

Costing Distance Education



Commonwealth Secretariat

Costing Distance Education

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PREFACE

For more than a decade we in the Commonwealth Secretariat have taken an active interest in distance education and in its use as a tool to grapple with educational problems of supply, of demand and of access. Over this period distance-teaching programmes have expanded dramatically; we have been able to respond in a small way by producing directories and handbooks on distance education and on its techniques.

Recently too, we have put new emphasis in our work on higher education. At a time when tertiary institutions have been constrained by limited budgets, distance education has aroused interest as a technique which may increase access to higher education even while costs are held down. That interest has sometimes led to the creation of entirely new institutions: open universities and colleges. But it has also led to the creation of distance-teaching departments within broader based universities and colleges, which are the concern of this handbook. Many governments and universities have felt that there were practical advantages in running distance-education courses and conventional courses side by side. The advantages are both educational and financial; distance teaching may, in this mode, be integrated more closely with conventional teaching and overhead costs may be kept down by the shared use of buildings, staff and services.

The book addresses a simple practical issue which flows from a decision to develop distance-teaching programmes in this way. Where a college or university is teaching in two modes, it becomes necessary to allocate its resources and expenditure between the two. But there is no easy and transparently equitable way of making that allocation; the administration of distance education is a different sort of activity from the administration of conventional education, with different forms of outlay and different ways of costing. This handbook demonstrates techniques for costing distance education and for allocating costs in institutions which are teaching in more than one mode. The book is based on the practical experience of the author, Greville Rumble, Planning Officer to the British Open University, who also has extensive consultancy experience in other open universities. We hope that it will be of value to many Commonwealth

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colleges and universities.

The need for the book was identified by a meeting of specialists convened in Cambridge in January 1985 by the Education Programme of the Secretariat. It is a pleasure to acknowledge their guidance, and that of the Commonwealth Standing Committee on Student Mobility which originally suggested that the meeting should be held. We are also grateful to Patrick Guiton, Director of External Studies at Murdoch University in Australia and to Richard Lewis, Assistant Chief Officer of the Council for National Academic Awards in Britain, who commented on the manuscript in its draft form.

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I. INTRODUCTION

There is general agreement among economists as to the potential economies of scale that can be reaped by distance education systems, and a number of general models have been developed to explain how the costs of distance education systems are structured and behave (see section 8.2 below). The majority of the models are, however, relatively crude and there is much less consensus about the best way of actually costing distance education. Indeed those developing and working in such systems have frequently under-estimated the costs involved or found it difficult to explain and justify the level of costs and their behaviour to their political masters, the governments or institutions that have set them up (Snowden and Daniel, 1980, p.76; Swinerton and Hogan, 1981, p.1).

These problems are severe enough where one is dealing with a purpose-built institution that has been established solely to teach at a distance. When one comes to deal with the situation in which a distance-teaching unit is set up within a conventional institution, these problems of understanding are exacerbated because there are no common measures for establishing and comparing the costs of conventional and distance teaching. A major purpose of this handbook is to discuss these issues and propose practical solutions which will be of use to administrators and decision-makers working in institutions that teach both by conventional face-to-face means and at a distance.

While the handbook is specifically addressed to those who are working in higher education institutions, much of what is said, particularly in the latter sections, is applicable to any institution that is teaching by both conventional and distance means.

The problem has been given added urgency by the very real pressures many institutions are now under to improve efficiency by increasing their output and/or decreasing their absolute costs (sometimes having to do both of these things at the same time by teaching more students for less money), and to explain and justify their costs.

If educationalists are to respond to these challenges they must be able to analyse and explain the relative costs of educational programmes at different levels (primary, secondary, higher, etc) using different modes of delivery (conventional full-time or part-time, at a distance), and relate these costs to both inputs (particularly staff) and outputs (notably certificated students or graduates).

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This requires an ability:

1. To identify the costs of the *teaching* system as a whole by separating out the costs of research and other *non-teaching* activities.
2. Having identified the absolute cost of the teaching, to identify clearly the activities and outputs of the distance education subsystems and distinguish these from those of the conventional teaching subsystems.
3. To identify the costs of particular academic teaching programmes and courses. (These terms are explained in section 3.1.)

This will be facilitated if the budgeting and accounting systems can be structured in a way that will support analysis of teaching, programme and course costs.

2. IDENTIFYING HIGHER EDUCATION COSTS

We begin by looking at the problem of identifying the specific costs of *teaching* in higher education institutions.

Higher education institutions are very complex, having multiple objectives and functions. At least at the university level these have included teaching and research as well as some more general functions such as the transmission of a common culture and standards of citizenship. In the United States universities commonly have an acknowledged 'community service' role. This includes the provision of instructional services (eg extramural type teaching), occupational services (careers advice, remedial training, short job- and career-related training courses) and non-instructional services including community service projects, counselling, consultancy, research and development work for local industry, and the provision free or at a charge of university facilities (eg refectory, sports, library, transport, etc) to members of the local community. Crosson (1981) provides an exhaustive taxonomy of such services.

Teaching may take place at a number of levels - undergraduate, postgraduate, and non-degree levels. It may be related to the student's initial education, marking the culmination of several years of uninterrupted study since early childhood; alternatively, reflecting more recent trends, it may be related to the continuing education of individuals who have finished their period of initial education but, after several years in the labour market, need further education to facilitate adjustment to technological, economic and social change or to meet individual needs for personal development. To add to the complexity of the situation, students may study full- or part-time, and the means by which they study may also differ, depending on whether they are studying by conventional or distance means. For example, it is common to distinguish between full-time (day) programmes of study, part-time (evening) programmes of study, and study by distance means.

Higher education institutions can thus be characterised as multi-product enterprises. For our purposes we are concerned *solely* with the teaching function.

In order to proceed we first of all need to be able to separate out the costs of non-teaching activities. We are not concerned with the specific identification of the outputs of non-teaching subsystems in themselves,

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nor with their measurement. We are concerned that the clearly identifiable costs of these subsystems are taken into account in such a way that the cost of the teaching subsystem is identified. We then need to identify the costs of each of the teaching programmes. To do this we need to be able to identify and assign the total costs of the teaching between the conventional and distance modes, and we may then need to assign costs further between particular academic programmes and courses. We will be able to do this relatively easily when the costs we are analysing are readily identifiable as being a direct charge to one or other mode, programme or course. However, to obtain a clear idea of the costs of a particular mode, programme or course we will also need to assign a proportion of the overhead costs of the institution to that mode, programme or course. This is not always easy.

3. THE CLASSIFICATION OF ACTIVITIES, COSTS AND SYSTEMS

The process of analysing costs will be made much easier if we are explicit and consistent in the terminology used in costing exercises. This section of this handbook therefore considers three issues: (1) the classification of activities in higher education systems, (2) the classification of costs, and (3) the classification of systems and subsystems.

3.1 Classification of activities

The costs of an institution can be aggregated at various levels. The lowest level of aggregation is for our purposes defined as an *activity* if it is a pursuit in which a person or piece of equipment is active, or a *component* if it is a physical entity that is a constituent part of a larger entity. An activity might be a tutorial, a lecture, an examination or a slide show; a component might be a television programme, a textbook, an individual slide or an examination paper.

Activities and components may be brought together in a *course* which is any coherent series of activities and/or components the successful completion of which is 'recognised' as coherent by the institution offering the course; recognition might involve the award of a certificate of some kind although this is not necessarily the case. While a course as defined may stand on its own, it may be part of a wider *line of studies*.

For our purposes a line of studies is any aggregate collection of courses which from the point of view of the institution has coherence and may lead to a qualification (for example, a diploma or degree), or which share a particular characteristic in the sense that they are courses aimed at similar kinds of students (for example, undergraduates, postgraduates) or at a particular kind of target audience (for example, degree programme courses, community education courses, etc).

The sum of all the courses within all the lines of study comprises the *teaching programme* of the institution. This may be contrasted with the *research programme* or the *public service programme* of the university.

Courses or lines of study may be delivered to students in various ways - either full-time or part-time, and either using conventional means or using distance means. We are interested in the distinction between conventional means and distance means and we shall refer to the distinction as one of *modes* - that is, teaching is either by the

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conventional mode or by *distance mode*. An institution that teaches by both conventional and distance means is described in this handbook as a *'two mode' institution*.

While there is a fairly clear idea of what is meant by conventional education (class-rooms and seminars look much the same worldwide) there is much greater diversity of approach in distance teaching. This arises in part because of the range of media used and because of the apparent and obvious differences between simple correspondence systems and systems using broadcasting, audio-visual materials, and 'new technologies' such as telecommunications, transmission networks, electronic mail systems and computer-based instruction. It also arises because distance teaching systems may make use of face-to-face tuition as well as postal, telephone and computer-based and electronic mail-based tuition.

Perhaps the most comprehensive general definition of distance education is that proposed by Keegan (1980, p. 30) who identified the key features of distance education as being (1) the separation of the teacher (as materials producer) from the student in space and in time; (2) the influence of an educational organisation especially in the planning and preparation of the learning materials (thus distinguishing the enterprise from a publishing venture); (3) the use of technical media; (4) the provision of two-way communication between the student and a tutor (thus distinguishing the activity from the preparation of teach yourself type programmes; (5) the possibility of occasional seminars; and (6) participation in a more industrialised form of teaching - a concept based on Peters (1973, p. 225) conclusion that distance education is best described by concepts and criteria applied to the process of industrial production including division of labour (on the side of teachers), mechanisation, automation, the application of organisational principles, scientific control, objectivity of teaching behaviour, mass production, concentration and centralisation.

3.2 Classification of costs

Precisely how costs are defined varies depending on the method of accounting adopted, the particular conventions used in respect of the classification of costs, and the purpose for which the analysis is being undertaken.

