run it, and maintain it, or (2) can transmit on someone else's network. The cost of (2) can vary considerably depending on whether the system is charged (a) an economic cost per hour, (b) a marginal cost per hour, of (c) gets free access to airtime. (The British Open University, for example, benefits because it is only charged the marginal cost of transmission on the BBC's network).

However, video can be transmitted or distributed by other means including:

- Satellite DBS (Direct Broadcasting Services) to homes and study centres. This involves costs of an uplink to the satellite, use of the satellite (at full or marginal cost), as well as the cost of reception dishes at each site (local centre or student's home). The major variables here are the cost of access to the transponder (projects like SITE in India have benefitted from access at less than the real cost) and the cost of and number of reception dishes.

- Satellite to cable head, and thence to local centre(s) and homes. Here costs depend on the prior existence of a cable network.

- Use of video-cassettes, involving the cost of video-cassette players in either homes or local centres, and the cost of the cassettes themselves. The cost of a video distribution service varies depending on whether videos are given to students or loaned to students on a returnable basis. The cost is also affected by who provides the video-cassette player (student or institution). An internal British Open University study showed, for example, that to meet the needs of a course over four years:

  a. it was cheaper to transmit an hour's material on the open-air network of the BBC (at a fixed cost for transmission of £737 per hour in 1984 prices) provided there were more than 936 students over the 4 year period (234 per year)

  b. it was cheaper to give students a video-cassette (incurring the cost of an E-60 cassette, its copying, and one-way postage to the student's home, provided there were less than 526 students over 4 years (126 per year). If this option is chosen, all costs are student variable.

  c. it was cheaper to loan students cassettes - incurring the cost of buying in a stock of cassettes, copying them, and paying the two-way postage to a student's home, if there were from 527 to 935 students over 4 years (133 to 233 students each year). Here, the cost of the stock of video-cassettes can be annualised, but the cost of postal distribution remains a student variable cost.

- Costs of tv or video reception are affected by the number of video-cassette players

or tv sets required, whether these have to be provided by the institution or are provided by the students, and whether or not they are run off electricity or batteries.

- Whether or not the production and transmission costs of tv and video are worthwhile will depend in part on the number of students served.

- TV is an expensive medium, particularly for poorer countries. It is difficult to justify unless electricity is available and a basic infrastructure (eg. maintenance services and trained manpower) available (Eicher et al, 1982 : 58). 'Educational television cannot be cheap and should not be recommended as long as a significant proportion of households are not equipped to bear a significant part of infrastructure fixed costs' (Eicher et al, 1982 : 58).

- For large numbers of students, use of video-cassettes is even more expensive than tv, but are much more effective, educationally speaking. Video cassettes are not as ephemeral as tv, can be replayed at will, and can be started and stopped at will.

- Film is even more expensive than video, and its significant use in education is 'probably doomed' (Eicher et al, 1982 : 60).

Radio and audio-cassette

As with television and video, there are two elements in the cost of radio and audio-cassettes - production and distribution:

- Radio production costs are cheaper than tv costs. Transmission costs are also cheaper. The British Open University nevertheless found that it was cheaper to provide students with non-returnable audio-cassettes (a student variable cost) than to transmit by radio (a fixed cost per hour) provided there were under about 1000 students on the course. Eicher et al (1982 : 58) are sceptical of the cost-efficiency of radio in any project where there is less than 2000 students. Radio can be strikingly cheaper than any other medium where the target audience is large (Perraton, 1982 : 15).

- Audio-cassettes are educationally more effective than radio, because they are not as ephemeral, because students can replay them as many times as they wish, and because they can start and stop the tape at will. They can be used effectively in conjunction with print ('listen and look').

Computer-based instruction

There are insufficient studies of the costs of computer-based instruction available to enable significant conclusions to be drawn. Costs per hour of student contact are generally high. Among the costs to be considered are the costs of equipping students with computer (including monitors etc.) and the cost of acquiring or developing software.

The cost-effectiveness of distance education

3.4 While comparative data on the relative cost of particular media is still scarce, there is plenty of evidence that distance education can be more cost-effective than traditional education.

3.5 The basic cost function of distance education is explained in Appendix 1. Broadly speaking, this function is:

$$T = S\pi + C\mu + F$$

where T is the total costs, S is the number of students, C is the number of courses or volume of materials, π is the unit cost per student, $\mu$is the unit cost of the courses or materials, and F is the fixed costs.

3.6 Those planning a distance education system in the hope that they will reap economies of scale must ensure that:

- the variable cost per student is less than that found in conventional systems operating at a similar education level
- the number of students S is large enough to bring down the average cost per student to a level where it is lower than the average cost found in conventional educational systems. The average cost per student (AC) is found by using the formula:

$$AC = \frac{C\mu + F}{S} + \pi$$

- drop-out rate is kept at a reasonably low level.
- the number of courses or volume of materials C does not grow so large as to increase the value of ($C\mu$ + F) to a level where it becomes difficult, given the likely volume of students (S), for the average cost per student (AC) down to a level that is 'competitive' with the average cost per student in conventional educational systems.

3.7 These conditions have very significant implications for:

- the choice of media. In theory distance educators have a wide choice available to them. In practice this is often constrained not only by the absolute costs of a particular medium but by the effect its adoption may have on average student costs.
- market research - aimed at ensuring that sufficient students will be attracted to particular programmes at the institution to enable economies of scale to be achieved.
- the resources put into student services. Since these costs are a student variable cost, the degree of investment in student support services has to be weighed against the effect on the average cost per student (AC) and on drop-out rates.
- the resources put into the central infrastructure (fixed costs of the institution) are too large relative to student numbers.

3.8 The concept of cost-effectiveness needs to be distinguished from that of cost-efficiency.

Effectiveness is concerned with outputs : an organisation is effective to the extent that it produces outputs that are relevant to the needs and demands of its clients. It is cost-effective if its outputs are relevant to the needs and demands of clients and cost less than the outputs of other institutions that meet this criteria. This implies the existence of criterion for the measurement of effectiveness.

Efficiency is concerned with the cost of achieving outputs: an organisation is efficient relative to another programme if its output costs less (per unit) than that of

the other institution. It becomes more efficient to the extent that it maintains outputs with a less than proportionate increase in inputs.

Organisations can be effective but not necessarily efficient. For example, one can teach Russian to Italians very effectively (i.e. they learn to speak Russian like a native), but if the cost per student of doing this is five times the costs incurred by anyone else, then one one is not doing it very efficiently.

An organisation may also appear to be more efficient than another one (i.e. its unit costs are lower) but the extent to which it is really efficient must depend on its effectiveness. The single-minded pursuit of efficiency (ie. cost-cutting) may damage the effectiveness of an organisation, thus diminishing its cost-effectiveness.

3.9 The fact that an organisation is cost-efficient in comparison with another does not necessarily mean that it is as cost-efficient as it could be. There may well be internal diseconomies which could be rectified without damaging its effectiveness

3.10 Distance and open education systems are not always more cost-effective than conventional educational institutions. Some of the major factors which may make distance or open education institutions less cost-effective than traditional ones are mentioned in paragraph 3.6.

3.11 It is important to point out that what is <u>not</u> being compared is the absolute cost of different systems. Distance education requires considerable investment before a single student can be enrolled - in both the development and production of course materials and the design and implementation of an institution's infrastructure. Thus Wagner (1977 : 360) pointed out that the ratio of fixed to variable course costs in conventional British universities was 8:1 whereas in the British Open University it was 2000:1. What is cheaper in distance education is the cost per student. What is compared is the average cost per student, full-time equivalent student, or student credit hour.

3.12 In summary, a distance system may cost more in absolute terms than the conventional systems with which it is being compared, but it can be more cost-efficient because it has sufficient students to bring the average cost per student down below that of conventional systems - thus making it more cost-effective.

