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ABSTRACT

Cost analysis makes it possible to establish how much things costs, set budgets, determine prices, and compare the costs of different options. In distance education (DE), the main areas of cost analysis are as follows: print-based correspondence systems; educational/institutional television and radio systems; multimedia systems, and e-education systems that deliver computer-based multimedia materials and communications synchronously and asynchronously. The following are among the items that must be identified in a cost analysis of DE: activities to be costed; resources used; direct and overhead costs; joint product costs; annualized capital costs; and cost drivers. Analysts and those commissioning them need to consider the following things: (1) the study's scope; (2) the report's basic format; (3) how the data will be collected; (4) any assumptions made in handling the data or formulating conclusions; and (5) how the data will be presented and in what level of detail. Comparisons of two or more educational systems usually compare average costs per student, average costs per graduate, or cost per student learning hour. The following items must be taken into consideration when measuring the benefits of DE: quantitative access; equal access; quality of the educational experience; cost-efficiency; economies of scale and scope; and benefits to students. (Contains 13 references.) (MN)

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Analysing Costs/Benefits for Distance Education Programmes

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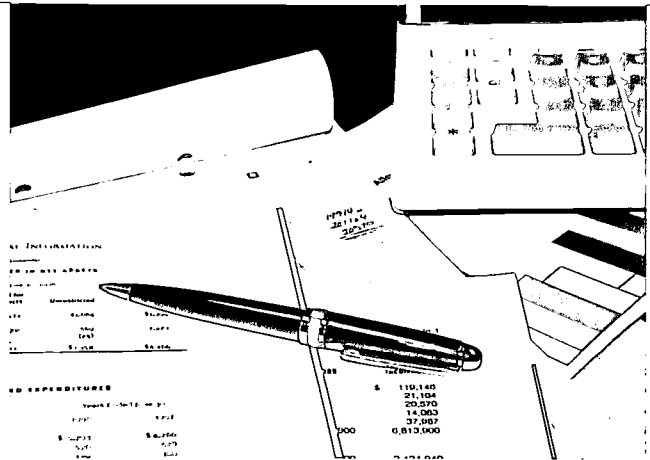
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Knowledge Series

Costing is important if policy makers and managers are to make the right decisions

Through cost analysis you can find out how much something actually costs, set a budget, determine a price and compare the costs of different options.



Distance education systems are generally thought to be more cost efficient than traditional face-to-face education. Costs can be spread over large numbers, lowering the cost per student. Yet the cost per student in the Mexican Telesecundaria, relative to traditional secondary schools in Mexico, rose between 1975 and 1981 even though student numbers had increased from 33,840 to 170,000. The institution was extending its operations into more communities and the average class size was decreasing, causing costs to rise. Costing is important if policy makers and managers are to make the right decisions.

Analysts need to understand how particular systems are structured and work before analysing costs.

INTRODUCTION

Through cost analysis you can find out how much something actually costs, set a budget, determine a price and compare the costs of different options. In distance education, the main areas are:

- Correspondence systems based around text (print-based)
- Educational/instructional television and radio systems, possibly supported by audio and video cassette programmes or involving radio, telephone and e-mail feedback loops
- Multi media systems (text, audio, video, and computer-based materials)
- E-education systems, delivering computer-based multi media materials and communications synchronously and asynchronously.

TYPES OF RESOURCES USED

- *Human resources:* staff salaries and wages, the *on-costs* of employing staff (e.g. employment taxes, insurance payments, staff benefits)
- *Premises and accommodation:*
 - a) Purchase of land, construction of new buildings and their infrastructure
 - b) Buying existing premises and adapting/renovating it
 - c) Renting accommodation
 - d) Running costs of buildings and grounds (e.g. utilities, repairs and maintenance)
- *Equipment and furniture:* note, small durable items such as staplers and hole-punches are consumables
- *Stocks, supplies, consumables and expenses:*
 - a) Stocks (inventory) are holdings of raw materials, components and goods, including work-in-progress and finished goods (paper, audiocassettes, texts)
 - b) Supplies are materials for which it is impossible, or not worth the trouble, determining a cost per unit of production (e.g. lubricants for machinery)
 - c) Consumables are materials used by the organisation but not incorporated into its products (e.g. office stationery)
 - d) Expenses are the cost of something other than stocks, supplies, and consumables (travel, postage, fees to non-payroll consultants).