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There are two methods for keeping financial records. *Cash accounting* recognises the revenues when cash is received and expenditure when cash is paid. *Accrual accounting* recognises revenues when they are earned and expenditures when materials or assets are used and services performed. It is generally accepted that accrual accounting gives a better reflection of an institution's financial position. However it is also important to manage affairs on a cash basis as well.

Costs are of various kinds. *Capital costs* are those costs incurred in acquiring goods or services that have a useful lifetime greater than the budgetary period (normally one year) within which the cost is incurred. They are distinguished from *revenue or operating costs* which are costs of goods or services that are consumed within the budgetary period. In practice what is defined as a capital cost and what is defined as an operating cost is a matter of judgement. Small pieces of equipment with a useful life of many years (eg pencil sharpeners) are usually classified as consumables and counted as an operating cost. Revenue costs may be *recurrent* or *non-recurrent*. A recurrent cost is a cost which is expected to recur from one year to the next (eg salary costs of permanent members of staff).

Operating costs may vary (increase or decrease) in proportion to the volume of output or level of activity taking place. These are called *variable costs*. Other operating costs may be largely unaffected by the volume of output or level of activity. These are called *fixed costs*. Fixed costs are, however, only fixed in the short term. Ultimately all costs are variable in the sense that the activities can be brought to an end.

The distinction between fixed and variable costs is crucial to the development of understanding about the way in which the costs of educational systems behave. However, what may be fixed in one circumstance (for example, where there are small increases in student numbers) may be variable in other circumstances (for example, where there are significant changes in the number of students). Given this, the change in the *total cost* of the enterprise may or may not be directly proportional to the variation in level of activity or volume in output. One can usefully talk about costs being fixed within a range of activities or volume of output (eg. within the range 2400 to 3800 students). The additional cost (or saving) per unit change of output or activity is the *marginal cost* of that increase or decrease in output or volume of activity. An example would be the cost incurred or saved by the addition of an extra

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student or the loss of one, respectively.

Those costs which can be directly associated with the output of a particular activity, course, or programme, or with a particular cost centre (q.v.) or system (q.v.) under review, are referred to as *direct costs*. Costs which are incurred by a particular activity, course, programme, cost centre or system along with other activities, courses, programmes, cost centres or systems (for example, a shared telephone exchange, centralised computer, etc) and where the discrete costs of each activity, course, programme, cost centre or system cannot be reasonably accurately, conveniently or cheaply measured, are called *indirect costs*. The total sum of all the indirect costs of an activity, course, programme, cost centre or system, wherever they have been incurred, are the *overhead costs* of the activity, course, programme, cost centre or system.

While there are alternative approaches this handbook assumes that the analyst wishes to carry out a full (or absorption) cost analysis in which all direct costs are allocated against activities, courses, programmes, or systems, and all indirect costs are apportioned between the various activities, courses, programmes or systems. Sometimes it is reasonably easy to *apportion* costs; at other times it is difficult and a relatively crude or arbitrary approach has to be adopted.

A *cost centre* is any location, person or item of equipment (or group of these) for which costs may be ascertained for a budgetary period for purposes of cost analysis and cost control. A cost centre may be a whole institution or any part of it (subsystem, department, activity, programme), depending on the particular exercise being undertaken. The total cost of an activity, course or programme may be incurred by a number of relatively independent departments, systems or cost centres.

A *cost unit* is a unit of product (for example, a television programme, printed correspondence text, or course), service or time (or combination of these) in relation to which costs may be determined or expressed. A *unit cost* is the cost of one of the cost units, however defined. The concept of a unit cost is most useful where the product, service, or period of time is standard (eg. a page of text, a slide). In educational systems this is rarely the case and a more useful concept is that of the *average cost per unit of product*. This is the total cost of the products, services or time divided by the total number of the products or services produced or performed, or the units of time involved.

Costs are incurred over spans of time. Generally the budgetary period

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is one year which may or may not coincide with the calendar year. Educational institutions tend to work within academic years which are broken into terms (usually two or three), although in some systems - notably correspondence-teaching systems - there may be no terms and no fixed academic year. Cost-incurring and resource-generating activities (notably teaching and fee collection) tend to occur on a cyclical basis determined in part by the rhythm of teaching activities (and hence in many systems are term based) or by other rhythms (notably in distance-teaching systems the scheduling of course development, production and delivery systems). Such rhythms frequently do not match the time periods delineated by academic terms or academic, calendar or financial years. They nevertheless need to be taken into account in analysing and comparing costs.

3.3 Classification of systems

Kaye and Rumble (1981, pp. 19-22) outlined a systems model of distance education based on a concept, developed by Miller and Rice (1967) for analysing organisations as open systems which exist by exchanging materials with their environment. The activities carried out by an organisation are divided by Miller and Rice into three categories: *operating activities* which are the specific import, conversion and export processes which define the particular nature and role of the enterprise; *logistical activities* which ensure the supply of necessary resources for the proper functioning of the enterprise (recruitment, training, purchasing, etc); and *regulatory activities* which ensure the overall coordination and control of all the processes within the enterprise as well as its links with the outside environment.

Kaye and Rumble used this approach to analyse the activities of distance-teaching systems into *two* major operating subsystems, a *course subsystem* which covers the development, production and distribution of mediated distance learning materials (texts, audio-visual materials, computer software, etc), and a *student subsystem* which covers the admission of students, their registration on courses and allocation to tutors and support facilities, the organisation of study activities, the assessment of students and their certification. The characteristics of the courses subsystem emphasises the dependence of distance-teaching systems on multimedia publishing. The student

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subsystem is quite separate - in systems terms - from the course subsystem, involving different activities, personnel and resources. The point of contact between the two subsystems occurs when the students receive the course learning materials and start to use them.

The value of this simple systems model is that it clearly identifies the principal activities involved in running a distance-education system and emphasises the specialisation of tasks and divisions of labour inherent in distance education. It also helps to pinpoint the activities which are independent of student numbers (eg course creation) and are therefore susceptible to economies of scale. This makes the model a useful starting point for financial modelling and cost analysis.

4. BUDGETING AND ACCOUNTING SYSTEMS FOR COST ANALYSIS

The way in which budgets and accounts are structured may hinder rather than help the proper analysis of costs. The purpose of this section is to outline an approach to budgeting that will enable the accounting system to support cost analysis. More importantly, it shows how budgets and accounts may be analysed in those cases where the budgeting and accounting system has not itself been developed in a way that will facilitate cost analysis.

4.1 Expenditure heads and budgets

In universities and other higher education establishments cost centres are generally associated with departments or with budget allocating committees. Within each cost centre budgets are created and costs are assigned against *heads of expenditure* which are generally further broken down into budget or account codes. Exactly how many heads of expenditure there are will depend on legal requirements (as in Venezuela) or on accounting conventions. Normally expenditure heads will distinguish between *labour costs*, *material costs* (the cost of commodities supplied to a department), and *expenses* (the costs of services supplied to the department including water, electricity, telephone, equipment hire, etc.). The British Chartered Institute of Public Finance and Accounting (CIPFA, 1980) has recommended expenditure heads for use in colleges in the local authority maintained sector. These are very broad and cover (1) employees, (2) premises, grounds and fixed plant, (3) supplies and services, (4) transport and moveable plant, (5) establishment charges, (6) agency services, and (7) miscellaneous. In the United States the National Association of College and University Business Officers has also laid down accounting standards governing higher education institutions (NACUBO, 1975) while the National Centre for Higher Education Management Systems (NCHEMS) studied the theoretical basis for higher education cost accounting with a view to developing a uniform set of standards, definitions and procedures that would use accounting and statistical data to analyse the full cost of resources utilised to achieve institutional objectives (Manning and Romney, 1973). Many of the attempts have been made with a view to facilitating inter-institutional cost comparisons. However, the heads of expenditure defined by, for example, CIPFA are

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really too broad to allow meaningful comparisons of the nature of the expenditure and its relationship with the underlying activities to be made, while experience at NCHEMS indicated that in practice it is extremely difficult to define a standard which can be applied to a wide range of higher education institutions. In general every attempt should be made to adopt the standard practices laid down by governmental or accounting bodies while recognising that inter-institutional and inter-sectoral cost comparisons (the latter covering comparisons between institutions subject to different funding arrangements) are difficult to make and, where made, need to be subject to appropriate qualifications

The number of budget or account codes established will depend inter alia on the nature of the activities and the preferences of individual budget holders.

4.2 Costing activities and outputs

Governmental and funding body pressures for increased efficiency in higher education in many countries, and the consequential need for improved management in higher education, have led to a demand for the introduction of activity costing. Irrespective of the pressure from funding bodies, there is advantage in management knowing how much a particular activity costs.

The costs of an activity need to be related both to the output and to the functional activities which take place to create it. The definitions of activities and outputs should be in practical, identifiable and controllable terms. The allocation of costs to activities and outputs should cover both staff and non-staff costs. There may be particular problems in allocating staff time (and hence costs) to particular activities and/or outputs. The means of allocating costs between activities and outputs should not be excessively complex. For example, in some cases it may be necessary only to estimate in broad terms the proportion of an individual's time spent on one activity as against another. In other cases it may be possible and desirable to keep detailed time sheets.

