

**INTERNATIONAL RESEARCH FOUNDATION
FOR OPEN LEARNING**

*Literature review on cost-effectiveness
in ODL systems*

Working document

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INTRODUCTION

This is a working document. It consists of four parts. The first part (chapter 2) is called *definitions and theories* because it deals with the definitions of (and theories related to) the basic concepts implicated in the title. The second part (chapter 3) presents (some of) the *evidence* relating to cost-effectiveness of open and distance learning studies partly taken from case studies of developing countries but also referring to the cost-effectiveness assessment of the OUUK. Chapter 4 deals with more *recent developments* in relevant technologies (IT and communication technologies) and the consequent widespread adoption of distance education methods in diverse institutional settings. Special attention is given to the newly developing learning environments in Europe and the UK. The final chapter draws conclusions from what has been argued, to provide a rationale for the IRFOL research.

To each section relevant literature is attached. That this paper is first and foremost a working document means that it is intended to grow with the research process. Hence no pretence is made that the literature listed is in any way exhaustive.

DEFINITIONS AND THEORIES

In this chapter we define the concepts of open and distance learning as well as of cost, effectiveness and cost-effectiveness. Finally, theories, which create *prima facie* expectations, that open and distance learning could be cost-effective, are discussed.

Defining Open and Distance Learning

Open and Distance Learning (ODL), as we use it here, covers a wide spectrum of labels ranging from *correspondence education* to *distance learning*, *distance education*, *resource based learning*, *flexistudies*, *open learning* etc. However it is possible to identify two main trends, respectively related to the words ‘open’ an ‘distance’ *Distance Learning*, or more generally

Distance Education (DE), stresses the method (*how* one goes about to teach at a distance), whereas *Open Learning* (OL) emphasises the motivation (*why*, and to what purpose, this method is used, i.e. to *open up* the educational system.) Giving a sized down version of Keegan's (1990) generally accepted definition, we may characterise DE by the following features:

- the separation of teacher and student
- the influence of an educational institution
- the use of technical media
- the provision of two-way communication

The first element in this definition refers to the 'specific difference' *distance*, which positions DE somewhat in a fringe position, with the distant learner as its specific constituency. In another widely debated definition of distance education by O. Peters¹, any reference to *distance* is conspicuously absent: "*DE is the most industrialised form of teaching and learning.*" This signals the claim of DE to be understood as a potentially generalisable mode of educational provision and places DE, rather than at the fringe, in a front position of educational innovation.

The remaining three elements of the above definition² can be seen as being translated by Rumble³ into a *definition of open and distance learning as a system*. According to Rumble, an ODL system comprises (at least) three subsystems:

- the regulatory subsystem
- the materials subsystem
- the student support subsystem

¹ O. Peters in Keegan (ed.) 1993

²It becomes clear that the first of Keegan's defining elements, *the separation of teacher and student* lies on a different level of analysis than the other three features: the *distance* necessitates (causes) a new teaching mode, of which the three other elements are the descriptors. Quite often the *separation of teacher and student* therefore serves as a sort of minimalist definition of DE (Perraton 1983, Dodds in Koul et al 1991, Orivel in Tuijman 1996)

³ The argument is based on the distinction developed by Rumble (1992 and 1997). It is, however, here presented in a slightly modified version. We use Rumble's definition later as a device to classify costs.

Each of these subsystems relate naturally to one of Keegan's defining features of distance education, listed above: The *use of technical media* may be seen as associated with the *materials* subsystem, the *provision of two way communication* corresponds to the *student support* subsystem, the *influence of an educational institution* relates to the *regulatory* subsystem.

The other trend in the above listed spectrum of labels, rallied around the “good word open”⁴ (as opposed to the bad word distant), signals a political and humanist stance to open up education for those who are disadvantaged by the system in place, be it in providing a *second chance* or in reaching those who cannot afford full time on-campus studies.

Combining these two trends, ODL presents a challenge to the system of conventional education (CE) in both of the central issues of the Economics of Education: *efficiency* and *equity*.

Related Literature

- Keegan D (ed.) 1993 Theoretical Principles of Distance Education (2nd ed.) Routledge, London
- Paine, N. ed. 1988 Open Learning in Transition National Extension College, Cambridge
- Peter O 1967 Distance education and industrial production: a comparative outline in Keegan D (ed.) 1994
- Peters O 1973 Distance education: a historical, sociological and anthropological interpretation in Keegan D (ed.) 1994
- Peters O 1993 Distance education in a post-industrial society in Keegan D (ed.) 1993
- Dodds T 1985 The development of distance teaching an historical perspective in Jenkins and Koul 1991
- Wagner L 1982 The economics of educational media The Macmillan Press, London
- Young M 1988 Education for the New Work in Nigel Paine 1988 Open Learning in Transition NEC, Cambridge
- Young M (et al) 1980 Distance Teaching for the Third World: The Lion and the Clockwork Mouse International Extension College, Cambridge

⁴ M Young in Paine (1988 p 9)

DEFINING COST-EFFECTIVENESS

Peters' formula⁵ of distance education as *the most industrialised form of teaching and learning* was proposed in the early seventies against a background of changed perception of education as a whole, expressed also by the emergence of *Human Capital Theory* (HTC): When Schultz (1961) and Becker (1974) used their method of *growth accounting* to analyse post-war growth in Britain and Germany, they had to stipulate education as productive resource in order to explain the observed growth patterns. This allowed for the first time to view *education as investment* rather than as consumer good. As an investment, education did attract renewed interest from economists. A wide range of analytical techniques (production function, cost benefit-analysis, cost-effectiveness analysis etc.), which had been developed in the context of industry or in the public sector, was applied to education and led to the development of what is known today as *economics of education*. According to Levin⁶, cost-effectiveness analysis (CEA) was developed in the 1950 in the context of the US Department of Defence to inform choices between the development of different and increasingly costly weapons systems and later was extended to the analysis of alternative government programs.

In order to understand cost-effectiveness, we look at its components separately. First we will discuss the notion of costs.

Costs

One would expect costs to be a straightforward concept, everybody knows only too well from experience. However, if one tries to back up one's common understanding by a definition of cost from an economics dictionary, one is pointed to a plethora of subcategories of costs (capital costs, fixed costs, opportunity costs, sunk costs, etc.) without finding a definition of *cost proper*. The nearest we may get, is the entry under costs which says that economists nowadays interpret

⁵ Keegan (ed.) 1994

⁶ Levin in Carnoy (1996 p 382)

costs as *opportunity costs*: “The cost of any action is what is forgone, given up, as a result of taking that action.” (Livesey, 1993 p 46) The question is, from which range of categories we may draw to substitute into the ambiguous expression “what is forgone”. Lipsey (1979 p 54) speaks of “measuring the opportunity cost of obtaining a quantity of one commodity in terms of the quantity of other commodities that could have been obtained instead”, thereby limiting the admissible entries to the range of commodities. To do so, however, means “presenting a central economic concept almost as a ‘handmaiden to commodity fetishism’” (Thomas 1990 p 7).

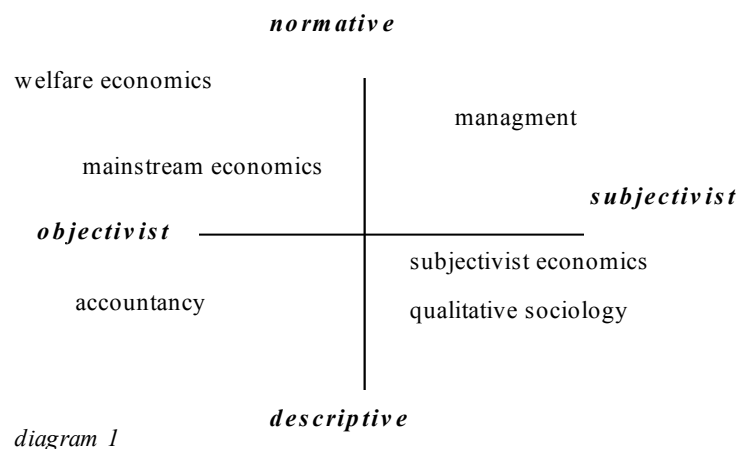
Thomas quotes Sen (1980 p 366) approvingly to remind us that economics does not concentrate on goods as the embodiment of advantage but on the “relationship between persons and goods ... income and wealth are not valued under utilitarianism as physical units, but in terms of their capacity to create human happiness or to satisfy human desires”. Thomas gives the *subjectivist economics of cost* considerable space since it underlines the claim of economics to be an *empirical science*: people’s behaviour and choices are not determined by the quantity of resources embodied in a commodity (like some old theories of value would have it) but by the *satisfaction* one anticipates to derive from it. Economists working in a subjectivist framework warn against what is referred to as “the *accountant’s methodology* where value is produced by visible and tangible things.” (Shackle, quoted in Thomas 1990 p10, my emphasis) This concern with satisfaction is reflected in *management theory*. Hope & Hope (1995 p 5, quoting J. Welch) illustrate the central importance of consumer satisfaction: “The three most important things you need to measure in business are consumer satisfaction, employee satisfaction and cash flow.”

The satisfaction of the consumer displaces all alternative choices and reflects the opportunity cost the customer is willing to bear. Costing procedures, however, as reflected in the accountancy’s spreadsheets normally do not measure satisfaction (neither the customer’s let alone the employee’s). This leaves managers, according to Hope & Hope, with important deficits in strategically relevant information.

However, while it has to be admitted that choices are subjective and not reducible to a simple accumulation strategy for commodities, to determine costs in terms of satisfaction (or *utilities*, as one tradition in economics would have it) generates measurement problems which mainstream economists fear would “wipe out traditional economic theory” altogether. (Blaug in

Thomas 1990 p 11) They prefer to interpret anticipated satisfaction in terms of *revealed preferences* expressed in market prices. Opportunity costs are then defined in terms of *tied up resources*. Psacharopoulos and Woodhall (1985 p 22) give a straightforward illustration how they want to have the notion of opportunity costs understood: “If resources are invested in education, for example, they are no longer available for investment in health, industry, or agriculture.” And: “These lost opportunities can be regarded as part of the cost of the investment, which is thus said to include *opportunity costs*.” As long as economists working in this framework are well aware that “commodities are only proxies for welfare ends”, Thomas is quite willing to go along with it. He concedes that the mainstream approach certainly “scores strongly with respect to shared meaning”. (Thomas 1990 p 22) There is, however, the danger that “the more we focus on commodities, and the valuations of the market, our concerns might become resources as ends in themselves where welfare is represented by the scale of an activity.” (Thomas 1990 p 22)

Relating this rather sketchy discussion of different concepts of cost in economics to the proposed IRFOL research, we can use the following diagram for pointing out some connections.