3.13 Perraton (1982 : 21-35) shows:

- that at the primary basic education level, some distance teaching systems with even quite small numbers of students (eg. Radioprimaria, Mexico with 2,800 pupils) had lower average costs than conventional schools, and students achieved comparable scores. Other systems with large student numbers (eg. ACPO, Colombia with 70000 pupils) were also cheaper. However, in the Ivory Coast the primary educational tv system had a higher average student cost than conventional systems, even though it had 231000 enrolments annually. (The cost of setting up a tv network and of paying teachers salaries near to those of regular teachers meant that even with its large student numbers the Ivory Coast ETV system could not bring the average cost per student down.)

- at the secondary level, where there are more systems, some distance education systems (such as the Correspondence Course Unit, Kenya with from 340 to 2900 students each year) were more expensive than traditional systems. The Malawi Correspondence College (with 3800 students) had a cost per successful student that was more expensive than that of day schools but cheaper than that of boarding schools, while the National Extension College, UK, were cheaper than full-time classes and probably cheaper than evening classes. Yet other systems (eg. Tevec in Canada with 25000 students) were said to be cheaper than the in-school

alternative.

- at the tertiary level, the British Open University is probably the best studied of all distance education systems. The cost per graduate at the Open University (which has an annual enrolment of 20000 - 25000) is about half the cost of a graduate at a conventional university, while the cost per student per year is about one third that of a student in a conventional university. The relative advantage of the Open University is less when comparing the cost per graduate because it has a higher drop-out rate than conventional UK universities. The costs at Athabasca University, Canada (with an annual enrolment of 4400) is comparable to that found in conventional universities in Alberta. These costs are for universities designed to teach only at a distance. Universities which run distance education programmes 'pick-a-back' on conventional programmes can expand their student numbers for relatively modest costs per student by teaching the additional students at a distance.

- in non-formal education, it is much less easy to draw comparisons between the costs of distance and conventional educational methods, not least because non-formal education does not lend itself to traditional methods of teaching what can be said is that where distance methods are used in large scale projects the unit costs are low.

3.14 Thus distance teaching can be cheaper than conventional methods, but this is not invariably the case. It is clear that achievement of high student numbers has a major impact on whether or not average costs per student are bought down to a level at which distance education is an attractive proposition. It is equally clear that distance systems have a high absolute cost and that it is cheaper to use conventional methods where student numbers are restricted. At which point a distance teaching system becomes cheaper per student than a conventional one depends on answers to the issues addressed in paragraph 3.7 above.

3.15 Two final points need to be made. Firstly, even though distance education can reap economies of scale, and even if the level of potential demand is such that one can envisage large numbers of students enrolling in a system, it is possible that the total cost will be such that a particular government or funding agency cannot contemplate starting to develop the system. Secondly, achieving a lower average cost per student may be economically and financially desirable, but it is a secondary objective. What is important is to teach students who perhaps cannot contemplate studying by other than distance or open means. The fact that certain students (eg. adults in full-time employment living in remote areas) can only be reached by distance means is in itself an important consideration in deciding to teach at a distance, and the comparative cost of doing this may be deemed irrelevant to the decision to establish a programme.

Cost of collaborative projects

3.16 Most distance and open education systems exist as autonomous institutions in their own right. No publicly available cost studies of collaborative projects operating at an international level (although such projects exist - eg. University of the South Pacific) or intranational level (eg. Universitá a Distanza, Italy; DIFF, German Federal Republic) have been identified. However, there is a cost associated with collaboration, and collaborative schemes may well incur costs which are not encountered in 'stand alone' schemes.

4. WHO SHOULD PAY FOR DISTANCE EDUCATION?

4.1 In considering who should pay for distance education, two dimensions need to be

considered: who pays, and for what.

What needs to be paid for?

4.2 Broadly speaking, the costs of a distance education system can be broken down into six elements:

(a) the capital costs of the institution (eg. buildings, equipment, etc..) but excluding (f) below
(b) the recurrent costs of running the institution (eg.administrative and managerial functions)
(c) the costs of developing and producing learning materials and courses
(d) the costs of teaching a course (eg. transmission, tuition, variable print, etc.)
(e) the costs of general student support services not directly related to teaching a course (eg. counselling)
(f) the capital costs of equipping a student to study (eg. television sets, computers, etc.).

4.3 We have seen that the costs of a distance education systems vary depending on among other things choice of media, level of service provided to students, cost of infrastructure, local prices, etc. The costs of teaching [(d) above] can be controlled relatively easily by consciously choosing how much support should be given to students. This will also be true of costs under (e) above. Decisions on media choice can also limit the capital cost of equipment needed by students to study [(f) above], as will a decision to locate equipment in a local centre where it is shared by a number of students, rather than put into students' homes. There are, however, a number of costs which are fixed irrespective of student numbers [(a), (c) and to some extent (b) above]. The average cost per student of (a) + (b) + (c) will depend on the number of students in the system.

Who might pay?

4.3 Various agencies might be approached to meet the costs of distance and open education systems.

(a) national governments
(b) international aid agencies
(c) employers
(d) students

4.4 In considering whether national governments should meet the cost of distance and open studies, a distinction is sometimes drawn between projects that aim to reach students in the normal schooling and post-secondary age-groups and those aimed at adults. It is sometimes argued that the costs of adult education should not be charged against public funds. A number of reasons are given for this, including, for example, adherance to a 'front-loaded' model of education which undervalues the education of adults; the belief that non-vocational adult education is essentially a private affair, of benefit to the individual, and hence the individual should pay; and the belief that the costs of vocational education and training should be met by either the individual or his/her employer. There is, however, another perspective that argues that the education of adults is not a luxury, that increased technological and social change leading to the obsolescence of knowledge acquired during the initial period of education and training means that individuals need 'continuous education' and that this it is not just an individual's or employer's responsibility to pay for this (since the capacity of individuals and employers, particularly small ones, to pay is limited), but also a government's responsibility.

4.5 Many governments are increasingly aware of the needs to train large numbers of

people in areas where there are acknowledged shortages of skilled labour, but they have been more reluctant to support the development of adult or continuing education in non-vocational and non-skills shortage areas. Thus the question of "who pays?" is linked to the question "what is being taught?".

4.6 It is clear that large employers frequently spend a great deal on training. Many have developed in-house distance and open education programmes to meet the needs of dispersed workforces. Such programmes may be wholly company-developed, or developed by a company in conjunction with a university or other educational institutions (eg. State University of California Chico in conjunction with Hewlett-Packard). Small firms, however, cannot invest in the development of programmes, and may have to rely on industry-wide provision which may or may not be entirely suitable to their need. Small firms also have problems in matching big firms in releasing staff for training purposes, and may also be reluctant to invest in staff training given that staff, once trained, may move on. (For example, it has been suggested that it is UK industry's reluctance to train computer staff that is one of the causes of national skill shortages in this area).

4.7 Individuals, while they may be willing to invest some personal resources in their further education and training, have to do so within the discretionary income available to them (ie. that income left over after the basic necessities of life for themselves and their families have been met). What constitutes 'discretionary income' levels is partly determined by the level of income of the target group, partly by personal expectations regarding what constitutes necessities, and partly by the cost of such necessities in the society in question.

4.8 Potential students have to set against discretionary income

- the recurrent cost of taking a course (fees, purchase of materials, cost of studying including postage costs, travel costs, etc.)

- the capital cost of equipping themselves to study at a distance. Some of the equipment students may need may already be widely available in individual's homes, and it may be reasonable to expect students to own it (eg. radios). Other equipment may not be readily available (eg. personal computers, video-cassette recorders/players, etc.). Sometimes students may own equipment, but it may not be compatible with equipment used by the institution. (This problem arises in the case of, for example, video-cassette recorders, video-disk players, and computers). Institutions may decide to provide equipment on a loan basis to individuals, to provide for access through local centres, or to require students to purchase the equipment themselves.

4.9 Account must be taken of the costs of study falling on students, relative to discretionary income, and the implications of the costs for access. (The implications may, of course, be very different, depending on the nature of the target group).