Table 1 (which is based on Kaye and Rumble's systems approach) lists some of the functional activities undertaken in distance and conventional education systems. The list has purposely been kept simple. The range of activities identified will depend in part on the complexity of each institution and the range of its outputs, and at least in distance-education

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Table 1: Typical functional activities in a 'two mode' university or institution of higher education

- A. Conventional class-based courses
 - a. Course planning and preparation
 - b. Production of any materials required for the course (eg slides, reprographed notes, examination papers)
 - c. Delivery of the course (teaching and instructional costs, expenses and consumables used in instruction such as the cost of field trips, computer time, etc., and the direct costs of examinations)
- B. Distance taught courses
 - a. Development (course planning, media selection, specification of teaching strategies, writing or design of the materials or components, editing, graphic design, developmental testing of components, external assessment of the draft course materials, hire of consultants) including direct administrative costs
 - b. Production of the materials in-house or externally, together with cost of materials bought in
 - c. Storage/warehousing costs
 - d. distribution costs (postage, carriage, transmission of broadcasts)
 - e. Delivery costs (face-to-face tuition, telephone tuition, computer conferencing costs, examinations, computing, laboratory experience, residential school costs, costs of stocks consumed or lost, etc)
 - f. 'Maintenance' of the course including redevelopment or redesign of any of the materials and supervision of courses in their delivery phase.
- C. Student/Learner Support and Services
 - a. Advertising of academic programmes
 - b. Administrative costs of admission and registration of students, their allocation to support facilities and tutors (but not the actual costs of the services), the maintenance of their records, certification and transcription services, etc
 - c. Counselling of students

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- d. Libraries
 - e. For on-campus students, residential facilities, health care, catering and recreational facility costs
 - D. Research
 - E. Community Services including non-instructional costs such as consultancy service costs, etc. (See Crosson [1984] for a taxonomy.)
 - F. Administration where it is not specifically related to course development, production or distribution, or students.
 - G. Maintenance of premises and grounds
-

systems on the range of media utilised. Table 2 lists outputs. Again the list has been kept simple.

4.3 Budget coding systems for financial analysis

The approach taken here assumes that the budgeting and accounting system is computer based but even if this is not the case the approach towards the analysis of costs could be applied to a manual budgeting system provided it was accepted that the resulting analysis would be relatively crude.

Budget codes would normally assign costs to a cost centre, an expenditure head, and a particular budget

eg Department of Physics; Staffing costs; Temporary staffing budget

giving a coding structure which might resemble the following:

Cost Centre	Account Code	Expenditure Head Code
CC	XX	0000

where, for example:

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Table 2: Typical higher education outputs

		(Conventional	(Course credits
		(mode	(Diplomates
		(	( Graduates:
		(	( - first degree
		(	( - higher degree
		(	( Contract
(Teaching	(	(	( teaching programmes
(programme	(	(	( delivered
(	(	(	( Course credits
(	(	(	( Diplomates
(	(	(	( Graduates
(	(	(	( - first degree
(	( Distance	(	( - higher degree
(	( mode	(	( Educational
(	(	(	( courses and packs
(	(	(	( of materials, and in-
(	(	(	( dividual materials
Outputs (	(	( Academic	(Specific projects
(	(	( research	(Personal research
(Research	((
(programme	(	( Institutional	(Specific
(	(	( research	(projects
(((
(	(	(	( Consultancy and
(	(	(	( advisory services
(Public	(((Professional and
(Service	(((subject area act-
(programme	(((ivities
		((Service on public
		((bodies

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CC	= Department of Chemistry
XX	= Salaries
0000	= academic salaries.

This will allow simple analysis of total expenditure by cost centre and expenditure head. The utility of this kind of analysis is likely to be limited.

The budget code can be extended to reflect functional activities but this requires the identification of activities (see Table 1) and their coding:

eg Code A001	Course development
Code A002	Course production

giving a coding structure which might resemble the following:

Accounting System Code	Activity Analysis Code
CC XX 0000	A000

This would extend quite considerably the kind of analysis that could be done, by helping to identify the cost of functional activities undertaken in each cost centre.

Finally the coding system might be extended to cover outputs (which would need to be clearly identified [see Table 2] and coded by programme, mode and course or project):

eg Teaching programme, Distance-education mode, Course
7324 The Latin American Novel

giving an overall coding structure as follows:

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Accounting System Code	Activity Analysis Code	Output Analysis Code
CC XX 0000	A000	TD7324

This would provide a systematic way of analysing the costs of the institution in a number of ways:

1. By activity and cost centre
2. By output and cost centre
3. By activity and output
4. By activity, cost centre and output

At times there would be a direct relationship between a budget/account code, an activity and an output; at other times this would not be the case. The system would need to be capable of allowing cross analysis between accounts, activities and outputs as necessary, but this should be very easy given a computer-based system, as follows:

Accounting System Code	Activity Analysis Code	Output Analysis Code
CC XX 0000	A000	TD7324
CC XX 0001	{ A001 } A002	TC5412
CC XX 0002		{ TD7324
CC XX 0003	---- A003	-----{ TD1659
CC XX 0004		{ TD3860

For example, assume that CC XX 0002, CC XX 0003 and CC XX 0004 are salary costs (XX) for academic, course support and secretarial staff in cost centre CC; the activity code A003 is course delivery; and the outputs are three distance-taught courses. The analysis enables costs to be analysed by cost centre, by expenditure heads, by activity and by output.

5. THE TREATMENT OF CAPITAL COSTS

The purchase of capital goods raises particular problems. Unesco (1977, p. 31) has suggested a standard list of headings for the capital [and other] costs of mass media projects, the capital items being (1) buildings of a general nature, (2) special buildings including (a) studios and (b) other special buildings, and (3) equipment and materials (including vehicles).

Where the capital cost is related to the purchase of inexpensive items it is common to treat it as a revenue cost. This still leaves one with the problem of how to deal with the capital costs of larger items. One way of proceeding is to argue that since the money has been spent, one can assume that these are *sunk* costs – that is, a cost that has been incurred and hence is not worth taking into further consideration.

Whether or not this is acceptable is likely to depend upon the purpose for which the analysis is being undertaken. Where it is a question of deciding on a future course of action on the basis of likely future costs (eg. continuation or abandonment of a project), then the right approach may be to ignore past (sunk) costs. On the other hand economists and accountants are likely to take the view that capital costs must be taken into consideration, particularly where the object of the exercise is to establish the 'real' costs of a project or to draw comparisons between the cost of one educational project and another.

Generally, however, the costs of capital items are *annualised* or *amortised* over their expected life. For example, if one buys a word processor and assumes that it will have a useful life of 4 years (it may have a longer life, but this may be uncertain or there may be good reasons for not assuming a longer life), one can *annualise* or *amortise* the costs of the equipment over the life of the project.

eg Cost of word processor, £2000; expected life, 4 years;
annualised cost, £500.

Dividing the cost (or estimated value) of facilities and equipment by durable years yields the depreciation resulting from their use over a year (in the above case £500 per year), and the result of subtracting the total depreciation from the cost or estimated value gives the written down value in a particular year:

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eg In the above case, the depreciation after three years is £1500, so that the written down value of the equipment in year 4 is £500.

Many economists argue that the treatment of capital costs outlined above is insufficient and that account must be taken of the *opportunity cost* of the capital investment - that is, the income foregone if we invest in capital goods such as buildings or equipment rather than trying to earn interest on our capital. It is argued that unless we do this we will seriously underestimate the costs of a project. While managers can normally ignore such considerations in their day-to-day business, in certain circumstances and particularly when addressing governmental and other funding bodies, one may have to take account of interest rates and add this to the annual amortisation. The formula most often used (see Jamison, Klees and Wells, 1978, pp. 32-3; Levin, 1984, pp. 67-73) for calculating the annualisation factor (which takes into account both the cost of depreciation and the opportunity cost of interest foregone) is:

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

where $a(r,n)$ is the annualisation factor, n is the lifetime of the capital in years, and r is the prevailing interest rate.

eg the annualised cost of a word processor worth £2,000 where the interest rate is 11% is

$$\begin{aligned} & 2000 \times 0.11(1.11)^4 / (1.11)^4 - 1 \\ & = \text{£}715.56 \end{aligned}$$

As Perraton (1982, p. 59) observes, 'the argument about discount rates is not purely academic. If we want to compare types of education which 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 [interest] rate adopted'.

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6. APPORTIONING COSTS

Not all items of income and expenditure are capable of being coded directly to particular activities and outputs. Many will need to be analysed and apportioned over a number of activities and programmes.

The apportionment of costs to activities and outputs where the cost, in the form of a member of staff, a piece of equipment or a general overhead service, is directly or indirectly expended on more than one activity or output, raises problems for those analysing costs.

6.1 The treatment of staff costs

If activities and outputs are going to be costed properly it is essential that the costs of staff should be attributed satisfactorily. This can be done in a number of ways:

1. By introducing timesheets which record the amount of time spent on particular activities and projects.
2. By apportioning staff time on the basis of a personal return based on a diary exercise that falls short of a detailed timesheet but which reflects the individual's assessment of the time spent on different projects and activities.
3. By apportioning staff time crudely on the basis of their terms and conditions of service (eg. 33% of total time spent on research, 57% on teaching, and 10% on other activities) and on a management assessment of what the individual has been doing (eg 60% of X's teaching has been on course 0000).

The approach outlined in (1) and (2) is that recommended by, for example, NCHEMS in the United States (Manning and Romney, 1973). It remains the case that information at this level of detail may not be available in higher education institutions. It may not be necessary to apportion staff time accurately, and in this case the costs of such staff may be assigned to general overheads (see 6.5 below).

6.2 Non staff costs

These may be allocated to specific activities or projects where they are

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directly related to the activity or project, perhaps in proportion to the volume of activity. Other non-staff costs can be allocated to overheads (see 6.5 below).

6.3 Income or revenue

Income directly related to specific projects, lines of study, courses or programmes should be attributed to the project, line of study, course or programme. This does not mean that the project, course or programme has the right to use the income for its own purposes, but it will enable judgements to be made about the extent to which a project is covering its direct costs and contributing to general overhead costs, or, conversely, is a 'drain' on university resources.

6.4 Costs of plant

Physical inputs include land, buildings, furniture, laboratory facilities, computers, libraries, etc. The allocation of the costs involved may be straightforward but may be (and more usually is) far from easy. Where costs can be related to a specific project, course or programme or to a specific activity then this should be done. Otherwise costs will have to be apportioned as a general overhead.