We may see economic approaches span along two axes: from *normative to descriptive* and *objectivist to subjectivist*. *Mainstream economics* is positioned largely on the objectivist side of the spectrum. This is also true for *welfare economics* which, incidentally, may be considered as

part of mainstream economics. Welfare economics has a distinct bias towards the normative side on the vertical axis.

Subjectivist economics is seen here as having a penchant to merge into *qualitative sociology*. Both can be located on the subjectivist side, on which I place also *management theory* though more towards the normative side. The placement of *accountancy* may be controversial. Though *accountancy methodology*, as indicated above, may be positioned on the objectivist side, its purely descriptive qualities may be debated. It could be said that any type of *format*, into which empirical data are to be entered, is implicitly normative.

The IRFOL research proposal entails two sets of questions: one is about costing (*what* the costs are and *how* they are costed) and one about developing guidelines for management to set up procedures to monitor cost-effectiveness in order to inform managerial decisions. The diagram suggests that these questions cut right across from the objectivist side, as far as costing is concerned, toward the more subjectivist and normative side insofar management guidelines are concerned.

Effectiveness

There are some widely quoted definitions of effectiveness. For instance: “An activity is effective when it achieves its goals.” (Denison, 1974) or, the definition given by Drucker “Efficiency is concerned with doing things right; effectiveness is doing the right things.” (Drucker, 1974 p 11)

Handy, as these definitions appear, they seem to merge two strands of thinking of rather different origin and, as closer inspection of the associated literature shows, the merger produces some confusion. Let us start with inspecting the concept of *efficiency*.

The notion of efficiency is originally related to the *input/output model of production*. A production process can be *efficient* by optimising the output/input ratio, i.e. it can be efficient in two ways:

(i) by *maximising outputs* from a given set of inputs (*technical efficiency*)

(ii) by *minimising costs of inputs* for a given set of outputs (*price- or economic efficiency*)⁷

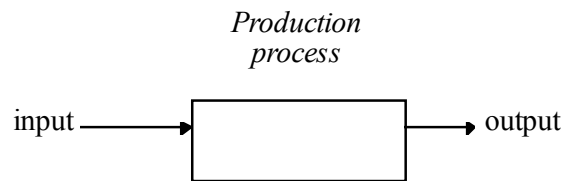
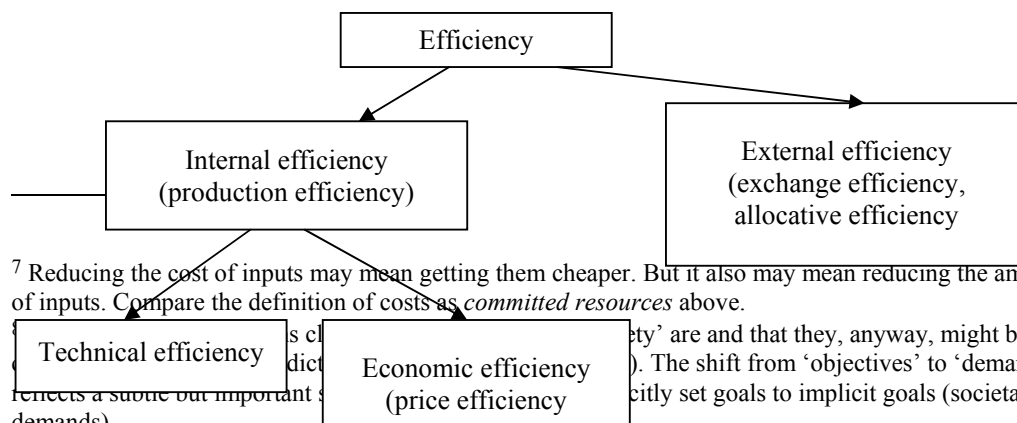


diagram 2

Production efficiency is also called *internal efficiency* since no reference is made to any externally set objective. It is, hence, possible that an internally efficiently organised production process does not meet externally imposed requirements, in which case it is said to be not *externally efficiency*. (That a production process may well be internally efficient without being externally efficient, may be exemplified by the case of an efficient production process generating commodities which fail at the market.) Not being externally efficient is the more possible since external requirements can be conflicting.

According to Mace the term *exchange efficiency* for example is used in relation to the demands of society and the term *allocative efficiency* if we refer to the objective function of an educational authority⁸ (Mace 1986, Block I pp 12-13).

The following diagram gives a synoptic view of the different efficiency concepts.



⁷ Reducing the cost of inputs may mean getting them cheaper. But it also may mean reducing the amount of inputs. Compare the definition of costs as *committed resources* above.

Technical efficiency reflects a subtle but important distinction between 'objectives' and 'demand' (societal demands). The shift from 'objectives' to 'demand' reflects a subtle but important distinction between 'objectives' and 'demand' (societal demands).

diagram 3

Drucker's definition of the efficiency/effectiveness distinction as *doing things right* vs. *doing the right things* seems to place effectiveness en par with external efficiency. This is, however, strongly at odds with the notion of effectiveness, as it is understood in education; *effective teaching* is at least as much concerned with *doing things right* as with *doing the right things*. Indeed, *doing things right*, i.e. teaching successfully is what is meant if one refers to effective teaching; much more so than the question if it is *the right things* which are taught (this being e.g. a question of the adequacy of the curriculum).

It is, however, not astonishing that the concept of efficiency, modelled at the production process, does not emphasise effectiveness. In a production process, which is a chain of interlocking activities of *doing the right things*, effectiveness is taken for granted. Neither the objective, nor the verification of its achievement, pose a serious problem.

In the educational context, the effectiveness concept is so prevalent because to determine what the outcome of an educational process should be and how its achievement could be measured, were no trivial problems. Indeed, the controversy continues and is likely to do so for any foreseeable time. However, on a less theoretical level, procedures have been institutionalised to determine the objectives of educational interventions and to measure their success. Objectives are identified in the diverse curricula and success is measured against a series of *performance indicators*, the most obvious of which are achievement tests.

However, educators are often at odds with the reductionist approach, implied in the use of performance indicators. They prefer a more *holistic* view on the impact of education on the

personality of the student and would allow for incubation times not compatible with the requirements of the throughput of the educational process.

To summarise: because effectiveness relates to goals, it appears at first sight that the efficiency/effectiveness relation replays the internal/external distinction, discussed above. Goal-relatedness, however, is not the privilege of external efficiency but in fact permeates any process of rational production. The low profile of effectiveness in the context of the production of (physical) goods is due to the fact that it is less problematic. Its salience in the educational context is due to the specific measurement problems it poses.

Hence the efficiency/effectiveness relation does not so much replay the distinction of external and internal efficiency but highlights the fact that *educational activities operate in a different measurement space*. This is further illustrated when finally analysing the notion of cost-effectiveness.

Cost-effectiveness

There is an obvious analogy between the notion of *production efficiency* defined above and the notion of *cost-effectiveness*. As in the case of production efficiency, there are two ways of being cost-effective:

(i) by *maximising the effects* of an educational strategy or intervention from a given set of inputs or, to quote Levin “..to chose that alternative which has the greatest impact on raising achievement scores for any given resource outlay.” (Levin 1996 p 382)

(ii) by minimising the costs, i.e. by choosing the educational strategy or intervention “which can achieve the particular objectives at lowest costs.” (Levin 1996 p 382)

The analogy is indeed striking: (i) obviously has its equivalent in *technical efficiency* and (ii) relates in similar ways to *economic- or price-efficiency*. However, as indicated above, cost-effectiveness issues pose different measurement problems than traditional production efficiency issues.

Levin⁹ describes the different *elements of cost-effectiveness analysis*: CEA consists in

1. assessing effectiveness

CEA is a method to inform a decision making process. Hence first of all the decision problem must be clarified. In our case, the rival educational programs must be identified. The effectiveness measures has to be identified and then applied to the rival programs.

2. estimating costs

Levin proposes the *ingredient approach* to costing. It consists of identifying all resources committed to the activity under question and putting a monetary value against each of them.

3. comparing cost-effectiveness ratios

Cost-effectiveness ratios are usually based upon the average effects and costs per students (the effectiveness of a specific method divided by its cost). This allows in principle to calculate the *cost per additional achievement gains*. The general decision rule is to select the alternative with the lowest cost per achievement gain¹⁰.

Levin gives an example:

consider four programs: 1. computer assisted instruction (10 min computer drill per day), 2. longer school day (one hr), 3. smaller class size (reduction from 35 to 30), 4. peer tutoring (sixth grades tutoring second grades for 15 min/day)

Cost turned out to rank the programmes in the following order: least costly: reduction in class size and increased length of school day. The most costly was peer tutoring (since it involved adult co-ordinators) being 4 times as high as the reduction of class size and 2 times as high as the CAI alternative.

⁹ The following resumé is based on Levin in Carnoy (1996 pp 382-386)

In terms of effectiveness, peer tutoring showed the greatest effect and the reduction in class size the smallest. CAI was in the middle range.

In terms of cost-effectiveness, it turned out that peer tutoring was the most cost-effective. It required only one-ninth of the resources to obtain the same effect on mathematics achievement as increasing the school day.

After having defined open and distance learning as well as cost-effectiveness (with reference to education in general), we look at specific issues of effectiveness and costs, related to open and distance learning. It will turn out that there are theoretical considerations which provide *prima facie* arguments for the cost-effectiveness of open and distance learning.

Related Literature:

Becker GS 1974 Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education National Bureau of Economic Research, New York

Knight BJ and RH Sabot 1990 Education, Productivity, and Inequality The East African Natural Experiment World Bank Publication: Oxford University Press, Oxford

Levin HM 1983 Cost effectiveness; a Primer Sage, London

Mace J 1986 The Economics and Financing of Education Block I and Block II, Alama Iqbal OU

Mace J 1992 Economics of Education I University of London External Programme, London

Mace J 1996 Economics of Education II University of London External Programme, London

Psacharopoulos G and M Woodhall 1985 Education for Development: An Analysis of Investment Choices World Bank Publication: Oxford University Press, Oxford

Schultz TW 1961 Education and Economic Growth in Social Forces Influencing American Education, ed. by N.B. Henry, National Society for the Study of Education, University of Chicago Press, Chicago

¹⁰ the assumption that the outcome/cost ratio is a linear function is, however, to be checked. There is no guarantee that for each increase in outlay the same achievement gains are generated.