COSTING

DISTANCE EDUCATION

Cost analysis has its basis in cost accounting, with rules and recommended practice. The analyst must identify:

- The activities to be costed
- The resources used, and how they behave
- Where necessary, overhead costs
- Where necessary, joint product costs
- Where appropriate, annualise capital costs
- The factors that drive costs (cost drivers).

Cost analysis places a money value on the resources used. It may be difficult however to relate the cost of activities to either the *budget* (a statement of expected expenditure over a period, normally a year), or the *accounts* (a statement of what has been spent over a period, normally a year). Generally it is better to use information from the accounts, since these reflect what has actually been spent. Bear in mind:

ACTIVITIES IN DISTANCE EDUCATION SYSTEMS

- Creating or acquiring, producing and delivering learning materials
- Providing administrative and pedagogic student support services
- Providing institutional management to support the above.

- The structure of budgets and accounts may have little to do with how activities are structured
- Budgets and accounts may reflect traditional organisational structures, rather than the products and services arising from expenditure
- Activities may run over the budget or accounting financial years

FIXED COSTS:	IN TOTAL	Unchanged	Unchanged
	PER UNIT	Decrease	Increase
VARIABLE COSTS:	IN TOTAL	Increase	Decrease
	PER UNIT	Unchanged	Unchanged

- It can be difficult to estimate how much time staff worked on a project
- Some data – for example, personal salary details – may not be available to analysts. They may need to use standard costs
- Accommodation costs may be unclear. Analysts may have to work out a standard accommodation cost per square metre/foot, and apply this to the floor area occupied by the work group. Alternatively, use commercial rental rates per square metre/foot of office accommodation
- Any assumptions must be clearly described.

DIRECT VERSUS OVERHEAD COSTS

Developing, producing and delivering a product or service involves *direct costs*, which result directly from offering the product or service. The cost of a course involves the salaries, expenses, and accommodation of staff involved in its development; the distribution of course materials involves the cost of packaging and postage/delivery.

However, many activities (management, finance, personnel, estate management) are not directly related to offering a product or service. These are true *overhead costs*, sometimes called *non-value-added activities*.

Some activities, such as basic student administrative processes (enrollment, advising, examinations), are effectively overhead costs because they have not been linked as a direct cost to a product or service.

JOINT PRODUCT COSTS

Products and services in a distance education system are usually solely for its own benefit. The main exceptions are:

- Instructional television and radio systems that broadcast (or record) traditional classroom lectures for distance education use
- On-campus flexible learning approaches that use materials developed for distance education to support independent study by on-campus students.

The intermediate products (lectures, materials) are a *joint product cost*, supporting both courses offered on-campus and at a distance. How much of the cost of the intermediate products should be allocated to each?

- Give one of the end products a "free-ride"
- Share the costs equally
- Apportion the costs, usually according to the number of students per programme.

RECURRENT VERSUS NON-RECURRENT COSTS

Recurrent costs occur yearly; non-recurrent costs are incurred for a fixed period only. Permanent, salaried staff is a recurrent cost; short-term consultants are a non-recurrent cost.

CAPITAL COSTS

Many expenditures are consumed as they are paid for (monthly salary bill, expenses), or are treated as if they will be consumed (consumables, supplies). These are *revenue costs*. Expenditures such as equipment, furniture and buildings have an ongoing value, collectively referred to as *capital expenditure*.