The best approach seems to be to calculate the cost of the facility and then apportion it in some way. Building costs (maintenance, security, utilities, cleaning etc) can be calculated as a cost per square meter. Costs may differ from building to building - for example, some buildings may be owned, others rented. The cost can then be allocated to staff on the basis of occupancy and costs apportioned to activities or outputs on the same basis as staff time. Common areas may need to be treated in a different way, being allocated to programmes (eg on the basis of student numbers) or courses (eg lecture rooms on the basis of usage).

The capital costs may be apportioned on an annualised basis or on a discounted basis (see section 5 above).

6.5 Overheads

Overhead costs may be programme specific or activity specific and need to be allocated to programmes, lines of study, projects or courses; or they

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may be general and need to be allocated across a whole range of activities, programmes, lines of study, projects and courses. Where crude approximations can be done they should be. In other cases the overheads may need to be classified as general and apportioned across the board – the best approach being to apportion such general overheads on the basis of the proportion which a programme, project or course's expenditure bears to total attributed expenditure:

eg. Total expenditure is \$12 000, of which \$10 000 is attributed, \$5 000 to project A, \$3000 to project B and \$2000 to project C. The balance of unattributed overheads is apportioned to the projects 5/10ths to project A, 3/10ths to project B and 2/10ths to project C.

Appendix 2 discusses the attribution of overheads in greater detail.

7. COSTING DISTANCE-EDUCATION PROJECTS

There are no intrinsic difficulties to costing any elements of a university's activities provided that the activity of costing is correctly approached and there is a desire to find the results. However, information which management would prefer not to know is unlikely to be prepared.

Table 1 identified in broad terms the typical activities undertaken in a 'two mode' university or other institution of higher education. Each activity involves cost elements which behave in different ways - ie. they are recurrent or non-recurrent, fixed or variable. Note too that the cost structure of a particular activity or course can be varied by changing the way it is organised - for example, the costs are different and behave differently depending on whether one gives each student a video-cassette, loans each student a video-cassette, provides a video-cassette in a local centre where groups or individuals can see it, or transmits the material by broadcast means.

Appendix 1 lists typical costs incurred in developing, producing and distributing distance courses. The list is not exhaustive.

Cost studies may be undertaken for a variety of reasons: to determine the costs of a policy proposal or a change in procedures; to compare the costs of two or more policy options; to establish how existing resources are being used as a preliminary step to the search for economies, either with a view to saving money or with a view to releasing resources for new ventures; and to provide data in support of performance indicators (used to evaluate and monitor performance). The analysis may focus on a whole institution or on a particular part of it. It may be concerned with the identification of full costs or only of the additional costs that will be incurred when a new project is established on the back of an existing one. The purpose of the analysis will affect the way in which the activity of costing is carried out; the extent to which overhead costs are apportioned to activities and programmes; and the extent to which the intention of the analysis is to identify average costs or marginal costs.

7.1 Course development and production costs and the special problem of joint supply

Imagine the situation where there are two lines of study each of which is teaching a number of courses. Each course requires 1000 days of academic

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staff time to develop it. Each line of study is developing three courses:

Programme 1		Programme 2	
Course A	1000 days	Course D	1000 days
Course B	1000 days	Course E	1000 days
Course C	<u>1000 days</u>	Course F	<u>1000 days</u>
TOTAL	3000 days		3000 days

If they go it alone they will spend 3000 days each on course development. However, in discussion they find out that one of the courses will more or less meet both their needs with some adaptation. As a result they can save on the amount of staff time put into course development by sharing the development of a common core (350 days each) and then putting in 300 days each on their own specific materials

Programme 1		Programme 2	
Course A	1000 days	Course E	650 days
Course B	650 days	Course F	1000 days
Course C	<u>1000 days</u>	Course G	<u>1000 days</u>
Total	2650 days		2650 days

As a direct result the institution, instead of spending 6000 days developing six courses, only spends 5300 days on developing what from the students' point of view is still six courses.

The issue of joint supply is central to universities, not least in the interplay between teaching and research (a particular problem which we shall ignore here). However, it raises problems for the costing of conventional and distance-mode programmes where conventional courses are adapted for distance-teaching purposes or where distance-teaching materials are used to instruct on-campus students, thus reducing the direct teaching on a campus-based course.

Imagine a course that has been developed initially for teaching in the conventional mode at a cost of £4500. It is then adapted for use in the distance teaching mode at a cost of an additional £12 000. There are 30 conventional students on the course costing £150 each (this may seem rather cheap but then they are taking a number of courses and this is the

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apportioned cost per student for this course only). There are 175 distance students on the course at a direct cost of £75 each.

The question arises, how do we analyse the costs involved? Broadly speaking we could adopt one of five approaches:

1. We can charge the full cost of developing the original conventional course to the conventional-mode programme (CMP) and the cost of adapting it to the needs of distance students to the distance-mode programme (DMP). This is the kind of approach normally found in Canadian 'two mode' universities.

	CMP	DMP
Development cost	£ 4500	£12 000
Cost/student	£ 150	£ 68.57

2. We could argue that since both programmes benefit from the dual mode course they should share the development costs equally.

	CMP	DMP
Development cost	£ 8250	£ 8250
Cost/student	£ 275	£ 47.14

3. We could argue that the costs of adapting the course to distance uses is a proper charge against the DMP, but that since the latter is benefitting from the earlier development work done in the CMP, it should bear a proportion (say half) of the costs originally incurred. This approach effectively loads a lot of the CMP costs onto the DMP. It is hardly equitable since the CMP course would presumably have been developed anyway.

	CMP	DMP
Development cost	£ 2250	£14 250
Cost/student	£ 75	£ 81.43

4. Another approach which will also tend to load costs onto the distance programme is to estimate what the DMP would have cost assuming that it was developed from scratch and not on the back of the CMP. Let us assume that the notional cost is taken to be

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£15 000. The actual cost remains £12 000. The notional saving which results is thus £15 000 - £12 000 = £3000. This saving could be attributed to the CMP, the difference between the notional 'full' and actual 'subsidised' development costs being 'charged' to the DMP programme by the CMP programme so that the apparent costs of the programme are then as follows:

	CMP	DMP
Development cost	£ 1500	£15 000
Cost/student	£ 50	£ 85.91

This approach opens up the possibility of a negative charge to the CMP when the notional cost less the actual cost of the DMP is greater than the cost of the CMP.

5. We could apportion the total costs of developing both the CMP and DMP versions of the course to the programmes on the basis of student numbers, so that, in the case we have specified, 30/205ths. of the cost are attributed to the CMP and 175/205ths. to the DMP.

	CMP	DMP
Development costs	£ 2415	£14 085
Cost/student	£ 80.5	£ 80.49

This approach is the same as ignoring the differences between the CMP and DMP and just treating the development costs of both versions of the course as the total development cost for all students. This approach is found in many Australian 'two mode' systems where no distinction is drawn between distance and campus-based costs.

	System cost
Development cost	£16 500
Cost/student	£ 80.49

The approach chosen may depend on the purpose of the analysis and in

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particular whether or not the intention is to identify average or marginal costs (see the introduction to section 7). However, the first approach has the merit of showing the specific costs of each mode.

7.2 Course presentation and teaching costs

So far as the teaching costs are concerned, there are broadly speaking two ways of analysing costs:

1. The most appropriate way to attribute the costs of teaching, if the aim is to analyse the real costs of each mode, is to assign the teaching costs to the appropriate programme, as follows:

	CMP	DMP
Total teaching cost	£4500	£13 125
Number of students	30	175
Teaching cost/student	£ 150	£ 75

2. An alternative approach, again found in many Australian 'two mode' systems, is to ignore all differences between the costs of teaching. This would give the following:

	System cost
Total teaching cost	£17 625
Number of students	205
Teaching cost/student	£ 85.98

The first option reflects the relative costs of the two modes. The cost per student may be expressed in terms of full-time equivalent (FTE) students. This possibility is discussed in section 8.1 below.

7.3 Costing over the life of a course

Distance education offers the possibility of lower average costs per student for teaching because it substitutes capital for labour. Any analysis of costs must take account of the period over which the capital investment in learning materials is spread (see section 5).

Appendix 1 gives details of typical costs incurred in the development,

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production and presentation of distance taught courses. Course development and production costs are non-recurrent and need to be written off over the life of the course. Stocking costs will be incurred periodically as needed, either to replace damaged or lost components where these are lent to students or to meet future demand where stocks are consumed by students. Storage, distribution and presentation costs will be incurred annually.

Table 3 presents fictional costs for a distance taught course which is developed over an 18 month period and then presented for four years. As far as development and production costs are concerned, the table first establishes the cash position at *constant* price levels. It then looks at these costs from two points of view: their annualisation (or amortization), and their discounting.

Table 3: Fictional costs for a distance taught course (£s)

Year	1	2	3	4	5	6
Development/ production costs						
a) Cash flow	23 000	130 000	16 000		7 000	
b) Annualised cost			42 250	42 250	45 750	45 750
c) Discounted cost						
- £169 000			53 235	53 235	53 235	53 235
- £ 7 000			-	-	4 032	4 032
- Sub-total			53 235	53 235	57 262	57 262
Stocking cost		43 000		8 500		3 500
Presentation cost			99 615	81 490	84 535	59 885

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The annualisation of the development and production costs presents some minor conceptual problems. The development and production costs incurred in years 1 to 3 relate to the presentation of the course in years 3 to 6 respectively. The cost in year 5 relates to the presentations in years 5 and 6 respectively. Annualised, these costs could be attributed to the relevant years quite easily, as follows:

Total development costs, years 1 to 3: £169 000
Total development cost, year 5 : £ 7 000

Annualised cost of development, attributed to years of presentation

- years 3 and 4	$(1/4 \times £169\ 000)$ = £42 250
- years 5 and 6	$(1/4 \times £169\ 000) + (1/2 \times £7000)$ = £45 750

This approach is reflected in line 2 of Table 3.