COST-EFFECTIVENESS OF ODL (THEORETICAL EXPECTATIONS)

ODL systems, as we will see, have a different cost structure than conventional education systems. This allows to expect certain *economies of scale* with respect to ODL systems. However, before investigating this argument in some detail, we have to ask if at all serious teaching can be done at a distance.

Media-equivalency

Educational effectiveness is about achieving educational objectives. Above we have characterised distance education by *the quasi-permanent separation of learner and teaching institution*. This separation has to be bridged by *media*. As media we understand here any educational technology (ET) which allows teaching at a distance, e.g. print, radio, TV etc. Because of this pivotal role of media in distance education, research on the effectiveness of media for teaching, affects distance education at its core. Distance educators generally defend the hypothesis, borne out by their practical experience, as well as their interest as profession, that “motivated students learn from any medium if it is competently used and adapted to their needs.” (Schramm 1977 p 79) This hypothesis in its strong version is often referred to as *media equivalency hypothesis*. Wells (1976 p 270) for instance claims: there are no significant differences (on cognitive measures of student learning) among variety of technological and instructional methods.” The implication of this hypothesis is twofold: first, it claims that distance education can be as effective as conventional education. Second, it implies that the drive for more costly technologies and more professional production techniques is not based on research evidence. (On the contrary, there is a case for always adopting the least costly technology available.) Clark (1983 p 457) even states that “the best current evidence is that media are mere vehicles that deliver instruction but do not influence student achievement more than a truck that delivers our groceries causes changes in our nutrition.” Though Clark’s meta-analysis of media studies suggests „that media do not influence learning under any condition”,

other authors take a more cautious view. Carter reflects on the fact that neurological responses to different media vary considerably and presses for research into the influence of different media on learning (Carter, 1996 p 35 and p 38).

It seems that most distance educators hold a weaker version of the media equivalency hypothesis: they accepted Schramm's proposition that motivated students learn from any media that is competently used, without taking this to imply that everything is learned by everybody through any medium with equal effectiveness (less even with equal cost-effectiveness). Bates (1995) argues that technologies/media should be combined to make an *optimally effective mix*. Kozma (1991) gives detailed discussion on the relative strengths of different media when he compares for instance the stability of texts with the capability of TV to deal with transient events or, with respect to computers, the ability to 'proceduralize' information. His example for the latter is the MBL (micro-computer based lab) which allows the student to manipulate physical events which the computer then in real time transforms into graphs.

Laurillard (1993) argues in a similar vein: she emphasises that media selection should be task related instead of starting by first opting for a medium, independently of a task.

A more sceptical synopsis of the experience with educational technologies/media gives Klees in Carnoy (1995). Even main-stream educators assess the cost-effectiveness of TV critically. Radio seem provide quite often effective solution. The criticism against PC based technologies is severe: "The fact oriented and programmed reasoning nature of computer uses in education exacerbates the neglect of the ambiguity, morality, creativity, critical understanding, and human interrelationship necessary to improving individual, social, and economic life." (Klees in Carnoy 1996 p 404)

There seems, however, little doubt that effective teaching through media is possible. The skepticism is more invoked by what we might consider as opportunity costs of technologically mediated teaching, i.e. the perception what is displaced when choosing educational technology for teaching. There are reasons to believe that the *educational experience* might be quite different.

Economies of scale

The success of industrialisation is largely due to a *substitution of labour by capital* in form of technology. The use of technology in ODL is central since it is technology, which mediates the distance of learner and teaching institution. This substitution of labour by capital is reflected in the *total cost function*¹¹:

$$TC(s) = F + V*s$$

(TC total costs; F fixed costs; V variable costs and s number of students)

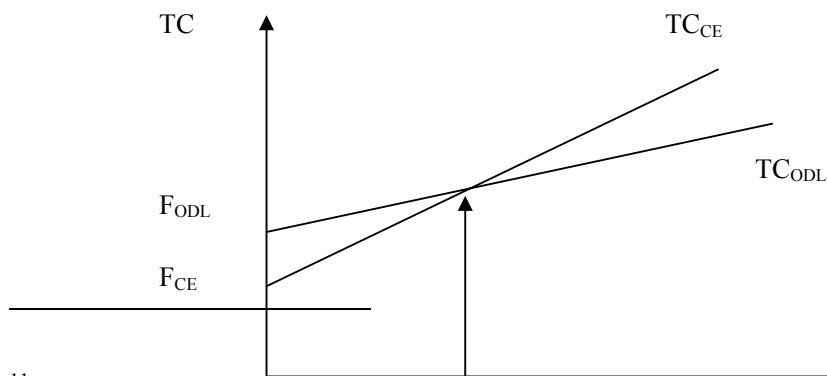
Fixed costs are those costs which are (to a large extent) independent of the level of activity of the system (e.g. broadcasting costs are independent of the number of listeners). *Variable costs* vary with the level of activity (e.g. contiguous teaching).

If ODL has succeeded in substituting labour by capital as compared with CE, this is reflected in different cost functions:

$$TC_{ODL}(s) = F_{ODL} + V_{ODL}*s$$

$$TC_{CE}(s) = F_{CE} + V_{CE}*s$$

The two graphs (in diagram 4) indicate that the cost function of ODL is more “accommodating” toward large numbers: indeed, beyond a certain *break even point* the total cost in ODL mode falls below the total cost in conventional mode, i.e. $TC_{ODL}(s) < TC_{CE}(s)$.



¹¹ It seems a bit weird to argue that the substitution of labour by capital is expressed by a function, which does not explicitly refer to *capital costs*. break-even point may quote Jamison (1982, p 276): “Thus,

Diagram 4

The analysis of the *average cost function* makes this point even clearer.

$$AC(s) = TC(s)/s = F/s + V$$

Then for increasing s , $F/s \rightarrow 0$ and therefore $AC(s) \rightarrow V$.

This argument applies for ODL as well as for CE. But since the variable cost for ODL are lower, the average or unit cost for ODL will fall below the unit cost of CE.

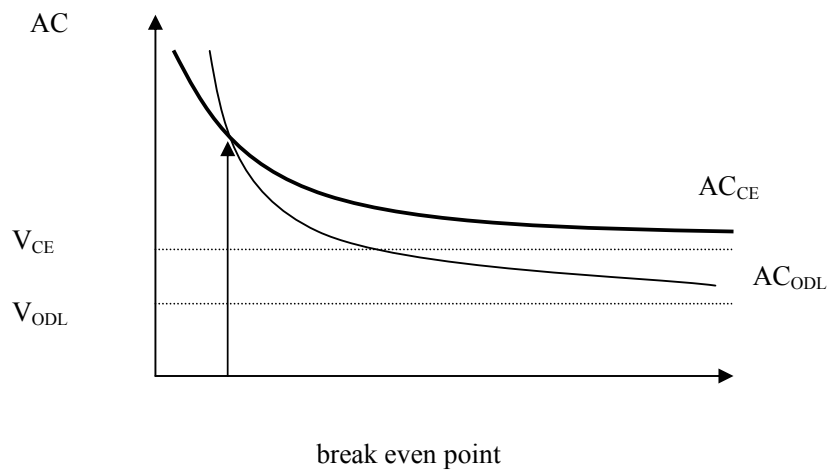


Diagram 5

This is meant by the usual reference to *economies of scale*: if the fixed costs can be spread over a large student population, their impact on total costs becomes increasingly negligible.

the concepts of fixed costs and capital costs are distinct, though it is often true that major capital expenditures are associated with substantial fixed costs.”

A further important cost function relates to the notion of the *marginal cost*. Intuitively speaking it means the cost to incorporate just one more student into the system:

$$MC(s) = TC(s+1) - TC(s) = F+V*(s+1) - (F+V*s) = F + V*s + V - F - V*S = V^{12}$$

Hence, for an ODL system the marginal costs are lower than for a conventional system.

The argument put forward in this section is central for the claim of ODL to be (potentially) more efficient than the conventional mode. It is quite often repeated in the literature on cost-effectiveness of ODL. We conclude with three quotes:

“The case for lower costs from the use of technology is essentially based on a decline in the cost of technology relative to output on the one hand, and the fixed, and relatively static, productivity of conventional education on the other. It is, in essence, in the substitution of technology for teachers that the cost of distance education lies.” (Curran, 1990 p 28)

“...whereas the costs of conventional teaching are to an extent proportional to the number of students, distance education implies a significant proportion of fixed costs caused by a generally large administrative overhead, the production of sophisticated didactic material, and their dissemination through broadcasting or other media. It is clear that such costs are to an extent independent from the number of users.” (Orivel, 1996 p 843)

“The clear and almost linear relationship between staff and student numbers which was the primary determinant of cost no longer applied. In cost terms the Open University system of producing courses is to higher education what Henry Ford was to motor car production. It offers a mass production alternative to the traditional craft approach.” (Wagner, 1982 p ix)

¹² Marginal costs are often, more generally, defined in terms of derivatives of the total cost function: $MC(x) = dTC(x)/dx$ which actually yield the same result as above. Intuitively speaking: the marginal costs are reflected by the gradient of the total cost function.

To summarise: if it is possible to teach effectively through any medium (technology), provided its competent use, and the cost structure of ODL allows for *economies of scale*, then, in fact, there is a strong theoretically based argument to expect that open and distance learning is more cost-effective than conventional education systems. The empirical evidence will be examined in the next section.

Related Literature:

- Ansari MM 1992 Economics of Distance Higher Education Concept Publishing Company, New Delhi
- Curran C 1990 Factors affecting the Costs of Distance Education in Bates 1990
- Curran C 1996 The Potential Cost Effectiveness of Tertiary Open and Distance
- Jamison DT 1982 An Introduction to the Method of Cost Analysis in Perraton 1982 School Equivalency in Perraton (ed.) 1982
- Klees SJ and SJ Wells 1977 Cost Effectiveness and Cost Benefit Analysis for Educational Planning and Evaluation : Methodology and Application to Instructional Technology US AID, Washington DC
- Levin HM 1983 Cost effectiveness: a Primer Sage, London
- Mace J 1986 The Economics and Financing of Education Block I and Block II, Alama Iqbal OU
- Mace J 1992 Economics of Education I University of London External Programme, London
- Mace J 1996 Economics of Education II University of London External Programme, London
- Orivel F 1987 Costs and Effectiveness of Distance Teaching Systems IREDU, Dijon
- Orivel F 1996 Evaluation of Distance Education: Cost-Effectiveness in Tuijnman A (ed.) 1996 International Encyclopedia of Adult Education Pergamon Press, Oxford
- Perraton H 1982 The Cost of Distance Education International Extension College, Cambridge
- Rumble, G. 1991 Topic 3: Budgeting and Economic Analysis in Distance Education in Deakin University 1991 Management of Distance Education Deakin University, Geelong
- Wagner L 1982 The economics of educational media The Macmillan Press, London

THE EVIDENCE

The substitution of labour by capital in the context of education means largely the substitution of teachers by technology, an option strongly associated with ODL. We have seen that there is a

theoretical basis to expect that ODL could bring down *unit costs and*, hence, increase the productivity (internal efficiency) of the education sector. However, the total cost function is a very abstract model¹³, which may well fall short to capture the more complex reality of what happens on the ground. We need *empirical evidence* if the claim for greater efficiency is to be substantiated.