4.10 Sometimes the costs of a project will be covered in whole or in part by an international aid agency. Such aid may be in the form of grants, technical assistance, donations of equipment, etc. Not all aid is necessarily helpful. It may, for example, commit an institution to using media which is inappropriate to the target student group; or it may lead the institution to commit itself in ways which it cannot sustain once the aid ceases to be given. For institutions with an on-going commitment to students, this could be serious.

What conclusions can one draw?

4.11 Unfortunately, the variables are so great that it is very hard to draw specific conclusions. However:

- the costs of large scale capital costs (buildings, broadcasting facilities, etc.) will generally need to be carried by a government or international aid agency, and treated as a sunk cost (ie. not recoverable)

- students may reasonably be asked to buy the basic equipment they need to study. If their financial situation is such that this is unreasonable, then:

  - the institution must buy the equipment and provide it to each individual. This can be very costly, and raises problems in respect of warehousing, checking equipment, maintaining it, sending it to students, and (in cases where the equipment is loaned) getting it back from students.

  - the institution must buy equipment and locate it in local centres where students can access it. This is less expensive but raises questions about queuing (demand to use the equipment vs.number of sets provided), ease of access to local centres (location relative to students' homes, opening hours, etc.), maintenance of equipment, and security from theft.

  - the institution can decide not to use the equipment.

- the extent to which students should pay for all of the costs of (1) tuition and direct other training costs, (2) general student support costs, (3) development and production of course materials, and (4) general institutional overhead costs, is a matter of judgement <u>but</u> in general commercial distance teaching institutions

  - restrict their use of media. The typical correspondence college uses correspondence texts, audio-cassettes and other inexpensive media.

  - only teach in fields where there is known to be an extensive demand for courses (ie. may well ignore areas of great national importance because the costs of writing the material <u>and</u> updating it are too great to warrant investment, given potential student numbers)

  - do not invest in significant levels of student support, thus keeping costs down, but also running the risk of high drop-out rates. Student support is often limited to tuition.

4.12 Experience at those institutions which run self-financing continuing education systems indicate the requirement to be self-financing means that one must (1) annualise development and production costs over the life of a course, and on the basis of estimated student numbers, charge students a fee sufficient to recoup those costs, (2) charge direct teaching and general student support costs, (3) make a charge for administrative overheads, <u>and</u> (4) charge a fee which will generate a return on investment and running costs sufficient to generate funds for the development of further courses, including remakes of ageing courses. Not surprisingly, this restricts the area in which courses can be developed to those where sizeable markets can be expected, and places a premium on seeking grants to cover the cost of the initial development and production of course materials.

4.12 Institutions operating at an international level will need to take account of varying conditions in host countries and these may affect:

- the absolute capital and recurrent costs of the system which needs to be set up in that country

- the ability of government to meet the absolute costs of the system, as designed

- the ability of students to buy equipment and pay for courses, (including fees and

incidental expenses incurred by students in the course of their studies)

- the running costs of the system (eg. effect on costs of customs dues on import of educational materials)

5. SOME UNANSWERED PROBLEMS

5.1 It should by now be clear that

- while generalised lessons can be drawn from the literature regarding the costs of media and the cost-effectiveness of distance education, these lessons can only act as a guide to planners

- there is no absolute consensus on how to cost a project. Even where procedures for specifying costs and outcomes with a view to evaluations projects, are written down (as for example in the International Office Educational Testing Service *Manual for the analysis of costs and outcomes in non-formal education* [1979]), there is a recognition that the most a manual can do is point to a way of proceeding, not provide a recipe to be followed slavishly

- experience shows that the costs of new projects are almost always under-estimated

- even when costs have been ascertained satisfactorily, they will only provide one element in an answer to questions such as:

  - Which project should be implemented?
  - Is the project a good investment?
  - Should the project be expanded?
  - Should the project be continued?
  - Should the project be replicated in other areas?
  - Is there a better alternative?

5.2 There is no substitute to costing each system as carefully and as accurately as possible.

6. WHAT NOW? - GUIDELINES FOR THE FUTURE

6.1 Section 5 ended by saying that there was no substitute for costing one's own system as carefully and as accurately as possible. Appendix 2 provides a possible framework for costing a project. It should be treated as a guide, not as something to be followed slavishly.

6.2 In any intranational or international project, a common framework for costing needs to be adopted if comparisons are to be drawn between the costs of different parts of the project.

6.3 Intranational and international projects raise particular problems in costing and the analysis of costs, not least because:

- organisational structures and work roles may differ, making it difficult to draw precise boundaries in allocating costs to categories of expenditure

- the absolute cost of services may differ markedly for reasons beyond the control of project administrators (eg. radio transmission may be free in one country, expensive in another)

- in the case of international projects, account has to be taken of exchange rates and differences in inflation

- If comparisons of cost-effectiveness are to be made, then common measures of desired outcome must be agreed for the whole project

6.4 Costing can be done, and judgements made about the relative cost-effectiveness of different systems. Neither costs nor measures of outcome are absolute. Each is capable of interpretation and variation. What is important is that there should be an agreed basis for doing the costing, and for measuring outcomes, so that informed discussion and decisions about the future can then take place.

Appendix 1

Economic studies of education costs

1. The majority of cost studies of distance and open education projects have been based on approaches derived from the discipline of economics. Such studies generally

   - identify the *fundamental variables* involved in the institution, project or activity that is the subject of the study. Variables may include

     - student load (based on head counts, full-time student equivalents, or some other appropriate measure of load)

     - either course loads (based on credits, credit hours, or some other measure of load) or materials (number of textbooks, television programmes, etc.)

   - identify the *costs associated with the particular variables* that have been identified, with a view to deriving an average unit cost per variable (eg. unit cost of one FTE student, unit cost of one television programme). Such costs are usually held to be the *direct costs* of that variable. A direct cost is a cost that can be directly attributed to an activity or variable.

   - identify those costs which are unrelated to defined variables. These costs are usually described as *overheads*. Such costs are usually called indirect costs. Indirect costs are costs that cannot be clearly related to an activity.

2. The studies then seek to show how total costs will change given a change in the volume of the fundamental variables within the system. Generally, it is assumed that the overhead costs are 'fixed' although this assumption is usually subject to caveats:

   - in the case of 'young' institutions that are still developing, there is a reasonable expectation that overhead costs will rise. Economic studies of Athabasca University by Snowden and Daniel (1980) and of the Universidad Estatal a Distancia by Rumble (1981) attempted to meet this point by assuming that overhead costs would continue to rise for several years during the initial years of development

   - even for established institutions, overheads are usually held to be 'fixed' within a range of levels of activities, as reflected by the value of the fundamental variables. For example, it may be held that there will be no change in overhead costs while student numbers are in the range 60,000 - 80,000, but that above this level some additional overhead costs may be expected to occur.

3. Typically then, an economic study will derive a series of simple cost functions of the following kind:

$$T = S\pi + C\mu + F$$

   where T is the total cost of the project, S and C are variables (for example, students and courses or course materials respectively), π and μ are the average unit costs of S and C respectively, and F is the overhead cost. T, π, μ, and F are expressed in money terms, S and C in volume terms. There may be more than two variables built into cost function. When comparing the costs of two or more projects or of two or more policy options, two measures are generally of importance. The first is the *total cost* (T) of the project or policy. The other measure usually adopted is to derive an *average cost* per student or participant in the educational programme. The *average cost per student* (A) is equal to the total cost (T) divided by the number of students (S)

$$A = T/S$$

4. It is obvious that as the number of students (S) increases, so the total student-related cost ($S\pi$) will increase. However, a sizeable proportion of the costs of distance education project are unrelated to student number (ie. $C\mu + F$) so that, while increases in student numbers adds to total expenditure (T), average costs per student (A) fall. 'Economies of scale' are achieved quickly at first, but once high volumes are achieved, further economics of scale are at the margin (see Appendix 1, figure 1).

5. Economic studies have their value in the sense that they

   - identify the fundamental (most important) variables affecting costs in distance and open education
   - demonstrate in simple terms the cost structure of distance and open education
   - assuming that the variables are identified in sufficient detail, enable broad conclusions to be drawn in respect of the cost structure of different media.
   - provide a basis for deriving average costs per student or some equivalent measure (eg. average cost per graduate, average cost per student credit hours, etc.) which can be used to make comparisons between systems, institutions, projects and policy options
   - provide a basis for deriving average costs per one hour's instruction, by media.