If opportunity costs are taken into account the picture changes somewhat. The third line of Table 3 discounts the development and production costs, assuming a 10% rate of interest. The initial development money of £169 000 which was spent over a three year period has been discounted over the four years the course is going to be presented., while the additional £7000 put in in year 5 has been discounted over two years.

Table 4 uses the information given in Table 3 to derive a cost per student. The cost per student of development and production costs are shown in two ways: (1) as the annualised cost divided by the number of students registered in that year, and (2) as the discounted cost, divided by the number of students registered in that year. The stocking cost is fixed at £24.50 per student, and in our example all the stocks are used by the end of the four years. In practice it is likely that there would be unused stocks left over which would then have to be written off. The cost of presentation is a variable per capita cost equivalent to £145 per student. The table ends by showing the cost per student assuming (1) annualised development and production costs, and (2) discounted development and production costs.

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Table 4: Cost per student on a fictional distance taught course, assuming data derived from Table 3

Year	3	4	5	6
Number of students	687	562	583	413
Development/ production costs				
Annualised cost/ student	£61.50	£75.18	£78.47	£110.77
Discounted cost/ student	£77.49	£94.72	£98.22	£138.65
Stocking cost/ student	24.50	24.50	24.50	24.50
Presentation cost/student	145.00	145.00	145.00	145.00
Total cost/ student				
- annualised method	231.00	244.68	247.97	280.27
- discounted method	246.99	264.22	267.72	308.15

In some systems, particularly where there are small numbers of students and where the media utilised are consumed by the students (in the sense that they are given to the students rather than loaned to them or held by the institution), the materials may be produced annually and hence there may be no need to amortise the costs of the materials. However, the development costs (particularly the cost of staff time involved in the planning and preparation of the course) should still be annualised or discounted.

It is worth noting that the development and production cost per student and hence the total cost per student would fall if student numbers were

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to rise. For example, if the number of students rose to 950 in the final sixth year of the course then the annualised cost per student of development and production in that year would be £48.16 and the total cost per student using the annualised method would be £217.66 (against £110.77 and £280.27 respectively); and the discounted cost per student for development and production would be £60.28 giving a total cost per student using this method of £229.78 (against £138.65 and £308.15 respectively).

One other point needs to be made. Throughout this section the assumption has been made that at the end of an agreed period of time, normally associated with the end of the planned life of the course, the materials will cease to have any value. Further, it has been assumed that the period of amortisation or discounting is fixed in relation to the life of the course. In practice this may not be the case. Course lives may be extended; different courses may have different lives; and some materials may be incorporated into replacement courses or continue to be sold.

The adoption of a standard course life over which the development and production costs of the course or of particular components are annualised or discounted may under-estimate or over-estimate the costs of a distance project relative to those of a conventional programme. In general the aim should be to annualise or amortise the development and production costs of courses or materials over their full life.

8. RESOURCING DISTANCE-EDUCATION PROJECTS

A significant problem for administrators and planners in institutions teaching at a distance is to explain the cost structures which apply to distance-education projects. This penultimate section attempts to address this issue, particularly as it affects 'two mode' institutions.

8.1 Resource models in campus-based systems

In conventional campus-based systems a very high proportion of total costs is spent on staff salaries and related costs. As a result resource models in conventional institutions are either based on *staff:student ratios* (typically relating staff to a headcount of students but often to a count of student full-time equivalents) or on *instructional workload models* which attempt to relate academic staff numbers to their teaching workload.

Those working in 'two mode' institutions which use a staff:student ratio model may attempt to weight students in some way. It is quite common to make use of the notion of a *full-time equivalent* student (*FTES*) in which a regular full-time campus based student is used as the base (ie, is equivalent to 1.0 FTES) while part-time distance taught students are weighted arbitrarily as, say, 0.5 FTES. Some institutions weigh part-time students on the basis of student load so that part-time students on one course are weighted say 0.3 FTES while another may be weighted 0.9 FTES. In some cases students are weighted differently depending on their subject area, so that a full-time student on a physics course, for example, may be weighted 1.8 FTES and a part time student 0.9 FTES, but students on a literature course would be weighted 1.0 and 0.5 respectively. Also postgraduates may be weighted higher than undergraduates. Practice varies enormously. Griew (1980, p. 81) has argued that while weighting may make explicit the largely hidden assumptions about the *internal* allocation of resources, the summation of the weighted FTES should be equivalent to the actual headcount of students used by government to determine grant.

Instructional workload models (see for example Sheehan and Gulko, 1976) make the fundamental variables affecting costs - notably tutor-student contact hours, average lecturer's teaching load, average class size, explicit. They have been adapted to measure the teaching load

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involved in distance programmes and compare this with the teaching load in conventional campus-based systems (see section 8.4, subsection b).

8.2 Economic models of distance-education systems

Most of the research to date on the cost structure of distance education has concentrated on the development of general economic models which have attempted to identify and explain the behaviour of costs in respect of the fundamental variables - particularly the number of courses and the number of students - in distance teaching systems.

One of the first such models was developed by staff at the British Open University and reported by Wagner (1977). This identified only two variables, courses and students (here and elsewhere within this section the actual symbolism used by original authors has been changed to provide greater internal consistency within this document):

$$T = c\beta + s\delta + f \quad \text{[Equation 1]}$$

where:

- T = the total cost
- c = the number of courses in 'development' weighted as 1.0, plus the number of courses 'in presentation' weighted as 0.1 of a course in development.
- s = the number of students
- f = the total fixed overhead cost
- β = the average cost per course
- δ = the average cost per student

This basic model was improved on by Snowden and Daniel (1980) who analysed the costs of the Canadian distance-teaching Athabasca University. They made explicit the distinction between courses in development and courses in presentation:

$$T = c_1\beta_1 + c_2\beta_2 + s\delta + f \quad \text{[Equation 2]}$$

where:

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- T = the total cost
- c_1 = the number of courses in development
- c_2 = the number of courses in presentation
- s = the number of students (weighted course enrolments)
- B_1 = the average cost of a course in development
- B_2 = the average cost of a course in respect of revision, maintenance and replacement
- δ = the average delivery cost per student (weighted course enrolment)
- f = institutional overhead costs (fixed)

and where:

$$c_2 = c_1/y$$

where:

$$y = \text{the life of the course in years}$$

such that, by substitution,

$$T = B_1(c_1 + c_2/y) + s\delta + f \quad \text{[Equation 3]}$$

Snowden and Daniel also argued that in a young institution it was unreasonable to expect overhead costs to be fixed and they accordingly modified their formula to take account of the fact that overhead costs would increase during the development phase and they made allowance for this in a further equation.

Further models of this kind were developed by Rumble (1981, 1982a) in respect of the distance-teaching Universidad Estatal a Distancia in Costa Rica and the Universidad Nacional Abierta in Venezuela, and by Guiton (1982) in respect of the distance-teaching systems of small 'two mode' institutions in Australia.

Rumble (1982b) has drawn attention to some of the problems of using formulae such as the above particularly where institutions are subject to

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reductions in funding. Moreover, while such models are useful in as much as they focus on the major cost-inducing variables and can, within limits, help in decision making at the macro-level, they 'do not specify the fundamental variables, which affect costs, in sufficient detail to be of practical value to people who are trying to prepare an operating budget for an institution' (Rumble, Neil and Tout, 1981, p. 235). This conclusion led Rumble, Neil and Tout to prepare a series of cost functions which would specify in greater detail the fundamental variables affecting costs in respect of the development of course materials and the provision of support services to students (ibid., pp. 250-70). While this is useful one must bear in mind that such formulae are abstractions which can be rendered useless by changing circumstances - for example, the introduction of new technology. Nevertheless the economic models discussed above have some importance precisely because they are simple to understand and can therefore be readily explained to politicians.

8.3 Production rates and staffing levels for course and media development and production

Academic and production staff time is an important element in the cost of developing and producing courses and media. A production-rate approach can establish the amount of staff time needed to prepare and produce the learning materials and hence the staff costs likely to be involved. Where courses are of a standard format it may be enough to establish the total amount of time of each class of employee required to develop and produce a course, and the average salary of each category, and then multiply the result by the number of courses in development and production. However, where courses differ widely in their use of media then it is necessary to establish production rates for each media. This is the kind of approach taken by Rumble, Neil and Tout (1981, pp. 257-61).

A production rate is derived by measuring the output of whole courses or of individual components and dividing this by the number of staff years of each category of staff involved, taking into account other duties, prolonged absences such as sick leave or maternity leave, etc. For example, assume that a particular institution has 67 full-time academic staff employed for 365 days each year. Weekends (104 days), public holidays (10 days), holiday entitlement (30 days) and research leave (20 days) account for a total of 164 days. In addition staff are expected to

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spend some time on administration (allowance 10 days). This leaves 191 'productive days' or 52.3% of an academic's year which can be spent on course development, teaching and research. (Note that this is quite high: the maximum 'productive time' for any category of staff would be about 63%). Changes in terms and conditions of service can be monitored and will show whether the assumptions built into the model remain valid.

Now assume that the staff have no teaching duties and are employed full-time to develop distance courses. One can then measure the output of standard courses or of particular components and derive a production rate for staff wholly employed in the development and production of distance materials and courses. For example, assume that the 67 staff developed 11 standard courses, then the production rate per academic member of staff of standard courses would be $11 \div 67 = 0.16$ per annum. Alternatively assuming that 325 hours of television or video programming is produced, then the production rate would be $325 \div 67 = 4.9$ programmes hours per annum.