Methodology of costing ODL systems

The methodology for assessing the costs of ODL project were developed in a number of papers by Jamison and Klees (1973), Klees and Wells (1977), Orivel (1980,1987) and Eicher (1980). Further contributions were made most predominantly by Rumble (1986) and Perraton (1982). Though there are certain differences in detail and emphasis (some of them are to be discussed), Orivel's paper may be taken to illustrate the overall approach. It gives an comprehensive account of the methodology which had been developed by then and which had been applied in the 20 case studies the World Bank had commissioned in order to evaluate the cost-effectiveness of ODL.

Orivel¹⁴ illustrates his costing procedure on a typical *realisation of an ODL system*.¹⁵ We can distinguish:

costs related to the *regulatory subsystem*: the central administration costs

costs related to the *materials subsystem*

- TV/broadcasting (production; diffusion; reception)

- print (production; duplication and distribution)

costs related to the *student support subsystem*

¹³ Further more complex costing models, based on Curran (1995 pp 27-31), are presented in Appendix 1.

¹⁴ Compare Orivel (1996 p 846); my presentation of Orivel's methodology makes use of Rumble's definition of ODL as a system.

- face-to-face component
- correspondence

It may suffice to present here Orivel's analysis of TV/broadcasting costs only, since it allows the discussion of the central conceptual problems.

The first level of cost analysis always relates to the central *technology used in the materials subsystem*. Orivel calls the respective classification therefore *technical classification*. In case of the TV/broadcasting media, the technical classification subdivides costs in *production, diffusion and reception costs*. (In case of print the technical classification leads to *production; duplication and distribution*.)

The next level of analysis is referred to as *classification according to the nature of inputs*, which is intended to separate the *recurrent costs* from the *capital costs*. Obviously, the two classifications lead to six subcategories (*technical classification times classification according to the nature of inputs*). The costs associated with each of these categories are supposed to be recorded in six specially prepared spreadsheets (see Appendix 2).

The definition of recurrent and capital costs introduce the *dimension of time* into the costing procedure, since *recurrent costs* are defined as resources consumed during the current financial period and *capital costs* have, by definition, a lifetime longer than one financial period.

There is a debate about how to treat capital costs. It seems inadequate to attribute the whole cost, say for a building, to the period when the cost was actually incurred (the expenditure made) and then regard it as *sunk costs*¹⁶ and consequently treat it in the forthcoming financial period as *free resource*. Therefore, the usual method had been, to spread the capital cost evenly over its the lifetime of the respective resource (be it equipment or premises, etc.). This type of annualisation or amortisation has been criticised by economists because it falls short of

¹⁵ We use the expression of *realisation of an ODL system* in the sense of *a configuration of technologies (=expert/equipment combinations) with at least one component from each subsystem*.

capturing the *opportunity costs of capital investment*. To see this point one has only to realise that it matters *at what time* during the project costs are incurred. Jamison, Klees and Wells (1978 pp 32-33) illustrate this point by discussing a fictitious example where a government has two spending options:

to buy a telecommunication system or

to rent the same type of system

Let the lifetime of the system be 10 years and let us suppose, for simplicity's sake that the rent equals to 1/10th of the buying price. According to the above method of amortisation, the cost incurred in each year are the same. However, in the first option the total cost are incurred at the very beginning of the project whereas in the second option the rent is paid in tranches which would allow to invest the part of the capital not yet due, to be invested and interest would be earned. Therefore, money is lost in terms of *forgone interest*. However, this could, in fact, be accounted for if a different method of capital cost ¹⁷ annualisation is used which takes into account not only the lifetime (say n) of the resource but also the (or various¹⁸) rates of interest (say r). The formula to be used is:

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

The debate about the proper treatment of capital costs is related, as already indicated, to the notion of *opportunity costs*. "The (opportunity) cost of an action is what is forgone... as a result of taking that action." (Livesey 1993 p 46)

The argument is not totally settled. It has however drawn attention to the question of the purpose and framework of costing. Rumble's reaction is rather dismissive: "From point of view of internal institutional management, the discounting of capital costs is largely irrelevant....The

¹⁶ Rumble (1997 p 20) defines sunk costs as costs "which are not regarded as relevant to current decision making".

time and effort required to discount capital expenditure including expenditure on course material does not seem to have any pay back in terms of improved resource management, and in view of this my own preference is to ignore discounting.” (Rumble 1986 p 30) However, he admits that in some circumstances it makes a difference and agrees to the way, Perraton (1982, p 59) summarises the situation: “...the argument about discount rates is not purely academic. If we want to compare types of education that are capital intensive with those which are labour intensive, it is important to agree about the proper treatment of capital. The larger the proportion of capital costs in the total budget, the more important is the decision about the discount rate adopted.”

Turning back to Orivel’s method: Having dealt with the question of annualisation of capital costs, a closer look on the spreadsheets associated with the six cost categories (compare Appendix 2) reveals that they relate smoothly to the categories which form the constituent elements of the total cost function: *fixed costs and variable costs*. It turns out that both spreadsheets relating to production costs refer to fixed costs, both spreadsheets relating to reception costs refer to variable costs¹⁹. In both spreadsheets, related to diffusion costs, there are two sections, one referring to fixed, one to variable costs.

In the ideal case the system is already in "steady state", i.e. a cross-section of costs in a given financial period can be treated as representative for any other²⁰. In this case we can, taking into account the number of students, compose our total cost function drawing together the figures, recorded in the respective spreadsheets.

For the sake of comparison with the conventional system, inputs have to be standardised to accommodate e.g. the fact that ODL students are often part time students. This is done by

¹⁸Since it is often not easy to decide about the proper interest rate many authors (among them Orivel) propose to annualise capital costs provisorically at three different rates: 0%, 7,5% and 15%.)

¹⁹ This is so because *production costs* are nearly all fixed. *Reception costs* to a large extent variable. Furthermore since *recurrent costs* are basically salaries and consumables and *capital costs* are basically premises and equipment there is a *tendency for capital costs to be fixed costs*.

²⁰In case steady state is not yet reached, Orivel proposes to observe the system at least three years to gauge the trends.

computing the workload of a full time students and attach an adequate weight to the part time student. The s in the total cost function therefor refers to *full time equivalent* (FTE) students.

This may suffice to outline the general thrust of the methodology. Some of the evidence gathered, using this method, will be presented in the next section.

Related Literature:

Ansari MM 1992 Economics of Distance Higher Education Concept Publishing Company, New Delhi

Coombs PH and J Hallak 1987 Cost Analysis in Education IBRD/World Bank Washington DC

Curran C 1988 Computer based Cost Projections in Distance Education programme, Paper Presented at ICDE Conference, Oslo

Eicher J-C 1980 Some thoughts on the economic analysis of new educational media in: UNESCO 1980 The economics of educational media Vol. 2 Cost and effectiveness, UNESCO Paris

Jamison (et al) 1987 Educational Media: Guidelines for Planning and Evaluation Sage Publications, London

Jamison DT 1972 Notes on Cost effectiveness Evaluation of Schooling in Developing Countries Stanford University, Mimeo

Jamison DT 1982 An Introduction to the Method of Cost Analysis in Perraton 1982 School Equivalency in Perraton (ed.) 1982

Jamison DT and SJ Klees 1973 The Cost of Instructional Radio and Television for Developing Countries Institute for Communications Research, Stanford

Jamison DT 1977 Cost Factors in Planning Educational Technology System

Klees SJ and SJ Wells 1977 Cost Effectiveness and Cost Benefit Analysis for Educational Planning and Evaluation : Methodology and Application to Instructional Technology US AID, Washington DC

Klees SJ The Economics of Educational Technology in Carnoy 1996

Klees SJ and SJ Wells Economic analysis and education: critical issues in application to instructional technology evaluation UNESCO, 1980 The economics of educational media Vol. 2 Cost and effectiveness UNESCO Paris

Orivel F 1980 Cost analysis in educational technology: practical problems in: UNESCO, 1980 The economics of educational media Vol. 2 Cost and effectiveness, UNESCO Paris

Orivel F 1987 Costs and Effectiveness of Distance Teaching Systems IREDU, Dijon

- Orivel F 1996 Evaluation of Distance Education: Cost-Effectiveness in Tuijnman A (ed.) International Encyclopedia of Adult Education Pergamon Press, Oxford
- Perraton H 1982 The Cost of Distance Education IEC, Cambridge
- Rumble G 1979 Planning for Distance Education in Halkemulder JR (ed.) 1979
- Rumble G 1986 Costing Distance Education Commonwealth Secretariat, London
- Rumble G 1991 Topic 3: Budgeting and Economic Analysis in Distance Education in Deakin University 1991 Management of Distance Education Deakin University, Geelong
- Rumble G 1992 The Management of Distance Learning Systems, UNESCO/IIEP, Paris
- Rumble G 1997 The Costs and Economics of Open and Distance Learning, Kogan Page, London
- Rumble G Topic 4: Financial Management in Distance Education in Deakin University 1991 Management of Distance Education Deakin University, Geelong
- Rumble G, M Neil and A Tout 1981 Budgetary and Resource Forecasting in Kaye A and G Rumble (eds.) 1981
- UNESCO 1980 The economics of educational media Vol. 2 Cost and effectiveness UNESCO Paris
- Wagner L 1974 The Costs of Large Scale Computer-Assisted Instruction. A Study of Plato (Mimeo)
- Wagner L 1980 Cost analysis and Educational Media Decisions, Polytechnic of Central London, Research Working Paper Number Nine
- Wagner L 1982 The economics of educational media The Macmillan Press, London
- Wells SJ 1976 Evaluation Criteria and the Effectiveness of Instructional Technology in Higher Education

School Equivalency

So far we have argued that there are *theoretical* reasons to expect ODL to be more cost-effective and we have presented a costing methodology for substantiating this claim on an *empirical* level. Unfortunately, a lot of cost-effectiveness studies have been produced which follow a range of different methodologies and are therefore difficult to compare. However, the methodology presented above fortunately was used in an evaluation of twenty distance education projects commissioned by the World Bank. This produced an almost unique set of

comparable evidence. Most of these case studies are presented in UNESCO (1980) or/and in Perraton (1982). The case studies, included in the Perraton volume, deal with *school equivalency*.