6. The virtue of economic studies lies in their simplicity. They can be used for 'propaganda' purposes by the institution to demonstrate:

   - the extent to which a particular distance or open education system is more cost-efficient (ie. has a lower average cost per student or graduate) than another system
   - to show how expansion of student numbers will enable economies of scale to be reaped.

7. On the other hand, economic studies of distance and open education projects generally identify a limited number of variables. The unit costs are average costs, derived by analysing the budget or accounts for a given year, and assigning costs to the variables in the model or to overheads. The total costs assigned to a variable are then divided by the number of units of that variable to give a unit cost per variable. Generally the models

   - do not specify the fundamental variables which affect costs in sufficient detail to be of practical value to the people who are trying to prepare an operating budget for an institution (Rumble, Neil and Tout, 1981:235)
   - depend for their validity on a range of judgements about the allocation of costs to variables (Rumble 1986 b : 4)
   - can seriously obscure the very wide range of costs found in individual programmes (Rumble, 1986 b : 5)
   - while they can demonstrate external cost-efficiency (ie. this system is more cost-efficient than that one), they are useless as a means of demonstrating internal cost-efficiency (ie. this system is as cost-efficient as it can be without impairing its effectiveness).

Appendix 1, Figure 1

Student numbers and unit costs in conventional and distance learning systems

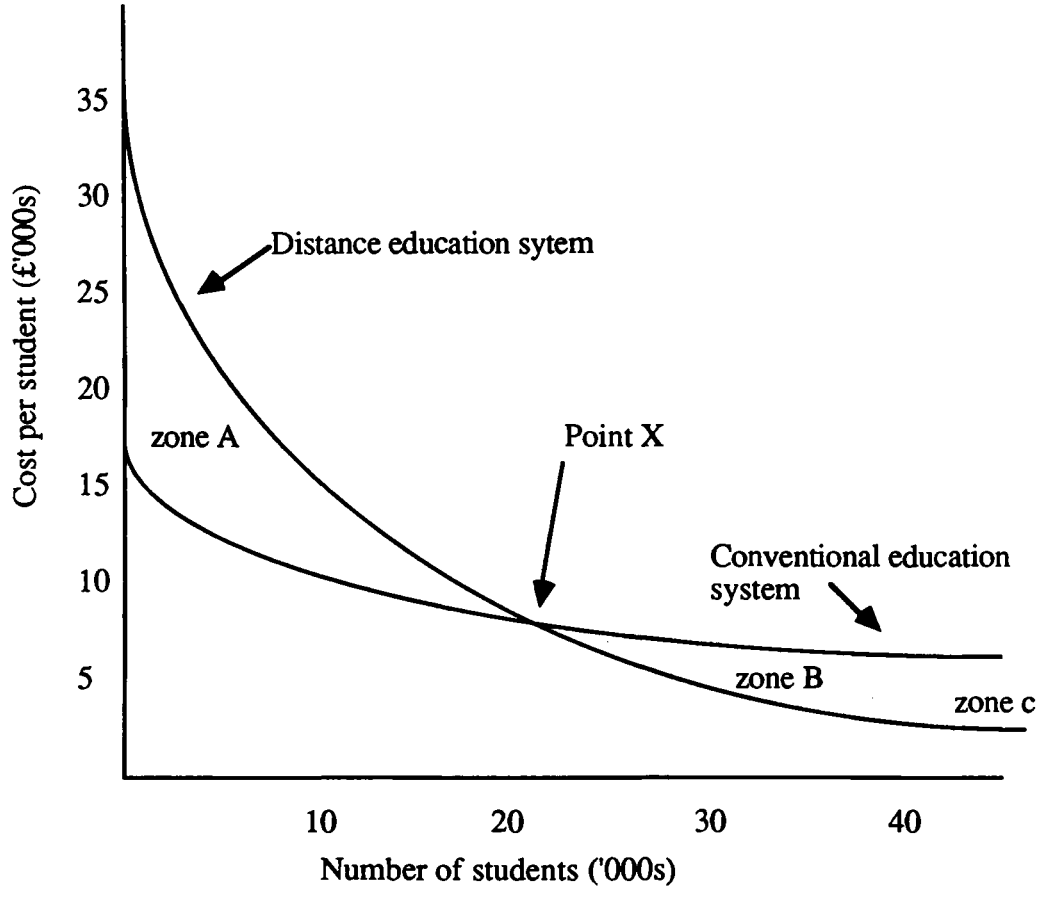
(Note: the figure is illustrative. The values attached to the axes will not necessarily have the values shown.)

Zone A : Distance system achieves rapid economies of scale but is still more costly per student than conventional system

Zone B : distance system is cheaper (per student) than conventional system, and economies of scale are still being reaped.

Zone C : average student cost curve of the distance system flattens out. It is cheaper per student than conventional systems but significant gains in economies of scale are no longer possible, however many students it takes on.

Point X : the number of students at which the average cost of students in the conventional and distance systems is the same.



Appendix 2

A modified accountancy approach to costing distance and open education programmes

1. The accountancy approach accepts the complexity of educational systems, with their multiple objectives, and sets out through activity costing to relate expenditure to the activities that go on to support these objectives.

Existing budgetary structure

2. Typically, budgeting and accounting systems in educational institutions are based on organisational units with line by line budgets, so that, while it may be easy to tell how much department x spent on academic salaries, it is very difficult to say how much was spent on the development of a particular project or programme (for example, on the Masters of Business Administration programme, a course on Financial Management within the MBA programme, or a television programme supporting the course on Financial Management).

Activity costing

3. Activity costing will identify the activities of the institution and allocate costs to that activity.

4. Two recent studies by Rumble (1986 a, 1986 b) and a study by Orivel (1987) have looked at the problems of costing distance education, and suggested a methodology for doing this. Fielden and Pearson (1978 : 37-62) also outline an accountancy-orientated approach to costing educational practice, while Eicher (1977 : 11-35), Jamison et al (1978: 25-62 and 93-102) and Eicher et al (1982 : 41-64) discuss methods and problems of measuring costs primarily from an economist's point of view.