Because capital items last for several years, it arguably gives a fairer picture of the financial situation to spread costs over their lifetime:

- Permanent *buildings*: usually over 50 years (Temporary buildings are spread over their expected life)

- *Furniture*: usually over 10 years
- *Equipment*: vehicles are usually over eight to 10 years, computers over three to five years (five being the common, but in my view, excessively long, period), central servers over three to four years, network electronics over five to six years
- *Distance education courseware*: over the expected lifetime of a course
- *Systems development* (for example, the cost of developing a new suite of computerised student administrative support systems): over its expected lifetime.

A fair comparison between traditional and distance forms of education, or between different kinds of distance education, requires measuring the *opportunity cost* of capital. The assumption is that, had the money not been spent on capital items, it could have been lent at the prevailing interest rate to generate income.

Economists annualise the capital costs to find their "true" cost. There is a formula for doing this (see Rumble, 1997: 45-6). There are also annualisation tables for given capital lifetimes and interest rates.

COST DRIVERS, FIXED COSTS AND VARIABLE COSTS

Cost drivers are factors that influence the total level of costs – for example, the number of courses, the volume of materials used and services offered.

Unchanging costs are *fixed costs*; for example, an institution needs only one Chief Executive Officer. Costs that fluctuate directly with the level of activity that drives them are *variable costs*; for example, every extra applicant generates additional paperwork.

Semi-variable costs are fixed within a *relevant range*, but an increase in expenditure is triggered when activity levels pass a threshold. The triggering mechanism may be automatic, or subject to some latitude. For example, the institutional norm may be one tutor for every 20 students. An additional tutor may not be appointed if there are 21 students, but will be as student numbers move towards 40.

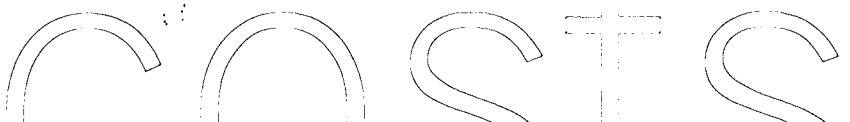
One of the tenets of activity costing is accurate identification of factors driving costs. Crude models emphasising just a few variables (e.g. registered students, courses in development and courses in presentation) are all right for "back-of-the-envelope" costing, but can seriously distort resource allocation and cost analysis. They do not allow managers to identify likely costs in sufficient detail, to manage budgets or analyse costs usefully.

The concepts of fixed and variable costs are central to budgeting and cost analysis, in particular to understanding the behaviour of average costs and to cost/volume/profit analysis. When teaching small numbers of students, face-to-face teaching almost invariably has a lower average cost per student. At high activity levels, distance education tends to have the lower average cost (see Figure 1). The Basic Cost Function and the Average Cost Function (see Rumble, 1997: 35), capture this relationship.

COST ANALYSIS

Analysts – and those who commission them – need to consider:

- The scope of the study, establishing its boundaries and what questions it is designed to answer
- The report's basic format, ensuring that the format and work plan will meet the commissioning agency's needs. These questions must be addressed:



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ANALYSING COSTS/BENEFITS FOR DISTANCE EDUCATION PROGRAMMES

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The Knowledge Series is a topical, start-up guide to distance education practice and delivery. New titles are published each year.

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(media) to analyse the development/production, delivery/reception and costs of courses by media, with different measures for each (print, video, etc.). The total cost for each media is then divided by the number of SLHs that the media gives rise to.

MEASURING COST-EFFECTIVENESS

Measurement against a standard: the ratio of the actual to the possible or ideal outcome. If the ideal is that 100% of students pass, and the effectiveness of the programme is 82%, then out of every 100 candidates, 82 have passed.

Measurement of relative effectiveness: compares the effectiveness of distance education against traditional education by comparing graduation rates within a period.

Measurement of learning gain looks at the improvement in students' performance over the period of their studies. This compares their qualifications on entry (or by a pre-test) with their final examination results. This can be difficult when students enter with a variety of qualifications, or because of the diverse units of measurement used to measure teaching and learning effectiveness. Comparisons between institutions are also more difficult if the standard of the end qualification (say, a degree) varies from one institution to another. Cowan (1985) suggests working with components of the process of education, rather than with the whole course.