Orivel's cost-effectiveness methodology can be seen as an analysis of economic or price-efficiency in an educational context (i.e. choose among effective strategies the one which is least costly). This type of analysis is especially appropriate when costing *school equivalency programmes*: to assess effectiveness, the examination results or test scores can be used whereas costs are assessed according to the methodology presented above ²¹.

In a summarising chapter, Jamison and Orivel (Perraton 19882, Chapter 9) present a synoptic table of the results of the 14 school equivalency case studies. The evaluation summary includes: the *total cost function*, the *unit cost* per student and then evaluates the respective project in terms of *effectiveness* (achievement scores), *equity* (access) and *efficiency* (where costs per student and costs per graduate are distinguished). As could be expected from such a variety of studies, the picture remains somewhat inconclusive. However, general observations can be made:

There is almost uniformly a positive effect on *access*²².

There is more often an *efficiency gain in cost per student*; if not, it is suggested that it might be due to the fact that enrolment could not be kept above the break-even point. (Cases in point are the *Kenyan Teacher Training* project where enrolment was too low and the *Bahia Madureza* project where the fixed costs were too high.)

There is often a considerable gap between *cost per students* and *costs per graduates*; this indicates one of the major problems of ODL systems: the high *drop out rate*. (This is the case in the South Korean Air Correspondence High School (ACHS). The drop out rate is often due to

²¹ In fact, Orivel's "cost and effectiveness methodology" (1987) is largely restricted to *costing* issues.

²² However, the relation of access and equity is more complicated than it seems. Access might increase the overall social inequality by increasing social differentiation; mass access also has often a depreciating effect on educational kudos (diploma disease) and equity may prove ephemeral.

the fact that students cannot find sufficient funds to continue to pay for the school. Even so, the cost per graduate at ACHS is well below the cost per graduate in the regular system.)

The picture of *effectiveness* is often unsatisfactory, however, this may partly be attributed to the positive effect on *equity* which means that more disadvantaged groups are accommodated. It is suggested that the use of *value-added* measures would improve the picture. (The authors suggest this to be the case in the South Korean ACHS and the Radio Escuela project in the Dominican Republic.)

- The use of ODL as *add-on* is more often not cost-effective since it always increases costs and generally does not sufficiently repay in terms of effectiveness-gains. (This is a fairly obvious point made by Orivel (1997 p 847) and Hawkrige (1987).)

A similar synoptic table, in this case for tertiary education, is presented by Perraton (1993, 1994). The picture appears to be more consistently positive, especially for *teacher education*²³. It confirms the *relevance of scale* (Perraton 1993) which is related to quality: quality material means high fixed costs, which must be spread over the number of students. Below a certain level of enrolment, quality may not be assured.

The table further underlines the problem of high drop-out rates on ODL systems. The interdependencies between drop-out rates, quality of material, student support, and the costs borne by students need to be better understood. To decrease student fees or increase student support may reduce drop-out rates and pay back in terms of *cost-effectiveness* (improved cost per graduate). Increase of technical sophistication²⁴ on the other side may result in higher fixed costs, leading to higher fees, which cannot be borne by the students and may eventually result in

²³ That distance education seems more successful in the higher echelons of education may be seen as to reveal a disquieting bias of DE to privilege the educational 'haves' over the 'have-nots'. The more educated you are, the easier you may profit from DE. This differentiating aspect of distance education may offset some of the equity effects due to wider access.

²⁴ Quality means different things to different people as Curran (1990) points out. Quality for the TV- or radio- specialist may mean unnecessarily sophisticated (glossy) programmes, which do not reap returns in educational achievement.

more dropouts. Perraton sees the need to study the drop-out problem more deeply since without it “the cost-effectiveness story is only half told.”

Especially in the tertiary sector opportunity costs of student time has to be taken into consideration. There is evidence that ODL is an attractive option for employers who cannot afford to send staff on longer courses²⁵. However, one has to be cautious to attribute generally higher *social* opportunity costs (in terms of forgone productivity) on students in the conventional system since students in ODL systems tend to be older and therefore the potential benefits to society from these students tend to be smaller than those from the younger students in conventional systems²⁶.

So far we have summarised what Klees (1996) calls the *dominant view on distance education*. There are, however, others like Carnoy and Levin (1975) who offer a more *critical* perspective. Their basic criticism could be summarised in three points:

Education should be seen as having *multiple effects*. To narrow down the effects of education to test scores, does not do justice to the complex experience, education may provide. To model the new paradigm of ODL by optimising selectively the cognitive variable only, will result in something, the public rightly considers as second rate education.

Especially since research suggests that cognitive achievements²⁷ are no good predictors of labour market success, distance education students seem to be cheated: often incurring higher private costs²⁸, they receive not only lower consumption benefits from their years of studying, they also have to be content with the prospects of lower incomes since their *credentials* are often not perceived as equivalent to those conferred upon students in more traditional systems.

Finally one may reflect upon the political and economic context of the respective developing countries as a whole. Since OPL provision is generally centralised, it tends to neglect local

²⁵ This is also confirmed by Temple (1995)

²⁶ This, however, could change if ODL became the mainstream option. Compare Mace (1978).

²⁷ Gintis (1971) as quoted in Carnoy and Levin (1995).

²⁸ “to add insult to injustice” as Klees (1996, p 402 in: Carnoy (ed.) 1996) put it.

needs and to socialise students into an urban middle class curriculum, which is often irrelevant to rural people. The access, it provides, leads to little more but urban unemployment and may be seen as a design by the ruling elites *to keep up a downwards pressure on wages of the more educated elements of the working class*. Distance education is here seen, not so much as increasing access but as a containment device to ‘cool out’²⁹ the aspirations and absorb the energies of those struggling through this system. High drop-out rates contribute to individualise failure and keep the system stable.

However, we have to distinguish the component of the criticism by the *critical view*, which is directed against ODL and against CEA as evaluation method. The critical framework often questions the implicit assumptions made in CEA (and, *a fortiori* CBA³⁰)

The criticism as presented by Klees and Wells (1983) is basically directed against the neo-classical tenets implicit in both techniques. They pretend to offer a neutral technical approach to social decision-making by determining ‘social efficiency’ (seen as an overarching and neutral criterion of societal well being), presumably taking into account the costs and benefits to society as a whole. However, key element in this assumption is that *resource costs as expressed in prices present a fair guide to how society values these resources*. This assumption is according to the critical view fundamentally flawed since prices, rather than reflecting social valuation, are results of historical struggles between social groups of unequal power. The critical view claims that entrenched in these seemingly neutral techniques (CEA and CBA) and its surface concern with social *productivity*, there is a backstage agenda of social *reproduction* based on the ‘one

²⁹ Klees (1996, p 402 in: Carnoy (ed.) 1996). The authors (1975 p 387) quote *Wilson’s two laws*: First law: All policy interventions in social problems produce the intended effect- if the research is carried out by those implementing the policy or their friends. Second law: No policy intervention in social problems produce the intended effect- if the research is carried out by independent third parties, especially those sceptical of the policy.” This is not because “anyone deliberately fudges the results”, but because they “apply very different standards of evidence and methods.”

³⁰ Cost-benefit analysis; CEA is sometimes called a half-priced CBA, since in CEA only inputs are required to be expressed in monetary terms whereas this is required for inputs as well as for outcomes in CBA.

dollar one vote' ideology³¹. Hence they demand that "aggregate monetary cost-analysis should be replaced by explicit judgements as to the value attached to who benefits from the resource expenditures." (Klees and Wells, 197 p 340)³²

Much of what the *critical view* expresses, deals with wider issues. It is certainly valid if those issues (relation to educational programmes to the economic and political environment etc.) are consistently ignored and a *focussed technique* like CEA is treated like a decision-generating algorithm. The *critical view*, hence, may serve as a remainder

that, as Levin puts it, *cost-effectiveness studies should be treated as "sources of information rather than sources of decision"* (Levin 1983, p 132).

Related Literature:

Ansari MM 1992 Economics of Distance Higher Education Concept Publishing Company, New Delhi

Coombs PH and J Hallak 1987 Cost Analysis in Education IBRD/World Bank Washington DC

Curran C 1988 Computer based Cost Projections in Distance Education programme Paper Presented at ICDE Conference, Oslo

Eicher J-C Some thoughts on the economic analysis of new educational media in UNESCO 1980

HEFCE 1993 Definition of Cost Centres

³¹„If we afford CBA its role in the decision making procedure, then, we must add a second value, namely that the distribution of income used to weight the preferences of individuals is in some sense the best one. In short, the existing distribution is good. (Indeed we have to go a little further and say it is the best.) DW Pearce (1983)

³² Klees and Wells seem to be especially disillusioned by the installation of cost-effectiveness as arbiter in social decision making on the background of the Salvadorian situation where the US sponsored a massive restructuring of secondary school teaching around the introduction of educational television (ETV). The *substitution of labour by capital* strategy of the project tallied nicely with the capital-intensive strategy of general economic development. Growth rates (of annually 10% then) were considerable but did not translate into minimal increases in industrial employment (1.1%). They render Carnoy & Levin's suspicion plausible that the increased number of secondary students serve to keep up the downward pressure on the wages of skilled labour. Moreover, the profits made from the sale of instructional technologies are not realised by *society as a whole* but by identifiable companies. All these considerations do not enter the cost-effectiveness equation. If it is correct that CEA and CBA depend on perfect markets and operate on value judgement as expressed in the Pearce quotation above then they may be seen as ill suited for developing countries.