Production rates can also be determined for the essential work of maintaining courses which are in presentation (eg. writing new examination papers, de-bugging texts where these are shown to have problems, etc). Generally it will not be necessary to determine production rates for the maintenance of particular components.

The essential formula is:

$$p = X/N$$

where:

- p = the production rate
- X = the product of output (be it a course of a standard type or a component of a course) which is being developed, produced or maintained.
- N = the number of staff of category N involved in the activity of developing, producing or maintaining product X

and where by extension:

$$N = X/p$$

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The cost of the staff required is then found by multiplying N by the average salary plus other employer costs for that category of staff, as follows:

$$N\Delta$$

where Δ is the average cost of the staff category.

Production rates can be established for the various categories of staff (academic course writers, editors, broadcast producers, designers, course coordinators, educational technologists, secretaries, etc) in respect of whole courses or particular components (print, audio, video, etc). One can think of this in terms of a matrix where on the horizontal axis one plots the various media X_1 (which may be print), X_2 (audio cassettes), X_3 (video programmes), ... X_n (the final component one is interested in), and on the vertical axis the various categories of staff N_1 (academic course writers), N_2 (editors), N_3 (designers), N_4 (video producers) ... N_n (the final category of interest to one). This would provide one with a series of production rates:

	X_1	X_2	X_3	...	X_n
N_1	$p_{X_1N_1}$	$p_{X_2N_1}$	$p_{X_3N_1}$	...	$p_{X_nN_1}$
N_2	$p_{X_1N_2}$	$p_{X_2N_2}$	$p_{X_3N_2}$	...	$p_{X_nN_2}$
...
N_n	$p_{X_1N_n}$	$p_{X_2N_n}$	$p_{X_3N_n}$	...	$p_{X_nN_n}$

where $p_{X_1N_1}$ is the production rate for staff category N_1 , producing component category X_1 . Institutional agreement would need to be reached on whether or not the historical production rates (if they are derived from past data) or the assumed production rates (if they are based on

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estimates) are reasonable or not.

The next step would be to use the agreed production rates against target output levels to establish staffing requirements for each category of staff. The total requirement for staff of category N_1 would be:

$$N_1 = [X_1/p_{X_1N_1}] + [X_2/p_{X_2N_1}] + \dots + [X_n/p_{X_nN_1}]$$

[Equation 4]

and this would be repeated for other categories of staff.

Example: Equation 4

The example which follows shows how the academic staff numbers required to support a particular programme of activity can be derived using production rates for various media. If N_1 is the number of academic staff and the volume of printed materials to be produced (X_1) is 320 course books of a standard length, the volume of audio-cassettes of one hour duration (X_2) is 200, the volume of video-cassettes (X_n) is 100 programmes of one hour duration, the production rate $p_{X_1N_1}$, $p_{X_2N_1}$, $p_{X_nN_1}$ for print, audio-cassettes and video-cassettes of the kind described is 5, 30 and 7 per annum respectively, then:

$$N_1 = (320 \div 5) + (200 \div 30) + (100 \div 7) = 84.94$$

Note that while we have been talking about the number of academic staff required, this is related to the input of staff time over a given period and not necessarily to the number of staff in post. Thus the output in the example given above could be achieved by 85 people over one year, or by 42.5 people working over two years.

The salary cost of staff would be:

$$N_1\Delta_1 + N_2\Delta_2 + \dots + N_n\Delta_n$$

where Δ_1 is the average cost of employing staff in category N_1

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8.4 Workload remission in 'two mode' institutions

In institutions that teach both at a distance and by conventional means and in which staff are expected to undertake duties across both modes, a major problem faced by those planning the allocation of staff time is to establish some kind of equivalency between the workloads imposed on those developing distance materials, those teaching on-campus students, and those tutoring distance students. In this section we look at one way in which this problem might be solved.

(a) Course teaching in campus-based programmes

Let us assume that academic staff working in conventional programmes have the same terms and conditions of service as those working in a distance programme, with the same number of productive days (following our earlier example, 191 days) and the same number of days available for teaching (134 days). Let us further assume that a full teaching load is defined as a teaching load of 15 hours per week during term time and that this is defined as the *standard lecturer load*.

The *average lecturer load* (defined as the average hours taught by a full time equivalent lecturer) can be determined easily using the Instructional Workload Model which is based on the formula

$$T = (S \times ASH) \div (ACS \times ALH) \quad [Equation 5]$$

where:

- T = the number of full-time equivalent lecturers determined by dividing the total class contact hours of staff by the average class contact hours of full-time staff
- S = the number of full-time equivalent students, determined by dividing the total student taught hours by the average student taught hours (ASH) of full-time students in the same subject area.
- ASH = the average taught hours of a FTE student which is obtained by dividing the total student hours by the number of FTE students.
- ACS = the average class size determined by dividing the total

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student contact hours by the total lecturer hours.

ALH = the average lecturer hours taught by a FTE lecturer, determined by dividing the total lecturer hours by the number of FTE lecturers.

In practice there are a number of ways of deriving the variables S, T, ASH, ACS and ALH (see Sheehan and Gulko, 1976).

The Instructional Workload Model is extremely flexible and can be used not only to determine the size of the teaching establishment (T) but by extension (a) the student:staff ratio (SSR) where:

$$SSR = S + T = (ACS \times ALH) \div ASH$$

(b) the average class size (ACS):

$$ACS = (S \times ASH) \div (T \times ALH)$$

and (c) average lecturer hours (ALH)

$$ALH = (S \times ASH) \div (T \times ACS)$$

Example: Instructional Workload Model

(a) Basic data

The table below provides basic data on seven courses a to g including information on the number of students (column 2) and the student hours on each course (column 3). Column 4 provides data on the total number of student taught hours on each course. This is obtained by multiplying the data in column 2 by that in column 3. The number of FTE students is given in column 5 and is equivalent to the student taught hours (column 4) divided by 200 (the full-time load per student). Column 7 provides data on the total lecturer hours required to teach each course.

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1 Course	2 Student numbers	3 Student hours on course	4 Student contact hours (SH) [col 2 x 3]	5 FTE student [col 4 ÷ 200]	6 Total lecturer hours (LH)
a	133	50	6650	33.25	350
b	141	100	14100	70.50	800
c	226	50	11300	56.50	700
d	189	50	9450	42.25	500
e	95	100	9500	47.50	500
f	170	50	8500	42.50	500
g	<u>104</u>	<u>50</u>	<u>5200</u>	<u>26.00</u>	<u>250</u>
			64600	323.50	3600

(b) Assumptions:

Average student taught hours of a full-time student is 200 hours.

Number of FTE lecturers is 34.

Each term comprises 10 weeks.

(c) Examples:

$$ALH = LH \div T = 3600 \div 34 = 105.88 \text{ hours per term} = 10.6 \text{ hours per week}$$

$$ASH = SH \div S = 64600 \div 323.5 = 199.69 \text{ hours per term} \approx 20 \text{ hours per week}$$

$$ACS = SH \div LH = 64600 \div 3600 = 17.94$$

$$T = (S \times ASH) \div (ACS \times ALH) = (323.5 \times 199.69) \div (17.94 \times 105.88) = 34$$

$$SSR = S \div T = 323.5 \div 34 = 9.5$$

$$SSR = (ACS \times ALH) \div ASH = (17.94 \times 105.88) \div 199.69 = 9.5$$

$$ALH = (S \times ASH) \div (T \times ACS) = (323.5 \times 199.69) \div (34 \times 17.94) = 105.9 \text{ per term} \approx 10.6 \text{ per week.}$$

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(b) Course development and production in distance programmes

The approach outlined in section 8.3 shows how the overall staffing requirements for course development, production and maintenance can be established using a production rates approach. Section 8.4 (a) shows how the Instructional Workload Model can be used to determine the average lecturer load (ALH) in a conventional class-based teaching programme. In both cases the assumption was that the staff were wholly involved in either producing materials or in teaching.

We can establish an equivalency between the overall load in the distance programme and in the campus based programme by equating the full-time loads for various activities (eg. a full-time load is equivalent to either producing five 64 page books or 30 audio-cassettes or a teaching load of 15 hours per week in the conventional programme). This allows us to determine a full-time load for an individual member of staff working on two programmes: for example, the development of two books would account for $2 \div 5 = 0.4$ of the staff member's time, while a teaching load of 9 hours would account for $9 \div 15 = 0.6$ of his or her time.

(c) Course tuition in distance programmes

Birch and his colleagues have adapted the instructional workload model to meet the needs of distance and fleximode type programmes teaching off-campus students in Britain. Their approach stemmed from the fact that instructional workload models as used in British further education colleges were geared to the staffing implications of teaching loads arising from conventional timetabled classes and laboratories and did not adequately meet the staffing needs arising from the tutoring of part-time students in non-conventional 'open learning' programmes.

Their starting point was to note that lecturers in conventional colleges are required to spend a minimum number of hours per week in college, of which a proportion is to be spent in front of a class (in UK colleges 30 hours and 20 hours respectively). The balance of the time (10 hours) is spent on preparation, marking, administration, etc. However, where teaching patterns emerge which require the lecturer to spend more than the normal amount of time on preparation and marking, as happens in distance-learning situations, and less on face-to-face contact, there has to be a way of negotiating an appropriate reduction of class-contact hours.

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They accordingly adapted the instructional workload model approach to provide an estimation of the number of staff required to support distance learners (Birch and Latcham, 1980; Birch and Cuthbert, 1981, pp. 53-5; Birch and Cuthbert, 1982, pp. 103-6).