Systems and levels of activity

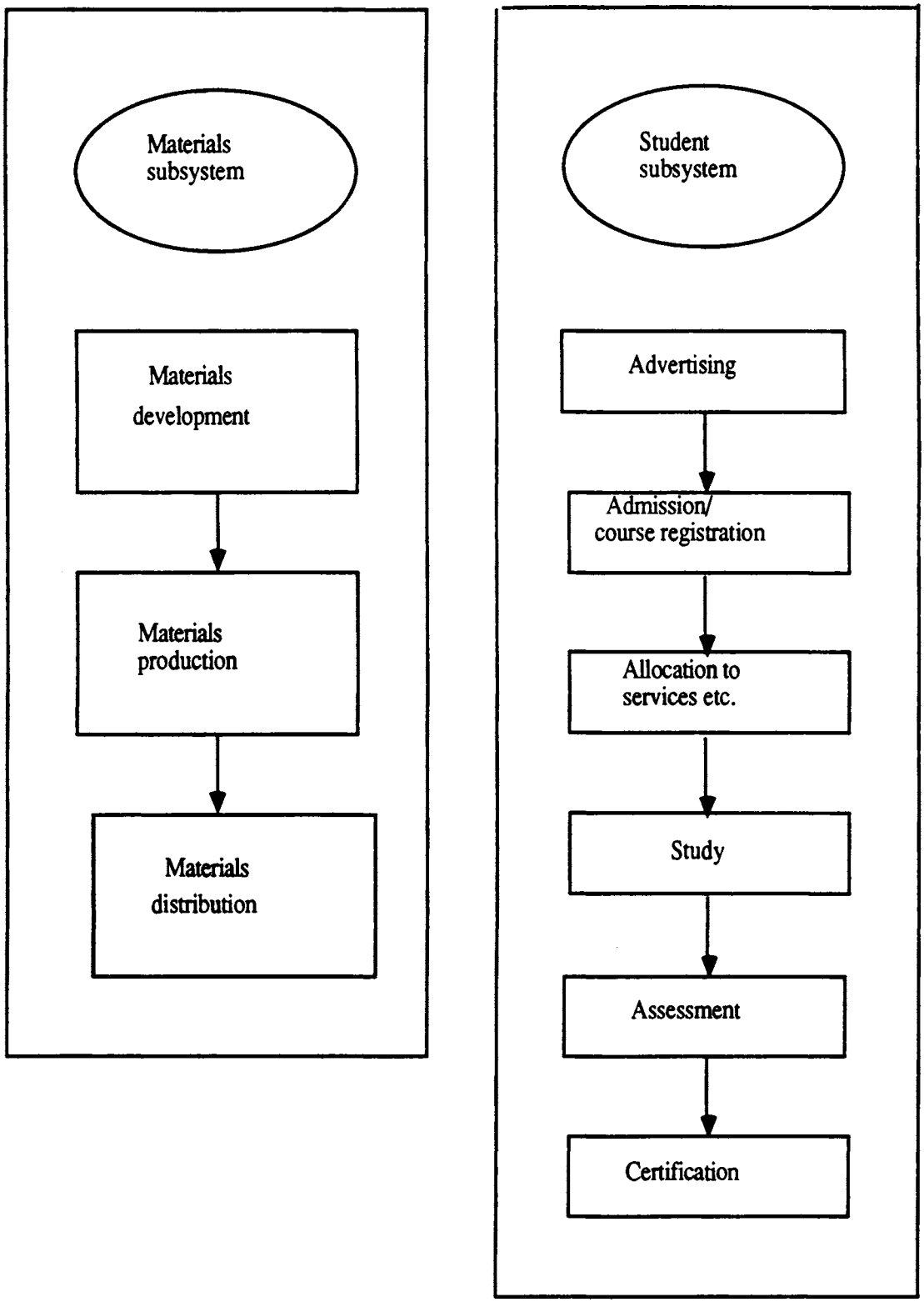
5. The systems-based approach to the analysis of distance education developed by Kaye and Rumble (1981 : 19-22) provides a basis for cost analysis. Kaye and Rumble identified two major 'operating' subsystems concerned with the import, conversion and export processes that are basic to any distance education system. These are the *materials subsystem* concerned with the development, production and distribution of learning materials: and the *student subsystem* which advises potential applicants, admits and enrols students, provides them with support services (tutors, local centres, counsellors, etc.), assesses and examines their work, and certificates them at the end of their studies. Each of these are a function, as are the various functions (public relations, personnel, finance, etc.) which go to make up the *management and decision-making subsystem.*

6. The point of contact between the two operating subsystems is the point at which the student receives the materials and begins to study them (Appendix 2 Figure 1). In complex distance education institutions (and most are complex) one can think in terms of a whole series of materials sub-subsystems (one for each medium used - print, radio, tv, audio-cassettes, etc.) and student sub-subsystems (one for each type of student, where a 'type of student' is a student subject to different academic regulations). At this stage it becomes possible to identify the *activities* and *components* involved in each sub-subsystem, where an *activity* is a pursuit in which a person or persons and/or a piece of equipment or pieces thereof is engaged, and where the activity is capable of being described in some way that indicates that it is part of an integrated whole (eg. tutorial, a film show, an examination, the task of editing a manuscript); and where a *component* is a physical entity which is in some sense self-standing (a textbook, a slide, a computer, a piece of computer software, an

examination paper) (Rumble, 1986 b : 13).

Appendix 2 Figure 1

Operating subsystems in a distance education system



7. Activities and components are the lowest level of disaggregation to which it is meaningful for our purposes to attribute costs. It may be easy to determine the costs of a particular activity or component (for example, a residential school or an audio-tape). Equally, it may be rather difficult to do so. In principle, however, it is possible.

8. It is worth saying that what one decides to define as an activity or component depends on the purpose of one's costing. For example, if one is costing a multi-media course, one might well identify the costs of the various activities and component that make up the course:

   eg. 10 textbooks
   4 audio cassettes
   3 tutor-marked assignments
   1 home experiment kit
   1 residential school of one week.

   However, if one were trying to cut the costs of one's courses, one might well examine:

   - the length of the textbooks, to see if one could not reduce the number of page or the design cost
   - the contents of the home-experiment kit (eg. chemicals, chemical glassware, electronic equipment, etc.)
   - the activities which make up the residential school.

9. Activities and components rarely exist in isolation as an educational experience. Normally, various materials are packaged together in an educational pack (for sale), or materials and activities together constitute a course. A *course* is any collection of activities or components which, taken together, comprise an entity within the institution's teaching programme, and which for purposes of student enrolment is identified as such. Courses may be of various lengths and at various levels. A course might have a code (H121) and a title (*The Causes of the English Revolution 1529-1649*). A *pack* would normally comprise materials but not activities. It too would be identifiable as an integrated whole, and would be available for purchase by the public. There may also be *projects*, which are any collection of activities and components which, taken together, contribute to the achievement of a set of objectives, and which is recognisable as a project. The preparation of this report might be regarded as a project.

10. Courses and projects can stand alone, but many belong to *programmes*. A programme of courses is any set of courses approved by a competent body as supporting a programme of studies leading (possibly) to some kind of certification (a particular degree or diploma) or which belong to a programme of studies with a common orientation (eg. a series of short courses in the field of health studies, for which no certification is offered, but which taken together have an overall coherence). Projects too may combine in a wider programme (for example, a programme of institutional research into learning at a distance).

11. Programmes of courses and packs may be regarded as part of an institution's *teaching mission* (a 'mission programme'). There may be other mission programmes - eg. community service mission programme.

12. Thus activities and components can be grouped at various levels - providing a *hierarchy of levels of activity* - each of which can be costed in the sense that the costs of activities and components (the lowest level of aggregation of cost of

interest to us) can be aggregated at different levels, to show what particular activities cost (be it at the lowest level, or at the level of courses or projects, or programmes, or mission programmes).

13. Before one can cost an institution properly, it is important to define the hierarchy of levels of activity which will interest one.

14. The kind of approach indicated above will provide a framework which will enable one to answer such questions as:

    (a) how much does a tutor marked assignment cost?
    (b) how much does the residential school on course H121 cost?
    (c) how much are we spending on tuition on course H121?
    (d) what is the total cost of course H121?
    (e) how much does the History degree programme [leading to the degree of BA(History)] cost?
    (f) how much are we spending on the undergraduate programme as a whole (ie. the sum of the costs incurred in developing, producing and delivering all the courses offered to undergraduates, and in supporting allundergraduates)?
    (g) how much are we spending on research?
    (h) how much are we spending on course production?

Coding budgets and expenditure to systems and levels of activity

15. Providing a framework is, of course, not enough. One needs to assign costs to activities, components, courses, projects, programmes and mission programmes.