- Jamison (et al) 1987 Educational Media: Guidelines for Planning and Evaluation Sage Publications, London
- Jamison DT 1972 Notes on Cost effectiveness Evaluation of Schooling in Developing Countries Stanford University, Mimeo
- Jamison DT 1977 Cost Factors in Planning Educational Technology System
- Jamison DT 1982 An Introduction to the Method of Cost Analysis in Perraton 1982
- Jamison DT and SJ Klees 1973 The Cost of Instructional Radio and Television for Developing Countries Institute for Communications Research, Stanford
- Klees SJ and SJ Wells 1977 Cost Effectiveness and Cost Benefit Analysis for Educational Planning and Evaluation: Methodology and Application to Instructional Technology US AID, Washington DC
- Klees SJ and SJ Wells Economic analysis and education: critical issues in application to instructional technology evaluation in UNESCO, 1980
- Klees SJ The Economics of Educational Technology in Carnoy 1996
- Orivel F 1980 Cost analysis in educational technology: practical problems in UNESCO, 1980
The economics of educational media Vol. 2 Cost and effectiveness UNESCO Paris
- Orivel F 1987 Costs and Effectiveness of Distance Teaching Systems IREDU, Dijon
- Orivel F 1987 Costs and Effectiveness of Distance Teaching Systems IREDU, Dijon
- Orivel F 1996 Evaluation of Distance Education: Cost-Effectiveness in Tuijnman A (ed.)
International Encyclopedia of Adult Education Pergamon Press, Oxford
- Perraton H 1982 The Cost of Distance Education IEC, Cambridge
- Rumble G 1979 Planning for Distance Education in Halkemunlder JR (ed.) 1979
- Rumble G 1986 Costing Distance Education Commonwealth Secretariat, London
- Rumble G 1991 Topic 3: Budgeting and Economic Analysis in Distance Education in Deakin University 1991 Management of Distance Education Deakin University, Geelong
- Rumble G 1992 The Management of Distance Learning Systems UNESCO/IIEP, Paris
- Rumble G Topic 4: Financial Management in Distance Education in Deakin University 1991
Management of Distance Education Deakin University, Geelong
- Rumble G, M Neil and A Tout 1981 Budgetary and Resource Forecasting in Kaye A. and G Rumble (eds.) 1981
- Rumble, G 1997 The Costs and Economics of Open and Distance Learning Kogan Page, London

- UNESCO 1980 The economics of educational media Vol. 2 Cost and effectiveness UNESCO Paris
- Wagner L 1974 The Costs of Large Scale Computer-Assisted Instruction. A Study of Plato (Mimeo)
- Wagner L 1980 Cost analysis and Educational Media Decisions, Polytechnic of Central London, Research Working Paper Number Nine
- Wagner L 1982 The economics of educational media The Macmillan Press, London
- Wells SJ 1976 Evaluation Criteria and the Effectiveness of Instructional Technology in Higher Education Higher Education 5 pp 253-75

The OUUK

The OU was founded in 1967 and became something like the flagship of open and distance learning. Being so much in the limelight, its economics have been thoroughly examined. We base our discussion of the claims of the OU's cost-effectiveness on the two papers of L Wagner (1972 and 1977) and the paper of Ludlow and Layard (1974). In a further section some critical comments by J Mace (1978) are discussed.

Wagner (1972) considers a university as a multi-product firm with three outputs: (i) teaching, (ii) research and (iii) maintenance of cultural standards. He restricts himself in his analysis of the OU explicitly to the first point, making however adjustments for the different proportion given at the OU to research. At the same time, in order to compare the OU with conventional universities, the input had to be standardised since the OU teaches only undergraduates whereas conventional universities also teach postgraduate students. Having made those necessary adjustments, Wagner describes the OU teaching system. He then proceeds to formulate the *total cost function* $TC = F + Vs$ we know from the second chapter. To do this, he has to determine all the fixed F and variable costs V . He identified the fixed costs as being about £7 mio and the variable cost as £61. We then can derive from the total cost function the *average cost per student* (for any given number of students) $AC = TC/s$. With a student number of 36500 he arrived at an average (recurrent) cost of £251. With this result for average recurrent cost the OU

produced undergraduates *at about a quarter of the cost of conventional universities*. Wagner further derives comparative data like for capital cost/student, average cost/graduate and resource cost/undergraduate. In all of them the OU compared well.

In his 1977 paper Wagner was largely able to confirm these results which had been partly based on *ex ante* estimates and could now be controlled using the real data. However, unit cost had not been fallen as much as predicted. This was explained by the great number of new courses, whose development had generated high costs, offsetting the expected *economics of scale*. Options were discussed to reduce unit costs further. It is interesting to observe that though it was responsible for a great proportion of the costs, the reduction of broadcasting was not seriously considered. That the use of these media gave the OU a distinctive profile, setting her aside from conventional correspondence school, certainly played a role. Instead, a comparison of course costs in science and technology with the arts and social sciences was made and a shift towards the cheaper arts subjects was presented as an option.

The paper of Laidlaw and Layard (1974) sets out to demonstrate that the variable cost per student-course was lower at the OU than elsewhere. The difference of development cost for courses and course- maintenance cost was analysed. The results of the paper are basically in line with the claim that the OU courses present good quality at lower costs than it is the case in the other universities.

It is interesting that the critical comments made by Mace (1978), did not so much discuss, neither the claims the OU makes to produce graduates at lower unit costs, nor the cognitive effects achieved by students graduating at the OU. Instead, the educational experience of part time distance learning as a whole is discussed and neglected costs are indicated.

Costs to the students: First, OU students are to a large extent part time students. Studies infringe on leisure time normally spent with friends and family. In comparison to this uncomfortable situation, the *consumption benefits* which can be derived from studying at conventional universities seem to be higher (socialising, match making...). Second, it seemed doubtful to the author that the OU could convey the same prestigious credentials as conventional universities.

Hence, to add insult to injustice, less prestigious credentials are the returns for the higher individual sacrifices.

Costs to society: whereas it is to be admitted that part time students seem to be more beneficial to society since there is less loss of productivity (equivalent to the foregone earnings) involved, it has to be kept in mind, that OU students are on the average older. Investing in older members of society can be seen as less desirable from a cost-benefit point of view since the aggregate lifetime productivity still to be expected from younger members of society is higher.

Mace further examines the OU claim to score high in equity, i.e. to be more 'open' than conventional universities. He points out that the more educated generally adapt easier to the more abstract environment of distance education teaching modes than the less educated. This trend is to be expected to grow stronger, the more advanced teaching technologies become.

These critical comments may highlight contexts and cost implications not immediately thought of by the more focused approach of institutional cost-effectiveness analysis. However, the good acceptance, OU graduates receive on the labour markets and the acceptance by students as shown by the OU enrolment figures, indicate that they may be exaggerated. The core contention that the OU teaching methods can produce cognitive effects, which compare well with other universities and this at lower cost, remains essentially upheld.

The selected evidence for cost-effectiveness of ODL systems, ranging from school-equivalency programmes in developing countries to tertiary education in developed countries like the UK, may suffice to fully endorse the cautious conclusion Perraton draws: "... it is possible to claim that there are circumstances in which distance teaching looks attractive from an economic point of view." (Perraton 1982, p 61)

In the next chapter we will deal with the impact of new technologies. They appear to have unfolded their proper dynamics, which show little willingness to be regulated by cost-effectiveness considerations.

Related Literature:

Laidlaw B and R Layard 1974 Traditional versus Open University Teaching Method: A Cost Comparison Higher Education, Vol. 3 pp 439-468

Mace J 1978 Mythology in the Making: Is the Open University really cost-effective? Higher Education 7(275-308)

Perry W L 1978 The Open University Open University Press, Stony Stradford

Wagner L 1972 The Economics of the Open University Higher Education, Vol 1 pp159-183

Wagner L 1977 The Economics of the Open University Revisited Higher Education, Vol. 6 pp358-381

Wagner L 1980 Cost analysis and Educational Media Decisions Polytechnic of Central London, Research Working Paper Number Nine

Wagner L 1982 The economics of educational media The Macmillan Press, London

NEW DEVELOPMENTS

Much of the evidence, referred to above, dates from the seventies and the eighties. Since then, enormous advances have been made in *information and telecommunication technologies*. These developments, in turn, sparked considerable interest in conventional education in the on-campus use of what was referred to as *flexible or resource based learning*. Conventional universities even ventured off-campus in order to target specialised markets. A sketch of the *newly developing learning environments* in Europe and the UK is added.

The impact of IT: diversification of technologies

The founding of the OUUK in 1967, which became the international flagship of ODL³³ marked what we might call, following Nipper (1989), the *second generation of distance education*. The central use, the OUUK made, in co-operation with the BBC, of the broadcasting media gave it a profile, genuinely different from *first generation distance education* based primarily on print and correspondence.

The *third generation of distance education* is characterised by the impact of telecommunication and information technology, largely based on the integrated use of computers.

Telecommunication has also a considerable innovative impact on second generation broadcasting technologies by extending its reach and range using satellites and fibre optic technology which allows households access to up to hundred different programmes³⁴.

But what marks the distinctive character of third generation technologies is the *interactivity* they allow. *Teleconferencing* facilitates almost real-time interaction across the globe and allows to a large extent to ‘mimic’ the interactivity of traditional classroom teaching. But also distinctively new features of communication are developing e.g. the asynchronous communication in *computer mediated communication (CMC)* where each learner and teacher, and learners among each other, can communicate via electronic mail in a way, not any more structured by the logic of turn-taking (chronological) which characterises usual conversation.

Furthermore, learning programs can take over much of the remedial training allowing to further reserving tutor/student contact for *quality time*. *Expert systems*, developed in the context of AI research, improved remedial *computer assisted learning (CAL)* into *intelligent computer assisted learning (ICAL)* which allows more sophisticated tutoring.

The increased interactivity has a fundamental impact on ODL. We did characterise, following Rumble (1992, 1997) ODL systems as consisting out of two major subsystems: the materials

³³ or following Wagner (1982 p ix) “is to higher education what Henry Ford was for motorcar production.”

subsystem and the student support subsystem. This distinction is reflected in the division of labour in the operation of ODL systems: the bulk of the learning material is produced and distributed in the materials subsystem which is serviced by the student support subsystem, taking care of the teaching/learning feedback. Increased interactivity allows to ‘mimicking’ traditional teaching in a way, potentially eroding this distinctive feature.