The essential requirement is to establish a notional load for distance students which can in some way be equated with the load imposed on academic staff by conventional teaching requirements. For example, it might be established that the correspondence and telephone tuition, and other contact with the individual distance student outside the *class* situation, is equivalent to 30 minutes per student, that the average distance student load per academic is 20, and that each group of 20 distance students has one hour of face-to-face contact per fortnight over a ten week term. The total teaching commitment for a member of staff with a group of 20 distance students would be (0.5 hours x 20 students x 10 weeks) + (1 hour x 5 sessions) = 105 hours or 10.5 hours per week. If the normal load in the conventional programme was 15 hours, then the load imposed by a group of 20 distance students would be equivalent to $10.5 \div 15 = 0.7$ of a conventional load. Thus an equivalency would be established which could be used to assess the individual teaching loads of members of staff and also relate them to course development and maintenance duties.

It is worth pointing out that the same approach applies to the various elements in conventional programmes where the workload arising from teaching a class-based course, supervising the work of sandwich students on industrial work experience, and supervising postgraduate students, needs to be assessed and related to the total load placed on an individual member of staff.

The teaching load arising from tutoring a distance course might be established as follows:

$$(S d \alpha) + [(S / g) t] \qquad \qquad \qquad [Equation 6]$$

where:

- S = the number of student courses on the course
- d = the number of weeks the course is taught
- α = the number of hours or the proportion of an hour which is allowed for contact with an individual

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distance student for purposes of correspondence tuition etc.

g = the average size of a tutorial group

t = the number of hours tutoring provided on the course

Example: Equation 6

Assume that there are 62 students (S) on a course taught over 10 weeks (d); that the allowance for correspondence tuition is 30 minutes per student (i.e. $\alpha = 0.5$ hours), the average group size (g) is 20 and there are 5 tutorials (t) during the term. Then the total teaching load over the term is:

$$\begin{aligned} & (62 \times 10 \times 0.5) + [(62 \div 20) \times 5] \\ & = 310 + (\text{say } 3 \times 5) \\ & = 325 \text{ hours} \end{aligned}$$

The average weekly load is then:

$$\begin{aligned} & \{(S \ d \ \alpha) + [(S / g) \ t]\} / d && \text{[Equation 7]} \\ & = 325 \div 10 \\ & = 32.5 \end{aligned}$$

If the full-time load (\hat{a}) is defined as being equivalent to 15 hours per week then the total staffing requirement (N'') to tutor a distance course will be:

$$\begin{aligned} N'' & = \{(S \ d \ \alpha) + [(S/g) \ t]\} / (d \ \hat{a}) && \text{[Equation 8]} \\ & = 2.17 \end{aligned}$$

8.5 A recommended approach to the development of cost functions for 'two mode' institutions

The development of cost functions for 'two mode' (distance and conventional) educational institutions can best start from the systems approach developed by Kaye and Rumble (see section 3.3). This makes quite

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explicit the 'front end' approach to the funding of course development and production, and the essential separateness of this subsystem both in time and in function from the teaching and student-support subsystem.

(a) Development and production of materials and/or courses ('one mode distance-education systems')

The first sub-element covers the staffing costs incurred in the development and production of the various media X (which we discussed in section 8.3). The second sub-element provides us with the non-staff costs of development and production. This allows us to develop a general cost function for the cost of the production and development of materials or courses (D), as follows:

$$D = [N_1\Delta_1 + N_2\Delta_2 + \dots + N_n\Delta_n] + [(\emptyset + \zeta)_{x_1} + (\emptyset + \zeta)_{x_2} + \dots + (\emptyset + \zeta)_{x_n}]$$

[Equation 9]

where:

- N = staff in any number of distinct categories 1, 2, ..., n, where the value of any category of N is derived from Equation 4
- Δ = the average employment cost of a member of staff in a given category N
- \emptyset = the development cost per unit of output for any type of course or component X where the number of courses or components is 1, 2, ..., n
- ζ = the production cost per unit of output for any component or type of course X where the number of courses or components X / is any number 1, 2, ..., n

The non-staff costs of development \emptyset will cover items such as consultancy costs, bought-in editing and design work, and other development costs involved in the production of, for example, prototype teaching materials. A list of possible items is given in Appendix 1. The non-staff costs of production ζ cover items (also listed in Appendix 1) such as print fixed costs, copyright clearance, video production etc. Note that where the

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materials are developed by contracted staff who are paid a consultancy fee, this will be covered in the second element of the cost function.

Example: Equation 9

Assume a standard course model X_1 which requires 6.4 years of academic staff effort (N_1) at an average cost (Δ_1) of £13 000 per year, 5.2 years of broadcast producer effort (N_2) at an average cost (Δ_2) of £18 700 per year, and 3.6 years of secretarial effort (N_3) at an average cost (Δ_3) of £7200 per year; a development budget (θ) of £15 000 and a production budget (ζ) of £47 000; then the total cost is:

$$\begin{aligned} & (6.4 \times 13\,000) + (5.2 \times 18\,700) + (3.6 \times 7200) + 15\,000 \\ & + 47\,000 \\ & = \text{£}268\,360 \end{aligned}$$

(b) Maintenance of courses in presentation ('one mode' distance-education systems)

Responsibility for the maintenance of courses and materials will normally be vested in a team of academic and other staff. Such staff will also usually have a budget which they can call upon should the need arise. Courses of different kinds may have different maintenance requirements. The costs of maintenance (M) can be reflected fairly easily in a generalised cost function, as follows:

$$M = [N_1\Delta_1 + \dots + N_n\Delta_n] + \mu_{x_1} + \dots + \mu_{x_n} \quad [\text{Equation 10}]$$

where:

- N = staff in any number of discreet categories 1, 2, ..., n where the value of N is determined by use of production rates as shown in Equation 4
- Δ = the average employment cost of a member of staff in category N

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μ = a standard budget for maintenance for any course or component X where the number of such courses or components is 1, 2, ..., n

(c) Course and materials presentation

A cost function for the presentation of courses or materials needs to take account of five sub-elements - the costs of delivery of the various media, storage of media, tuition or other forms of face-to-face contact, correspondence tuition, and examinations.

Appendix 1 provides details of the various cost elements that may be encountered in a distance-education system. We shall approach each of these sub-elements in turn.

The cost functions outlined below are based on specific assumptions about the relationship of costs to particular activities and volumes. It is important to note that changes in these assumptions will alter the nature of the cost functions themselves (contrast for example the approach to costing correspondence and face-to-face tuition where the staff are internal to the institution and undertake the function as a part of their normal duties [see equation 13] and that taken in equations 14 and 15 where these services are provided by external tutors). None of the cost functions are likely to fit specific circumstances but all them are 'idealised' in the sense that to a greater or lesser extent they reflect the kind of operations that take place in teaching at a distance.

(i) Storage:

The total cost of storage (**S**) is:

$$S = (X_1 \Omega_1 + \dots + X_n \Omega_n) + (q_{x1} + \dots + q_{xn})$$

[Equation 11]

where:

X = the number of components of any particular media X where the number of media X is any number 1, 2, ..., n

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Ω = the variable cost of storage of any component 1, 2, ..., n

q = the fixed cost of storage of any component 1, 2, ..., n

(ii) Delivery including transmission:

The total cost of delivery (**H**) is:

$$H = (X_1 \partial_1 + \dots + X_n \partial_n) + (w_{X1} + \dots + w_{Xn})$$

[Equation 12]

where:

X = the number of components of any particular media X where the number of media X is any number 1, 2, ..., n

∂ = the average cost of delivery or of transmission of media X

w = the fixed cost of delivering or transmitting media X where the number of media X is any number 1, 2, ..., n

(iii) Correspondence and face-to-face tuition (internal provision)

The staffing requirements for the internal tutoring of distance courses in 'two mode' institutions was established by Equation 8. The cost (**K**) is established simply, as follows:

$$K = \Delta_{N''} N''$$

[Equation 13]

where:

$\Delta_{N''}$ = the average cost of employment of staff in category N''

N'' = the academic staff required to tutor distance

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courses (as derived by Equation 8)

In addition to the staffing costs there may be the costs of the postage incurred in returning corrected assignment papers to the students. The costs of sending out the original question papers may well be absorbed in the costs of mailing course materials to students.

(iv) Correspondence tuition (external)

In institutions where the tutorial function is separated out and done by contracted staff, the cost of correspondence tuition (**A**) may be made up of a number of elements including in respect of tuition on any *one* course:

1. A flat rate fee to the tutor per group of students (including an element for general expenses):

$$\text{Flat rate fee} = (s/l)y$$

where:

- s = the number of student courses on course c_j
- l = the standard tutorial load per correspondence tutor
- y = the standard flat rate fee (including an element for expenses)

2. A marking fee per assignment submitted where the total payment to the tutor will be:

$$s(ar)z$$

where:

- s = the number of students on the course
- a = the number of assignments to be submitted
- r = the rate of return of assignments
- z = the rate of payment per assignment (including an element for postage expenses)

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The total cost of tuition (**A**) for all courses c_1, c_2, \dots, c_n would be:

$$A = y \{ (s/l)_{c_1} + \dots + (s/l)_{c_n} \} + z \{ s (ar)_{c_1} + \dots + s (ar)_{c_n} \}$$

[Equation 14]

(v) Face-to-face tuition (external):

The cost of face-to-face tuition (**F**) can be expressed by an adapted instructional workload model (see Equation 8 above) or it may reflect piece-work payments to 'external' tutors. In the latter case the cost can be expressed fairly simply for any course:

$$h \{ (s/g) t \}$$

where:

- h = cost per tutor hour
- c = the number of courses where this is any number 1, 2, ..., n
- s = the number of students on a course
- g = the average size of a tutorial group
- t = the number of hours of tutoring in groups on a course

and for all courses $c_1 \dots c_n$:

$$F = h \left[\{ (s/g)t \}_{c_1} + \dots + \{ (s/g)t \}_{c_n} \right] \quad \textit{[Equation 15]}$$

(vi) Examinations

The cost of running examinations (**E**) can be expressed as follows:

$$E = kb + mev + \forall \{ (js_{c_1}) + \dots + (js_{c_n}) \}$$

[Equation 16]

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where:

- k = the number of centres at which examinations are held
- b = the average cost of hiring an examination centre
- m = the number of invigilators per examination
- e = the number of examinations scheduled to take place
- v = the fee per invigilator
- c = the number of courses $c_1 \dots c_n$
- s = the number of students on a course
- j = the examination sitting rate
- ¥ = the fee for marking an examination script

The cost of setting examinations may be treated as part of the maintenance costs of the course, while the costs of printing the papers can be treated as an annual production cost within the print budget.