Measuring overall effectiveness across a number of variables. Nielsen and Taito (1993: 121) report on the effectiveness of the Universitas Terbuka, Indonesia's teacher training programme in terms of student scores on exit tests, compared with comparable face-to-face programmes. They measured student performance in four areas, applying weighting to each score to derive an overall score (Table 1).

Attaching a cost to learning gain. In Wagner (1982: 43-4), University X spends UK£5,000 on teaching 25 students economics (Table 2).

The learning gain is 25% (the difference between an average entry test score of 30% and an average exit score of 55%). University Z spends £10,000 teaching 60 students economics, with a learning gain of 15%. University Z is the most expensive in total cost, but its average cost per student is less than University X (i.e. it is more *cost-efficient*). However, University X is more *cost-effective*. It has an average learning gain of 25% against University Z's 15%, and if we divide

the average cost per student by the average percentage point learning gain in each university, we find that University X spends £8.00 per learning point gain against £11.13 at University Z.

MEASURING THE BENEFITS OF DISTANCE EDUCATION

Quantitative access: Distance education can increase enrolment at all levels of formal education, in non-formal settings, and for training. Measure its contribution by establishing a proportion of total national places provided through distance means at an institution.

Equal access: Distance education can meet the needs of remote communities, those whose jobs prevent them from attending regular classes, or those who are tied to the home. Survey students and potential learners to find out how many cannot study by traditional means.

Quality of the educational experience: Distance education students may have access to teaching materials and lecturers not otherwise available, and student support services can provide high quality advice and support. The major drawback is the lack of opportunity for teacher-student or student-to-student dialogue, but electronic conferencing systems (email, computer conferencing and computer-based video conferencing) make e-education increasingly attractive. Distance education learning materials may seem limited without access to a library, but e-libraries can help with this.

Cost-efficiency: Distance education may have a lower cost per student/per graduate than traditional approaches (Rumble, 1997: 134-160), but as dropout rates tend to be higher in distance education, the average cost per graduate tends to be higher than the average cost per student. However, e-education approaches have different economies of scale from other forms of distance education (see Rumble, 2001).

Economies of scale and scope: Distance education provides economies of scale at the early stages of programme expansion, as fixed costs are spread across more and more students. Thereafter, economies tend to come from economies of scope.

Benefits to students: A little researched area. Are the lifetime earnings of distance students the same, more, or less than their counterparts from traditional institutions? Distance education students can earn as they study but may start their education later in life, when they have fewer years to earn at a higher level. The ability of distance education institutions to garner higher paid jobs for their graduates has been questioned. What studies exist, however, suggest that distance students do benefit financially.

TABLE 2: EFFICIENCY AND EFFECTIVENESS (EXAMPLE)

University	Total cost	Number of students	Average cost per student	Entry Test average score	Exit Test average score	Learning gain (% points)	Average cost per learning point gain
X	5,000	25	200	30	55	25	8.00
Z	10,000	60	167	45	60	15	11.13

TABLE 1: WEIGHTED AVERAGE EFFECTIVENESS RATIO (EXAMPLE)

	Subject matter	Skills (theory)	Skills (practice)	Attitudes	Overall score	
DISTANCE	Exit score (maths)	0.44	0.66	0.79	0.83	
	Weighting	3	1	2	1	7
	Total	1.32	0.66	1.58	0.83	4.19
	Weighted average	$4.19 \div 7 = 0.59$				
TRADITIONAL	Exit score (maths)	0.49	0.68	0.87	0.65	
	Weighting	3	1	2	1	7
	Total	1.47	0.68	1.34	0.65	1.14
	Weighted average	$4.14 \div 7 = 0.59$				