Related Literature:

- Bates AW Options for Delivery Media in Perraton (ed.) 1982
- Bates AW The Challenge of Technology for European Distance Education in Bates AW 1990
- Bates AW (ed.) The Role of Technology in Distance Education, Croom Helm, London
- Bates AW 1995 Technology, Open Learning and Distance Education Routledge, London
- Bates AW 1990 Media and Technology in European Distance Education, Proceedings of the EADTU workshop on Media, Methods and Technology EADT/OU, Milton Keynes
- Curran C Factors affecting the costs of media in distance education in Bates AW 1990
- Curran C and R Saunders 1992 The Use of Computer based Systems in Resource Management of a Developing National Distance Education programme Education and Computing, Elsevier
- Curran C 1992 Institutional Models of Distance Education: A National Co-operative Programme Higher Education Management, Vol. 4, No 1 OECD
- DELTA 1993 The Review Board Report on Information and Telecommunication Technologies applied to Education and Training pp 9-10 Brussels
- Garrison DR and D Shale 1990 Education at a Distance: From Issues to Practice Robert Krieger Publishing Company, Malabar Florida
- Garrison DR Communications technology in Garrison DR and D Shale 1990
- Mason R and A Kaye (eds.) 1989 Mindweave; Communication, Computers and Distance Education Pergamon Press, Oxford
- Nipper S Third Generation Distance Learning and Computer Conferencing in Kaye and Mason 1989
- Rumble G On-line Costs: Interactivity at a Price in Mason, Kaye (eds.) 1989

³⁴ It goes without saying that this information overload may be regarded as a somewhat mixed blessing.

Institutional diversification

Telecommunication and information technologies did not impact on education, exclusively via ODL systems. The availability of these technologies, however, increased the use of distance education in on-campus settings. This is not completely new. Dual mode institutions (generally universities teaching on campus as well as off-campus) have been in operation since long. However, the availability of more technological configurations induced a proliferation of institutional settings in which ODL activities are used: besides the dedicated and dual mode, we have the mixed mode where different modes of presentation are integrated in the delivery of one and the same course.

We have consortia where different institutions pool resources (like OLF in the UK) to produce distance education material available for all participating institutions. We have ‘networks’ like the NTU (National Technology University) which link teaching institutions (like engineering facilities) to industrial clients (Rumble 1983).

The motivation to take up distance education even in traditional setting are quite divers: There are quality considerations: materials, produced along distance education lines, are often preferred by students and sometimes even create, where not freely available, a ‘black market’ (Taylor/White, 1991).

Second, the pressure for efficiency gains is increasing: more students have to be accommodated given budgets, which in real terms are at best stagnant. The economies of scale must be sought even in the conventional system.

Third, the need for flexibility to cater for students who though officially full time students need increasingly to complement their income through part time work.

Fourth, ODL methods are used to access profitable off-campus markets of professionals who need retraining or upgrading. For institutions with declining budgets this may open up rather profitable avenues.

Furthermore, experience shows (see Bates 1990, p 18) that it is easier to attract additional funding for probing new technologies rather than for conventional teaching. And this is complemented often by a genuine curiosity of educators into the potential of new technologies.

The combination of institutional diversification and technological diversification is marked by a shift in terminology: instead seeing distance education as having a distinctive institutional profile, course based differences are emphasised and terms like resource-based learning or flexible learning are preferred. Rumble (1992, 1994) already indicated that ODL systems might find themselves increasingly vulnerable by dual and mixed mode competition. The competition is certainly increased by experimenting with all sorts of institutional/technological synergies.

Related Literature:

Birch DW and RE Cuthbert 1981 Costing Open Learning in Further Education Council for Educational Technology, London

Bushra El 1973 Correspondence Teaching at University IEC Broadsheet on Distance Learning (3), IEC, Cambridge

Rumble G 1986 Activity Costing in Mixed-Mode Institutions; A Report based on a Study of Deakin University Deakin Open Education Monograph No. 2

Rumble G 1992 The Comparative Vulnerability of Distance Teaching Universities, Open Learning 7-(2) pp 31-45

Rumble G 1994 Mixed Modes of Teaching and Learning: Structures, Resources and Developments in Thorpe, M. and D. Grugeon 1994

Rumble G 1994 The Comparative Vulnerability of Distance Teaching Universities: a Reply Open Learning 9-(3) pp 47-49

Taylor JC and VJ White 1991 The Evaluation of Cost effectiveness of multimedia mixed mode teaching and Learning Australian Government Publication Service, Canberra

White V 1992 Responses to Greville Rumble's article "the Competitive Vulnerability of Distance Teaching" Open Learning Vo. 7, No3 p 61

New learning environments: EC

The recent report of J Jenkins (1994) gives a comprehensive picture of a remarkable number of major European initiatives. The commitment to promote closer relations in Europe was one of the main objectives, set already in the Treaty of Rome 1957. The possible role of distance education in this context has been explicitly recognised (Treaty of European Union, Article 126) and was reinforced in the Memorandum 12 November 1991 §18 and §42-48. The Task Force for Human Resources, Education, Training and Youth set up already in 1989 had launched a number of initiatives to bring about increased co-operation. A LINGUA programme was set up to promote multi-lingualism in Europe and draws heavily on self-instructional method of distance learning. ERASMUS and TEMPUS should increase European student mobility. The EADTU (European Association of Distance Teaching Universities) is involved in ERASMUS. TEMPUS which operates primarily in Central and Eastern Europe supports a number of joint teaching and training programmes using distance education methods. FORCE, EUROTECNET and CEDEFOP are aimed to support in one way or another vocational training. Also here ODL methods are extensively used. EUROFORM and HORIZON are aimed at retraining to alleviate youth unemployment. NOW supports especially women.

The DELTA (Developing European Learning through Technological Advance) tries to create the European infrastructure for new technologically mediated forms of leaning. This is partly done by setting up pilot project but also by networking and integration of different technologies. The range of project initiatives, listed here, is not exhaustive:

SMILE tries to use distance education for small and medium sized enterprises. MTS, Multimedia Tele-School uses distance education for European personnel development. ECOLE, as the acronym indicates, aims at a European Collaborative Learning Environment. COSYS tries to use computer technology for computer based course production and delivery. This would provide on-line access for authors to relevant databases, would allow printing on demand (solving costly logistical problems) etc. JITOL aims at continuing professional upgrading.

JANUS uses new satellite technologies for the promotion of academic learning. CO-LEARN improves teacher learner feedback through video-conferencing and CMC. EAST develops further computer application and educational software. ILDIC does the same for multimedia application and finally TRIBUNE is the central processing unit of DELTA.

COMETT (COMmunity programme for Education and Training in Technology) is another umbrella programme under which a number of projects is promoted. Most of the COMETT projects are designed to train the personnel for the new learning environment. Two COMETT projects, PALIO and COSTEL are designed to train the trainers for distance education programmes. Others are designed to improve skills training in telecommunication like IN#TEL#EC. BIT is a consortium, which develops biotechnology-training packages. A set of European Masters programmes has been developed like EMOT the European Management of Technology.

Needless to say that these activities overlap. They demonstrate, however, that distance education and open learning methods show their impact on different levels. There is little emphasis on evaluation, partly *because these projects are part of the construction of new learning environments* on which their effectiveness ultimately depend in much the same way motor car efficiency depended on the availability of the infrastructure of streets.

New learning environments: UK

Also in the UK the initiatives promoting educational technology³⁵ and building up new networks in the tertiary education sector will strongly impact on the future educational landscape. A number of universities ventured into the development of new *courseware* still more often for on-campus use but at the same time building a base allowing course presentation to be switched more easily from mere flexibility-increasing on-campus options to proper distance teaching. These newly developed courseware ranges from arts subjects like philosophy (e.g. *MacLogic* at St Andrews) or history (*DISH*, Design and Implementation of Software in History, at Glasgow university) to neuro-anatomic surgery simulations like the *NeuroSys* also at Glasgow.

Besides courseware development, capacity and infrastructure developments are well under way. Several universities engage in enhancing computer literacy and IT skills with programmes integrating IT closely into the teaching of academic subject matter (a point in case is Durham university's Computer Literacy Programme). Increasingly, communication networks link universities. *JANET* provides e-mail facilities between and universities inside a university. *LIVE-Net* (London Interactive Video Education Network) links schools belonging to London University through fibre optic cables which allow the transfer of data and video between schools.

But conventional universities also venture in distance education proper. Aberdeen University extends its reach to students in the Northern and Western Isles where lectures can be received on the electronic whiteboard (EWB). In the use of IT networks to increase access to information, Aston provides an example of a local area network providing library and information services.

³⁵ The following information is largely taken from CSUP (1992)

There is often little co-ordination between all these initiatives, but they begin already to shape the educational landscape. They develop increasingly (electronic) links to partners outside the UK, mostly with Europe. These co-operations are often facilitated by the EATDU. A point in case is the WIRE project in which a number of UK universities co-operate with European universities to engage in joint teaching ventures. Provided that these developments increase in density, they could develop a critical mass, which could profoundly change the educational landscape in the UK and in Europe as a whole.

Related Literature:

Commission of the European Communities 1991 Open Distance Learning in the European Community Open Universiteit, Heerlen

CSUP 1992 Teaching and Learning in an Expanding Higher Education System Polton House Press, Edinburgh

DELTA 1995 Telematics for Flexible and Distance Learning Commission of the European Communities, UK

EDEN 1996 EDEN Conference, Fururoscope, Poitiers

Evans T and Nation D 1996 Opening Education Routledge, London

OECD 1995 Learning beyond Schooling OECD, Paris

Robinson A 1996 Policy Implications for Distance Education in the European Information Society in Evans T and Nation D 1996

CONCLUSIONS FOR IRFOL

1. The IRFOL research is two pronged: It is about *costing* and about *management*. Whereas costing procedures should follow a mainstream approach in order to map costing data onto a common format, the development of management guidelines might well adopt a notion of cost, which extends to subjective perspectives of the different stakeholders in the respective institutions. This is in line with the dictum of Levin that CEA should be seen as informing decision making but not as a decision-generating algorithm.

2. The rapid development of new information and communication technologies multiplied the options of course presentation and delivery in diverse institutional settings. Even in dedicated distance teaching contexts, choices have to be made between different technology combinations. If these choices are to be based on cost-effectiveness data, *cost-effectiveness has to be monitored on course level* (rather than on institutional level). While procedures to monitor effectiveness are well established, similar procedures to monitor costs on course level are less prevalent. However, they are the preconditions for the cost-effectiveness monitoring of courses.

3. The IRFOL research focuses on cost-effectiveness on course level. At the same time we have seen that the whole landscape of learning seems to be shifting. Recent technologies foster the growing of a diversity of learning networks into new learning environments. This development will impact on costs as well as on effectiveness. The research initiatives like the one of IRFOL can be considered as part of this change and should be reflected in this context.