16. Typically, an institutional budget will be drawn up on a line-by-line basis by departments (Table 1)

17. There is quite often a legal requirement to prepare a budget and report on expenditure on a line-by-line basis.

18. It is very rare for a department to work on a single programme or mission-programme, let alone on a particular group of courses or project. Educational institutions and departments within such institutions have multiple objectives. The problem is to assign the line-by-line departmental costs to activities. This can be done through a budget coding system which assigns costs to:

    1. <u>Traditional budget categories</u>
       (a) a department (ie. a managerial unit)
       (b) a budget line (descriptive of the kind of expenditure)

    2. <u>Subsystem/functional categories</u>
       (c) a subsystem (materials, student, management and decision-making)
       (d) a function (ie. a subsystem of one of the operating subsystems or of the institutional managerial and decision-making subsystems)

    3. <u>'Levels of activities' categories</u>
       (e) a mission programme (teaching, research, community service)
       (f) a programme (as defined above)
       (g) a course, project or pack (as defined above)
       (h) an activity or component (as defined above)

Levels of activity and the problem of what is or is not a direct cost

19. Note, though, that not all costs can be assigned to the lowest level of activity. For

example, the costs of the personnel office are not directly related to courses or the teaching or research programmes. They are overhead costs which can be assigned to a subsystem (management and decision-making) and to a function (personnel). Whether or not one can assign costs to a particular 'level of activity' category (ie. (e) - (h) in the

Appendix 2, Table 1 : A departmental line-by-line budget

Department of Biology 1988 Budget

	Price levels: Jan.1988	
	£	£
STAFF		
Academic Salaries		
Secretarial salaries		
Technical salaries		
Administrative salaries		
Staff : sub total		
NON-STAFF		
Consumables		
Travel		
Reprographics		
Equipment maintenance		
etc. etc.		
Non-staff : sub total		
Total		

list in paragraph 18 above) depends on whether the costs are direct costs of that level. Thus, one can only assign costs to an activity if the costs arise directly as a result of that activity (eg. a residential school). The organisation of residential schools in general will be an overhead cost which can be regarded as a direct cost of the teaching mission programme (one would not have residential schools if one was not teaching). It may, however, be possible to assign these overhead costs to particular courses on an average basis (ie. the average cost of organising a residential school for a course is the total cost of organising them divided by the number of courses with residential schools). Similarly, the cost of organising residential schools for all the courses in a particular programme of courses may be summed and assigned as a direct cost to the programme of courses. (This simple example, incidentally, shows how cost analysis may be done at various levels).

20. Appendix 2, Figure 2 summarises these levels of cost and the way in which they can be aggregated.

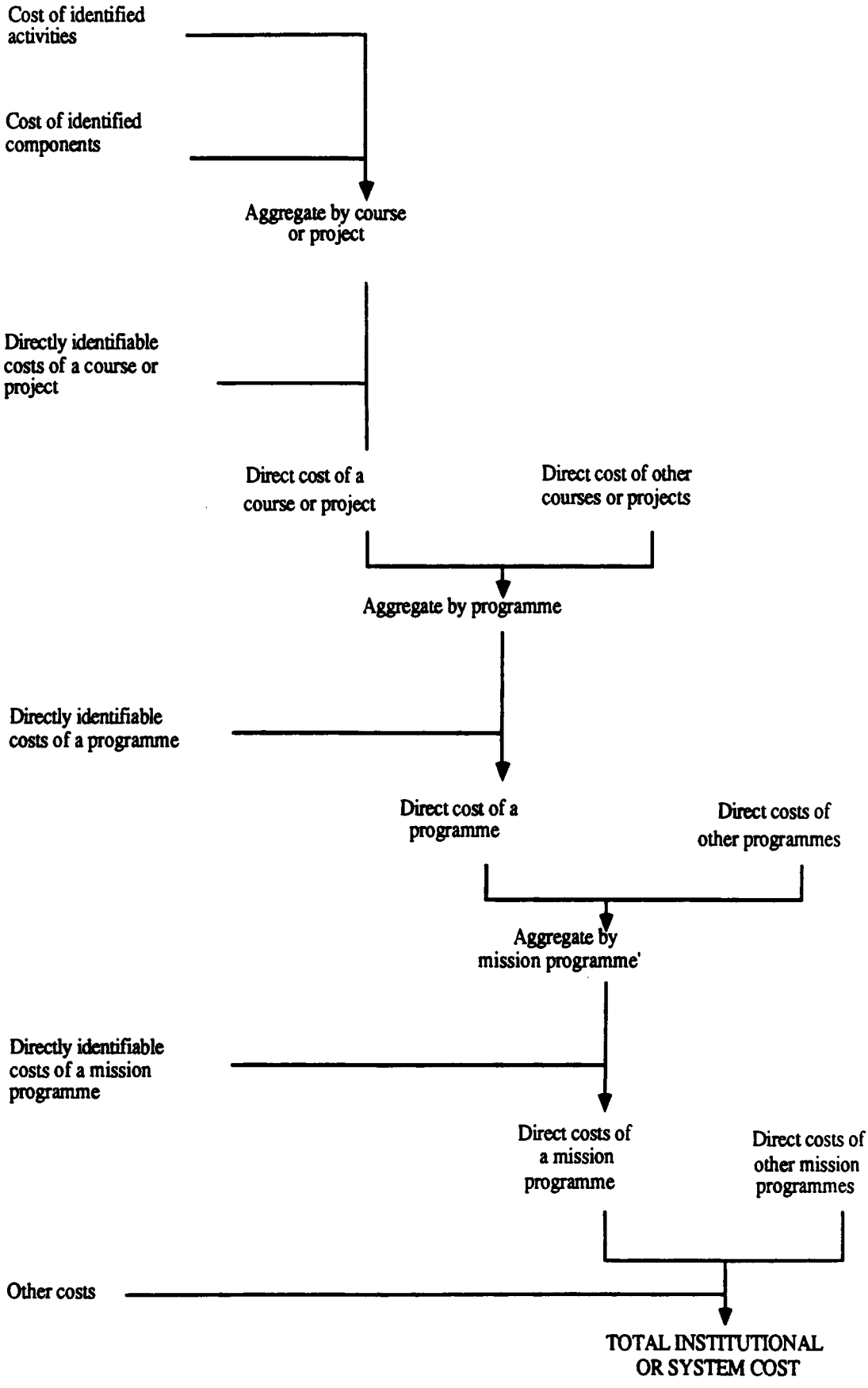
Identifying costs

21. How, though, does one identify costs of courses, projects, programmes and mission programmes?

22. At each level, one seeks to identify the direct costs of the activity one is interested in. The direct costs may be staff, non-staff or capital costs, and each of these elements is

Appendix 2 Figure 2

Levels of aggregation of costs



analysed below (the latter in paragraphs 37 et seq).

Staff costs

23. Typically individual members of staff work on a number of projects or courses during any one period of time. An academic, for example, may be working on the development of one course, supporting the presentation of another, working on a research project, and involved in administration. The cost of his time, therefore, needs to be assigned in some way to particular courses and projects, and to 'managerial overheads'. Rumble (1986 b : 17-23) discusses ways in which this might be done. He concludes that:

    - the cost of time must be the total cost to the employer of hiring the person, including salary, insurance, employment tax, etc. (ie. gross employer cost)

    - efforts should be made to identify how much time a person has actually spent on a course, project or activity, rather than how much time it is planned to spend on it. This means collecting data after the event.

    - since memories are short, individuals should be asked how much time they spent on an activity at regular intervals, (say every 3 months)

    - since many higher level staff do not have fixed hours of work, since what they are paid is unrelated to how many hours they actually work and since asking them how much time (in hours or days) they spent on an activity might be regarded as threatening, the best approach is to ask what proportion of their time was spent on an activity.

24. Once information has been collected on the proportion of a person's time spent on various activities, it is a relatively easy task to apportion the gross employer cost of the individual between the various activities: eg. Editor Y spent 30% of his working time on course H121, 60% on course H137, and 10% on 'managerial activities' (supervising junior editors). Time spent on holidays or away on sickleave is ignored, and the gross employer cost of Editor Y is apportioned between the various courses and 'overheads' on the basis reported above. 'Overheads' in this case are regarded as being a direct cost of the teaching mission programme, and are therefore coded at that level. As a general rule, any task that takes up less than 5% of a person's time should be ignored, but 100% of each person's time should be assigned to activities.

Non-staff costs

25. Care needs to be taken in identifying the various non-staff costs which make up courses and projects.

26. A major problem is to ensure that course costs are identified on a uniform basis. This problem was recognised by Eicher (1977 : 17-18) who classified 'course' costs according to whether they were *conception, production, transmission* and *distribution* or *reception* costs. There is some discussion of this proposal by Orivel (1977 : 26-30), leading to the emergence of an approach which 'commands general agreement' and which is based on the analysis of costs in accordance with the following 'technical classification':

    - general administration costs
    - production costs
    - transmission (or distribution) costs
    - reception costs

    (Eicher et al, 1982 : 51)

27. Rumble (1986 a : 53-7) provides a list of the typical cost elements found in a distance education system. Another list, based on the needs of Deakin University, is provided in Rumble (1986 b : 25). The list below summarises this information.