- Are you analysing part of a system (e.g. a course, assignment handling), a major subsystem (student services), or the whole institution?
- Are you looking only at costs to the institution, (costs carried on its budget), or are you taking account of the costs of other stakeholders (employers, students, the government) in a wider analysis?
- How about areas that are subsidised – say, access at no cost to a national transmission network, or highly subsidised access to study-centres in schools? Should you cost them as the need arises, or use commercial prices as a "shadow cost"? This might be fairer if you are comparing costs with an unsubsidised venture, or trying to work out how much it might cost to replicate a system elsewhere.
- Should you disregard certain costs for a more fair comparison? For example, one institution may have heavy financial commitments (such as major research projects) that the other does not.
- Are you comparing costs at a common price level (adjusted for inflation or deflation)?
- When comparing the costs of institutions in different jurisdictions, does converting local currencies to a common standard (such as the US dollar) make sense? Exchange rate fluctuations do not accurately reflect actual changes to the comparative cost, although it can sometimes be necessary to convert to a common international currency (e.g. when requesting international aid).
- Are you looking only at costs, or for possible savings from switching to distance education/changing the technology of distance education?

- Decide how the data and information will be collected, and whether it will meet the analyst's/agency's needs
- Identify any assumptions made in handling the data or coming to conclusions
- Decide how the data and information will be presented, and at what level of detail.

COMPARING SYSTEM COSTS

WHAT COMPARISONS ARE MADE

The commonest comparison is the costs of a distance education system with a traditional classroom-based system. Many of these macro-level studies assume a particular mix of media and technologies, without questioning whether a different mix might result in a lower costing system. Factors affecting the cost of face-to-face education include whether small tutorials, seminars, lectures, or independent and resource-based learning strategies are adopted.

Each technology used also has a different cost structure. Take audio. The cost of delivering a radio programme is totally independent of the number of students that listen to it, mainly involving a fixed cost and no institutionally carried variable costs (unless you have to open up with radios). With audiocassettes, there is an immense cost per student (or learning group) to cover the costs

of the cassette, its packaging and postage. There may also be a reception cost – the cost of audiocassette players, assuming you provide these. Analysing the break-even point (in number of users) will help establish the number of students at which audiocassette delivery becomes more expensive than radio transmission.

Most of these comparisons focus only on the relative *cost-efficiency* of systems, institutions or technologies. A system is more cost-efficient than another is if the unit cost of its output is lower than the unit cost of the system with which it is being compared.

Most cost-efficiency studies assume that the quality of the output is constant, and that it is just efficiency that varies. However, as there are usually differences in output quality, you should also measure effectiveness and relate this to cost.

MEASURING COST-EFFICIENCY

The cost-efficiency of two or more educational systems is usually measured by comparing:

- Average cost per student*, by dividing the total annual cost of the institution by the number of registered students in that year. This assumes that within an institution, the teaching-learning experience of all students is similar. However:
 - The cost of educating someone in a laboratory subject may be much higher than the cost of educating someone in the social sciences
 - Some students are full-time, others part-time. The cost per student may need to be adjusted to a standard, usually the cost per *full-time equivalent (FTE) student*, equated to a notional course load (credit points/course hours per year).
- Average cost per graduate*. Consider:
 - Variances in the cost of different subjects will affect the costs per graduate
 - The length of a course (in years) may vary. Medical training takes longer to complete than an arts degree. Also, there are jurisdictional differences – a Bachelor's degree takes three years in Wales, but four years in Scotland.

It is not enough to multiply the cost per student by the number of years that it takes to graduate; not all students graduate. The dropout cost needs to be considered, by taking account of the regulations governing student progress in particular cases (see Rumble, 1997: 125 for an example).

- Cost per Student Learning Hour (SLH)*. Hülsmann (2000) provides a useful framework for looking at the relative costs of media. To establish the number of SLHs studied by students, you take the number of SLHs course developers believe are required (this approach is usually related to credit hours). The drawback is that the resulting *cost per SLH (course) measure* is unrelated to the costs of materials developed to support the course. To deal with this, Hülsmann uses the *cost per SLH*



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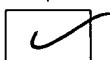
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