(e) Overhead costs

No cost function is proposed for general overheads, largely because it is difficult to be specific in advance as to the particular requirements of individual institutions or to judge in advance the likely structure of such costs. The treatment of overhead costs in 'youthful' distance-teaching systems is discussed in Snowden and Daniel (1980).

8.6 A final comment on models

It cannot be stressed enough that the models proposed in section 8 are abstractions which reflect the particular situation described in the text. Models such as these can be used as a basis for planning, but each model will need to be checked and validated against the particular circumstances under which it will be used.

9. CONCLUSIONS

In this handbook considerable stress has been placed on the clear definition of terms, be it the identification and classification of activities, costs, systems or outputs, and the development of appropriate accounting systems to support cost analysis (sections 3 and 4). The treatment of capital costs was discussed as a separate issue (section 5), as was the apportionment of costs (section 6 and Appendix 2).

Section 7 looked at the costing of distance education from an accounting point of view and discussed the special problem of joint supply.

Section 8 turned to resource models. Section 8.1 looked briefly at resource models used in conventional educational systems, while section 8.2 examined some of the economic models that have been developed to explain the behaviour of costs in distance-education systems. The particular issue of staffing was taken up in section 8.3 where production rates for staff concerned with the development and production of distance courses and media was discussed.

Section 8.4 then looked at the specific problem of 'two mode' institutions and the question of 'remission' of normal (conventional) teaching duties for staff involved in the development and production of distance courses (subsection b) and in their tutoring (subsection c).

Finally, section 8.5 provides a series of cost functions which might be used to establish the total costs of the two major operating subsystems in distance education - the courses subsystem and the student subsystem. Alternative cost functions are proposed depending on how the work is organised (and with the specific needs of 'two mode' institutions in mind). The cost functions proposed here can nevertheless be taken only as a guide towards a possible approach since they must be specific to the situation they are intended to model.

Nevertheless, it is hoped that the approach outlined in this handbook will prove of use to administrators concerned with the costing, budgeting, and accounting of distance education projects, and with the problem of justifying those costs to political 'paymasters'.

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APPENDIX 1

TYPICAL COST ELEMENTS IN DISTANCE-EDUCATION SYSTEMS

Typical cost elements in distance-education systems are listed below. The list is not exhaustive.

In this Appendix: D = Direct Cost, I = Indirect Cost, V = Variable Cost, and F = Fixed Cost. These are for guidance only.

Development and redevelopment of materials and courses

(a) Staff Time

- Academic (D)
- Secretarial (D)
- Editorial (D or I)
- Design (D or I)
- Administrative course or materials support (D or I)

(b) Contracted work

- Academic consultants (D)
- Contracted course authors (D)
- Editorial work (external) (D)
- Design work (external) (D)

(c) Media development

- Purchase of materials (D)
- Computer assisted instruction (D or I)
- Development of support systems (D or I)
- Computer program development (D or I)
- Home experiment kits (D or I)
- Ancillary materials (D or I)
- Tutorial or assessment policy (I)

(d) Academic assessors (D)

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(e) Developmental testing

Cost of materials (D)
Payment to testers (D)

(f) Discretionary and sundries budget (D)

Production

(a) Print fixed costs

Keyboarding, film assembly, pre-press, machine make-ready, cover preparation, cover proofing, cover make-ready (D)

Copyright clearances (D)

(b) Television and Video productions *

Producer days (D)

Production Assistant days (D)

Research Assistant days (D)

Travel and subsistence allowances and expenses (D)

Studio days (inc. floor managers, studio assistants, cameras) (I)

Film crew - staff (D)

Film crew - expenses (D)

Outside Broadcasting facilities (I)

Hiring premises, locations and facilities (D)

Hired technical equipment (D)

Film lighting equipment (D)

Film stock and processing (D)

Film shooting (I)

Film editing (I)

Film dubbing (I)

Film lighting (I)

* Based on A. Hancock (1977) *Planning for Educational Mass Media*, p. 250.

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- Video resources (recording) (I)
- Video tape (D)
- Video editing (I)
- Telecine transfer (I)
- Titling (I)
- Other services (I)
- Hospitality (D)
- Miscellaneous expenses (D)
- Participants' and Artists' Fees (D)
- Participants' and Artists' expenses (D)
- Walkons (D)
- Makeup (D)
- Costume (D)
- Costume staff (I)
- Scenery construction - materials (D)
- Scenery construction - staff (I)
- Scenery projection (I)
- Copyright - purchased film (D)
- Copyright - music (D)
- Purchased Film Library (D)
- Graphics and design - materials (D)
- Graphics and design - staff (I)
- Visual Effects materials (D)
- Model building (D)
- Transport (D)

(c) Radio and audio productions

- Studio costs (I)
- Outside broadcasting (I)
- Producer days (D)
- Production Assistant days (D)
- Research Assistant days (D)
- Travel and subsistence (D)
- Editing (I)
- Contributors' fees (D)
- Contributors' expenses (D)
- Copyright - music (D)

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Copyright - other materials (D)
Production expenses (D)
Master Tapes (D)

Presentation

(a) Print variable and stocking stocks

Machine working, binding, paper, cover working, cover artboard,
other materials (DV)

(b) Other materials

Audio cassettes, video cassettes, filmstrips, slides, records,
scientific equipment, consumables, textbooks, maps, bought-in
materials (DV if given to students, DF if provided in centres or
bought in as stock for loan to students)

(c) Storage (I)

(d) Distribution and transmission

Packing (D, V by student courses)
Postage (D, V by student courses)
Carriage (D, V by student courses)
Radio transmission (D, F per transmission)
Television transmission (D, F per transmission)
Broadcast repeat fees (D, F per broadcasts)

(e) Teaching costs

Tutor marked assignments and tests (D, V by student courses)
Computer marked assignments and tests (D, V by student courses)
Face to face tuition (D, V by groups)
Telephone tuition (D or I, V by students)
Tutor expenses (D)
Tutor training (D, V by tutors)
Examination centres - hire (D)

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Examinations - invigilation (D)

Examinations - script marking (D, V by student courses)

Laboratory hire (D)

Computer line charges (D)

APPENDIX 2 APPORTIONING OVERHEADS

There is no absolutely right way of apportioning overhead costs to cost centres, activities, programmes, or outputs. The best way is probably one that distributes indirect costs to each cost centre, activity or output in proportion to the services that cost centre, activity or output receives or consumes. Common methods used are based on appropriate student (student credit hours, FTE-students, student headcount) or other measures (FTE-faculty, square footage of assigned space, time comparisons, etc.). Some indirect costs may be allocated on the basis of the proportion of the attributed costs of the cost centre, activity, programme or output to the total attributed costs of all cost centres, activities, programmes or outputs (apportionment on the basis of expenditure). However, this method tends to obscure the uniqueness of each cost centre's (or activity's, programmes's or output's) needs and usage of overhead facilities and fails to identify an adequate measure of use or output against which the allocation is being made.

Appropriate measures for the allocation of overhead costs may differ between conventional and distance-mode programmes. For example, library costs may be allocated:

1. In conventional systems, on the basis of student numbers, however measured.
2. In distance-education systems where libraries predominantly serve the needs of academic course writers and researchers, on the basis of an appropriate count of staff.
3. In some distance systems where students are offered a postal library loan service, on a student or student course number basis.

In each case the approach must be to examine the nature of the costs involved and decide on the best means of apportionment. The following are suggestions:

1. General administrative costs (excluding the costs of student administration and of course management): apportioned to academic cost centres, activities, programmes and outputs on

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an expenditure basis.

2. Personnel administration: apportioned on the basis of staff headcounts. Under this basis the costs of personnel administration might be apportioned to academic units and to general support units. Where it is apportioned to general administrative units, then there is a need for a second stage apportionment of these general administrative costs. This second stage apportionment may best be done on an expenditure or some other appropriate basis. For example, suppose that the total cost of personnel administration is £x and that there are two academic units (cost centres) with 50 and 20 staff respectively, with 30 staff in the administrative unit. The first stage apportionment of personnel costs would be:

First apportionment:

	Academic Unit A, 50 staff, £0.5x
Personnel costs £x	Academic Unit B, 20 staff, £0.2x
	Admin Unit, 30 staff, £0.3x

Second apportionment:

	Academic Unit A, 5/7 x £0.3x
Admin Unit £0.3x	Academic Unit B, 2/7 x £0.3x

3. Course administration: apportioned on the basis of number of courses, credit hours, etc - either in development or in presentation, as appropriate.
4. Student administration: apportioned on the basis of an

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appropriate method of counting students.

5. Physical plant and maintenance: apportioned on the basis of occupancy or usage in the first instance, and then on the basis of the activities, programmes, or outputs served by the people occupying it or using it. Where it is not directly apportionable, then a second level apportionment will need to be done. This may be on an expenditure basis.
6. Computer centre: allocated on the basis of usage in the first instance, and then on the basis of the relationship of usage to outputs, activities or cost centres. Second level apportionment may need to be done.
7. Libraries: see comments above.
8. Student services: apportioned on the basis of a headcount or some other appropriate measure of students.

A two step apportionment process should result in the apportionment of *all* overhead costs to activities, cost centres, programmes or outputs. For a description of a similar process, see Walters (1981). The means of apportioning overhead costs should not be unduly complex.

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