(1) Development/re-development costs
Gross employer costs of staff (academic, technical, instructional designer, editor, etc.), Consultants, External editorial and design work, Purchases of materials to help develop the course. Design/development costs incurred in preparation of computer assisted instruction, home experiment kits, ancillary materials, etc., Academic external assessment, Developmental testing, General expenses.

(2) Production
Print fixed costs (keyboarding, film assembly, pre-press, machine make ready, cover preparation, etc.), Copyright clearances, TV and video-production, radio and audio -production.

(3) Stocking and presentation
Print variable and stocking costs, other material purchase and stocking costs, Storage, Distribution (carriage, mail) and transmission costs, Teaching costs (marking of assignments, face-to-face tuition, residential schools), Examination costs, Tele-tutorials and tele-conferencing, Computer line charges, Local centre costs associated with a particular course, etc.

28. *Development and production costs* are in their nature an investment cost. Stocking costs arise wherever stocks of material are acquired. Some stocks are held for student use in local centres or form a central pool of materials from which items are lent to students during their period of registration on a course. Examples are course books and recommended readings placed in local centres and home experiment kits lent to students. Other stocks are consumed as the material is given to students on a non-returnable basis. *Presentation costs* are incurred annually. Some presentation costs are invariable with student numbers (eg. cost of transmission of broadcasts), some are variable with student numbers (eg. postage where this is to students' homes), and some are indirectly related to student numbers or other factors (eg. carriage of course materials to local centres from which students can collect them).

29. Precisely which costs are incurred and how the costs 'behave' will depend on:

- media choice
- choices about production and distribution
- choices about location (local centre vs. home-based systems)
- choices about provision to students on a permanent or temporary (loan) basis.

30. The purpose of the exercise described above is to ensure that the various cost elements involved across all courses are identified and taken into account in costing individual courses. Not all courses will involve the same costs elements (eg. some courses may use computing, but it is unlikely that all will). The adoption of a standard spread sheet with defined cost categories (but with room for the addition of other costs) will help ensure standardised costing across the institution. Standardised costing also assumes that there are agreed unit costs for standard activities. For example, the costs of marking an essay may be standardised across the institution. On the other hand, the cost of producing a text or television programme may vary depending on length, quality, etc.

31. Course cost spread sheets (Table 2) will need to indicate the costs of a course over time. Generally speaking, costs of development are incurred from one to three years before presentation while costs of production will be incurred up to one year prior to presentation. Presentation costs will be incurred annually over the life of the course. While the course is being presented, some elements may be redesigned, resulting in

further production costs. Production costs may also be incurred when re-stocking is required.

32. Summary spread sheets will show the cost of developing, producing and presenting all courses in any one year (Appendix 2 Table 3).

Appendix 2 Table 2

Course costs : cash flow over the life of the course

£000s

year	1	2	3	4	5	6	7	8	9	10	Total
Development	33	33	34								100
Production			25	25							50
Presentation			15	15	15	15	15	15	15	15	120
Re-development							10				10
Production*					15		5		10		30
	33	33	74	40	30	15	30	15	25	15	

* when (1) re-developed materials need to be produced or (2) stocks of existing materials run out.

Appendix 2, Table 3

Summary of costs of development, production and presentation (DPP) - all courses, year x

	H121	H123	H124	H125	...	Total
Development	x					x
Production		x		x		
Presentation			x	x		x
Total DPP costs	x	x	x	x		x

33. Project costs can be derived in a similar way, although it may be harder to devise a common spreadsheet. However, all projects have (1) initiation and (2) running costs, and costs of projects should be identified with as much care as is taken in the

identification of course costs.

Average costs per student

34. In order to compare the costs of courses, one needs to have some kind of common measure, such as an average cost per student on a course. Courses may, however, be of a different length, while students may have different course loads, so the 'average cost per student head' or 'average cost per student course' can be an unsatisfactory measure for making comparisons. When such difficulties are incurred, a common measure (such as the average cost per FTE student or average cost per student hour) needs to be adopted.

Appendix 2 Table 4

Annualising the cost of development and production

£000s

	Presentation years			
	1	2	3	4
Development and production £150.0k				
Annualised cost of development/production	37.5	37.5	37.5	37.5
Presentation	15.0	15.0	15.0	15.0
Total annualised cost	52.5	52.5	52.5	52.5

35. Rumble (1986 a : 27-31; 1986 b : 27-32) discusses ways of doing this. He argues that:

- the first step needs to be to apportion the costs of development and production over the agreed life of the course. e.g. Assume a course costs £150,000 to develop, produce, and provide non-consumable stocks for, and it is intended that this course should be offered over four years. The costs of development and production should be annualised over the four years of presentation. The 'annualised cost of presentation' then becomes the direct cost of presentation plus the annualised cost of development and production (Appendix 2 Table 4).

- if further development work and production of non-consumable stocks occurs, then the cost of such work should be annualised over the remaining life of the course (Appendix 2 Table 5).

- in the event that a course is withdrawn earlier than expected, the annualised development and production cost of the course for its final year(s) is written off

- in the event that a course's life is extended, no attempt is made to revise the period over which development and production costs are annualised. The decision to extend the course's life is taken on the basis of its presentation costs plus the total cost of any further development and production required before its life can be

extended. The costs of the latter would, of course, be annualised over the additional years of life of the course.

- stocks which are consumed by students should be treated as a cost of presentation, and accounted for in the year in which they are used. The value of any unconsumed stocks surviving when the course finishes its life should be written off.
- if comparisons are to be made between years, price levels should be standardised to current year price levels.
- the question of whether or not to discount the 'capital' cost of development and production needs to be addressed. Economists hold that it is not enough to annualise the costs of capital over their life. They hold that one needs to take account of the

Appendix 2 Table 5

Annualising the cost of development and production including redevelopment/further production

£000s

	Presentation years 1	2	3	4
Development and Production £150k			10.0	
Annualised cost-original development/production	37.5	37.5	37.5	37.5
Annualised cost-additional development/production			5.0	5.0
Presentation	15.0	15.0	15.0	15.0
Total annualised cost	52.5	52.5	57.5	57.5

opportunity cost of the capital investment - that is, the income foregone when money is invested in capital goods rather than being put to work to earn interest. Unless this is taken into account, the costs of a project will be seriously underestimated. To take account of opportunity costs of a project and of the cost of depreciation one takes the prevailing interest rate and applies it to the annualised cost using the formula

$$a(r, n) = \frac{r(1+r)^n}{(1+r)^n - 1}$$

when a (r, n) is the annualisation factor, n is the lifetime of the capital in year, and r is the prevailing interest rate.

Perraton (1982 : 59) has observed that 'the argument about discount rates is not

purely academic. If we want to compare types of education that are capital-intensive with those that are labour-intensive, it is important to agree about the proper treatment of capital. The larger the proportion of capital costs in a total budget, the more important is the decision about discount rate adopted'

Discounting does make a difference to the costs of a project. For example, assume the cost of development and production is £152,200 annualised over four years (ie. n=4), then the cost per year is £38,050. Discounted over four years where n=4 and the annual rate of interest is 11% (ie. r=0.11), the cost per year is £49,058.

$$\text{i.e. } £38{,}050\ [r(1+r)^n / (1+r)^n - 1] = £49{,}058$$

From the point of view of institutional management, discounting capital costs is largely irrelevant once the decision to invest in the capital has been taken. It is important at the pre-investment stage, where one is faced by a decision on whether or not to use capital or labour.

36. Once the annualised (and, if necessary, discounted) value of the course materials plus the annual costs of presentation have been determined, it is possible to derive an average cost per student on the course. Appendix 2 Table 6 shows how this might be done.

Appendix 2 Table 6

Cost per student per course

	Year			
	1	2	3	4
• Annualised/discounted cost per course	75000	75000	75000	75000
• Presentation costs : (a) Fixed-costs	17000	17000	17000	17000
(b) Variable cost per student : £100	40000	35000	30000	10000
Total	132000	127000	122000	102000
No. of students	400	350	300	100
Average cost per student	£340.00	£362.85	£406.66	£1020.00
Course value : 10 credit-hours				
Average cost per credit-hour	£34 .00	£36.29	£40.67	£102.00

Capital costs

37. In distance education, capital replaces labour offering to educationalists what Wagner (1982 : ix) describes as 'a mass production alternative to the traditional craft

approach'.

38. Capital costs include the costs of buying land, buildings, furniture, equipment, library stock, etc. where the goods or services purchased have a useful lifetime greater than the budgetary period in which the cost is incurred (normally one year) and a cost which is significant. Precisely what constitutes a significant cost is a matter of judgement, but small items of equipment which have a useful life of many years (eg. pencil sharpeners) and a low unit cost are usually treated as consumables.

39. From an institutional management point of view, the cost of capital, once incurred, is a sunk cost. Economists, however, rightly point out that the costs of capital should be taken into account when drawing comparisons between the costs of different institutions, projects or policy options. This is done by annualising the cost over the expected life of the capital, and discounting it using the formula given in paragraph 35 above.

40. How capital is valued depends on attitudes. There are those who believe that it should be valued on the basis of historical cost - generally the cost of purchase. Others believe that the value should be based on net realisable value (ie. the estimated net sale proceeds of the capital). Yet others argue that it is not the historical value nor the sale value that matters, but rather the replacement cost of the capital, and it is this approach which is recommended here. Taking the replacement cost automatically takes account of (1) inflation (2) changes in price level, up or down (particularly important in respect of new technology, where unit costs tend to fall as the technology is absorbed and mass markets are created), and (3) the fact that one tends to replace aging equipment with more modern and 'better' (ie. more technologically advanced) equipment. Land is a special kind of capital good in that, as an asset, it does not (normally) require replacement. The capital cost of land might therefore be ignored, but if it is taken into account, there should be uniform treatment (eg. discounting over an agreed standard period). Buildings are also problematic in that one might decide not to replace an old (historic) building with an exact copy, were it, for example, to burn down. The replacement cost adopted should therefore be based on modern building styles, recognising that for insurance (a recurrent cost) purposes, one might wish to rebuild in an old-fashioned style to harmonise with other old buildings. Thus the suggestion here is that where capital costs are taken into account, the annualised value should be based on:

$$\frac{\text{current replacement cost of capital items}}{\text{years of life of capital item}}$$

41. The annualised value of capital (buildings, equipment, etc.) can then be allocated to projects, courses, programmes and mission programmes on the basis of use. Sometimes this will be clear-cut; at other times, it will not be. In the latter case, proxy measures may be used. For example, the annualised capital cost of a building may be divided between general overheads or mission programme overheads (in respect of open space), or in the case of offices or other work areas, apportioned to courses, projects etc. on the basis of the time which the occupants of the office or work area spend on particular courses, projects, etc. The easiest way of doing this is to add the cost of the space occupied by an employee to the gross employer cost of that employee, and apportion the overall gross employer cost + space cost along the lines mentioned in paragraphs 23-24 above.

42. It has to be said that there is a cost involved in developing and running financial systems capable of analysing costs in this way, and that those undertaking such an analysis need to be sure that they wish to proceed in the way suggested. Obviously, there are other ways of proceeding - from ignoring capital and particularly space costs to treating such costs as a general institutional overhead. In any comparative study,

the important thing is to be consistent across all departments, programmes or institutions.

Running costs of buildings/equipment

43. The running costs of buildings and equipment (eg. utilities such as power, heating, etc. and consumables such as inks) can be identified and may be allocated to courses, projects, programmes, mission programmes or general overheads (see Appendix 2 Figure 1) as appropriate, using proxy measures (such as the use of time of those occupying the building).

Problems of joint supply

44. One of the problems which one faces in allocating course and to a lesser extent project costs to programmes is that a course or project may support more than one programme. For example, service courses (eg. in statistics, computing, etc.) may serve the needs of students on more than one diploma or degree programme.

45. Obviously if one is interested in the costs of particular programmes, one needs to dis-entangle these costs in some way. Rumble (1986 a : 23-7) discusses this problem in relation to mixed-mode institutions (ie. institutions which teach both at a distance and by conventional means) where the costs of developing and producing a course may be set against both the distance teaching programme and the conventional teaching programme. He suggests (1986 a : 25-26) five ways of proceeding:

    (1) Where a course is developed for one programme (Programme A) and later used on another (Programme B), the original development and production costs should be charged to A, and any costs of adaptation charged to B.

    (2) Where a course is developed for two programmes A and B, the cost should be shared equally between them.

    (3) Where a course is developed for programmes A and B the common costs should be shared equally between both programmes, but any special costs arising from its use in one or other programme should be charged to that programme.

    (4) Where a course is developed for programme A but later adapted for programme B, one can estimate what the development *de novo* of a course for programme B would have involved, and change this to B, with any residual costs (equivalent to the total cost of development less the notional cost of developing a course *de novo* for B) to programme A.

    (5) Where a course is developed for A and B, one charges the costs to both A and B pro-rata to the number of students on the course enrolled in the A and B programmes.

46. As far as presentation costs are concerned, Rumble (1986 a : 27) suggests two approaches:

    (1) analyse the teaching (presentation) costs appropriate to each programme, and assign them on that basis

    (2) ignore all differences between the programmes, work out the total presentation cost of the course, and assign the costs to the programmes A and B pro-rata to student numbers enrolled in A and B respectively.

47. Generally it seems right to assign costs that are proper to a particular programme to that programme, while sharing joint costs equitably.

48. Thus, for example, the first and fourth method proposed in paragraph 45 seems to be inequitable (although, of course, the first method may be important when one is considering the cost of a decision to adapt an existing course for use in another programme). Also, if it is a question of choosing between apportionment of costs between one or more programmes on an equal basis (eg. cost attributed to any programme = total joint costs divided by number of programmes) and dividing total costs between programmes pro-rata to student numbers, the method adopted should be the former since the latter

    - will be more difficult to do on a routine basis because student numbers fluctuate
    - will tend to distort fluctuations in programme costs arising from increases or decreases in student numbers
    - makes little sense since one cannot know in advance how many students one is going to have, and as a result could not project the futre costs of one's programme.

Help in costing new projects

49. One of the problems faced by those initiating a new distance or open education project is that they frequently have little experience in costing distance education. This is a common problem. Swinerton and Hogan (1981 : 1) point out that non-traditional programmes 'cannot be driven by the same financial flywheels as the more customary academic programs'. Generally 'the budget for a non- traditional degree program is a nightmare for everyone involved'. In those cases where it is funded 'by the same mechanisms as traditional programs, ... there is an inevitable pressure to mold the program itself to fit traditional funding formula'.

50. There is evidence that in a number of projects, including the British Open University during its planning stage (see Perry, 1976 : 20), the financial resources needed to set up and run non-traditional education systems have been seriously underestimated.

51. Rumble, Neil and Tout (1981 : 248-70) developed a series of cost functions which attempt to specify the fundamental variables affecting costs in a distance education programme in sufficient detail to be of practical value to people trying to prepare an operating budget for an institution. While these cost functions have distinct limitations, not least because 'models cannot recreate the complexity of the organisation they seek to reflect' (Rumble, Neil and Tout, 1981 : 236), they form a basis for the development of similar cost functions which can be applied in specific cases. Rumble (1986 : 42-51) provides a further set of cost functions. These cost functions are <u>not</u> meant to be definitive, but can act as a guide to those who are developing their own systems and wish to (1) specify variables affecting costs and (2) having assigned values to the variables, forecast costs with what will hopefully be a greater degree of accuracy than those who do not use a cost function based approach to costing. Formula of this kind can therefore help those about to set up a distance or open education project at least as far as costing main stream activities goes. It is generally much harder to estimate the level of overhead costs which will be incurred by a project.

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