LITERATURE

- AAOU 1993 Economics of Distance Education Asian Association of Open Universities VIIth Annual Conference 1993, Open Learning Institute, Hongkong
- Ansari MM 1992 Economics of Distance Higher Education Concept Publishing Company, New Delhi
- Bates AW 1982 Options for Delivery Media in Perraton (ed.) 1982
- Bates AW 1990 Media and Technology in European Distance Education, Proceedings of the EADTU workshop on Media, Methods and Technology EADT/OU, Milton Keynes
- Bates AW 1994 Costing Distance Education Technologies Developing a Methodology The Open Learning Agency Burnby
- Bates AW 1995 Technology, Open Learning and Distance Education Routledge, London
- Bates AW The Challenge of Technology for European Distance Education in Bates AW 1990
- Becker GS 1974 Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education National Bureau of Economic Research, New York
- Birch DW and RE Cuthbert 1981 Costing Open Learning in Further Education Council for Educational Technology, London
- Bushra El 1973 Correspondence Teaching at University IEC Broadsheet on Distance Learning (3), IEC, Cambridge
- Carnoy M (ed.) 1995 International Encyclopedia of Economics of Education Pergamon, Oxford
- Carnoy M and HM Levin 1975 Evaluation of Educational Media: some issues Instructional Science 4: 3/4 pp385-406
- Clark RE Reconsidering Research on Learning from Media in Review of Educational Research, Winter 1983 Vol. 53 No 4 pp 445-449
- Commission of the European Communities 1991 Open Distance Learning in the European Community Open Universiteit, Heerlen
- Commission of the European Communities 1995 Telematics for Flexible and Distance Learning Commission of the European Communities, UK
- Coombs PH and J Hallak 1987 Cost Analysis in Education IBRD/World Bank Washington DC

- Crabb G (ed.) 1990 Costing Open and Flexible Learning. A Practical Guide NCET, London
- CSUP 1992 Teaching and Learning in an Expanding Higher Education System Polton House Press, Edinburgh
- Curran C 1988 Computer based Cost Projections in Distance Education programme Paper Presented at ICDE Conference, Oslo
- Curran C 1990 factors affecting the Costs of Disatance Education in Bates 1990
- Curran C 1996 The Potential Cost Effectiveness of Tertiary Open and Distance Learning European Commission, Luxembourg
- Curran C and R Saunders 1992 The Use of Computer based Systems in Resource Management of a Developing National Distance Education programme Education and Computing, Elsevier
- Curran C 1992 Institutional Models of Distance Education: A National Co-operative Programme Higher Education Management, Vol. 4, No 1 OECD
- CVCP 1988 The Costing of Research and Projects in Universities: A report and guidance for universities CVCP, London
- DELTA 1993 The Review Board Report on Information and Telecommunication Technologies applied to Education and Training pp 9-10 Brussels
- DELTA 1995 Telematics for Flexible and Distance Learning European Commission UK
- Dennison WF 1979 Monitoring the Effectiveness of Educational Institutions in British Journal of Educational Studies 26-(3) pp 234-246
- Dhanarajan G (et al) 1994 Economics of Distance Education Recent Experience, Open Learning Institute Press, Hongkong
- Dodds T The development of distance teaching an historical perspective in: Jenkins, Koul 1991
- Drucker 1974 The Effective Executive Heinemann, London
- EDEN 1996 EDEN Conference, Fururoscope, Poitiers
- Eicher J-C 1980 Some thoughts on the economic analysis of new educational media in UNESCO1980
- Employment Department How to Profit from Open Learning- Company Evidence
- Evans T and Nation D 1996 Opening Education Routledge, London
- Garrison DR 1990 Communications technology in Garrison DR and D Shale 1990

- Garrison DR and D Shale 1990 Education at a Distance: From Issues to Practice Robert Krieger Publishing Company, Malabar Florida
- Glennan TK and A Melmed 1997 Fostering the Use of Educational Technology: Elements of a National Strategy RAND <http://www.rand.org/publications/MR/MR682/contents.html>
- Halkemunlder JR (ed.) 1979 Distance Education for Development. Report of an International Seminar, 13-15 September 1979, Addis Ababa German Foundation for International Development, Bonn
- Hanushek EA Education Production Function in Carnoy (ed.) 1996
- Hawkrige DG 1987 Operational Review of Distance Education IBRD/World Bank
- Hawkrige DG Distance education and the World Bank British Journal of Educational Technology 19(2) 84-95
- Hawkrige DG not dated Media Taxonomies and Media Selection OU, Milton Keynes (Mimeo)
- HEFCE 1993 Definition of Cost Centres
- Henry NB (ed.) 1961 Social Forces Influencing American Education, National Society for the Study of Education, University of Chicago Press, Chicago
- Hope T and G Hope 1995 Transforming the Bottom Line Nicholas Breley Publishing
- Hornik R (et al) 1973 Television and Educational Television in El Salvador Research Report No.14 Stanford California Stanford University Institute for Communication Research
- Jamison (et al) 1987 Educational Media: Guidelines for Planning and Evaluation Sage Publications, London
- Jamison DT 1972 Notes on Cost effectiveness Evaluation of Schooling in Developing Countries Stanford University, Mimeo
- Jamison DT 1977 Cost Factors in Planning Educational Technology System
- Jamison DT 1982 An Introduction to the Method of Cost Analysis in Perraton 1982 School Equivalency in Perraton (ed.) 1982
- Jamison DT and E McAnany 1978 Radio for Education and Development Sage, Beverly Hills
- Jamison DT and P Suppes and S Wells 1974 The Effectiveness of Alternative Instructional Media: A survey Review of Educational Research 44 pp 1-64
- Jamison DT and SJ Klees 1973 The Cost of Instructional Radio and Television for Developing Countries Institute for Communications Research, Stanford

- Jenkins J and BN Koul (eds.) 1991 Distance Education: A Review International Extension College, Cambridge
- Jenkins J European Distance Education A handbook of Current European Programmes and Networks The Commonwealth of Learning, Vancouver
- Kaye A and G Rumble 1981 Distance Teaching for Higher and Adult Education Croom Helm, London
- Keegan D (ed.) 1993 Foundations of Distance Education Routledge, London
- Keegan D (ed.) 1993 Theoretical Principles of Distance Education (2nd ed.) Routledge, London
- Keegan D (ed.) 1994 Otto Peters on Distance Education Routledge, London
- Keegan D and G Rumble 1982 Distance Teaching at University Level in Rumble G. and K. Harry (eds.) 1982
- Klees SJ The Economics of Educational Technology in Carnoy 1996
- Klees SJ and SJ Wells 1977 Cost Effectiveness and Cost Benefit Analysis for Educational Planning and Evaluation : Methodology and Application to Instructional Technology US AID, Washington DC
- Klees SJ and SJ Wells Economic analysis and education: critical issues in application to instructional technology evaluation. UNESCO, 1980
- Knight BJ and RH Sabot 1990 Education, Productivity, and Inequality The East African Natural Experiment World Bank Publication/Oxford University Press, Oxford
- Kozma RB 1991 Learning with Media in Review of Educational Research Summer 1991 Vol. 61 No 2 pp 179-211
- Laidlaw B and Layard R 1974 Traditional versus Open University Teaching Method: A Cost Comparison, Higher Education, Vol. 3 pp 439-468
- Laurillard D 1993 Rethinking University Teaching: A Framework for the Effective Use of Educational Technology Routledge, London
- Levin HM 1983 Cost effectiveness; a Primer Sage, London
- Mace J 1978 Mythology in the Making: Is the Open University really cost-effective? Higher Education 7(275-308)
- Mace J 1986 The Economics and Financing of Education Block I and Block II, Alama Iqbal OU
- Mace J 1992 Economics of Education I, University of London External Programme, London

- Mace J 1996 Economics of Education II, University of London External Programme, London
- Mason R and A Kaye (eds.) 1989 Mindweave; Communication, Computers and Distance Education Pergamon Press, Oxford
- Mayo K, EG McAnany and SJ Klees 1973 The Mexican Telesecundaria Cost-effectiveness Approach AID Studies in Educational Technology, Washington D.C.: Academy for Educational Development
- Nipper S Third Generation Distance Learning and Computer Conferencing in Kaye and Mason 1989
- OECD 1995 Learning beyond Schooling OECD, Paris
- Orivel F 1980 Cost analysis in educational technology: practical problems in UNESCO, 1980
- Orivel F 1987 Costs and Effectiveness of Distance Teaching Systems IREDU, Dijon
- Orivel F 1996 Evaluation of Distance Education: Cost-Effectiveness in Tuijman, A. (ed.) 1997
- Paine N ed. 1988 Open Learning in Transition National Extension College, Cambridge
- Perraton H 1982 Alternative Routes to Formal Education Distance Teaching for School Equivalency IBRD/World Bank, Washington DC
- Perraton H 1982 The Cost of Distance Education International Extension College, Cambridge
- Perraton H Comparative Cost of Higher Education: Scale and Quality in Dhanarajan, G (et al) 1994
- Perraton H The comparative Cost of Distance Education: the Relevance of Scale in: AAOU 1993
- Perry W L 1978 The Open University Open University Press, Stony Stradford
- Peters O Distance education in a post-industrial society in Keegan D (ed.) 1993
- Peters O 1967 Distance education and industrial production: a comparative outline in Keegan D (ed.) 1994
- Peters O 1973 Distance education: a historical, sociological and anthropological interpretation in Keegan D (ed.) 1994
- Phelps R (et al) 1991 Effectiveness and Costs of Distance Education using Computer Mediated Communication American Journal of Distance Education Vol. 5 No 3 pp 7-19

- Potashnik M and D Adkins 1996 Cost Analysis of Information Technology Projects in Education: Experiences from Developing Countries Education and Technology Series Vol. 1 No 3 World Bank
- Potashnik M et al 1996 Research on Education and Technology (1980-1996) Abstracts of Publications by the World Bank Education and Technology Series Vol. 1 No 1 World Bank
- Psacharopoulos G and M Woodhall 1985 Education for Development An Analysis of Investment Choices World Bank Publication: Oxford University Press, Oxford
- Robinson A 1996 Policy Implications for Distance Education in the European Information Society in Evans T and Nation D 1996
- Rumble G 1976 The Economics of the Open University OU, Milton Keynes
- Rumble G 1979 Planning for Distance Education in Halkemulder JR (ed.) 1979
- Rumble G 1986 Activity Costing in Mixed-Mode Institutions; A Report based on a Study of Deakin University Deakin Open Education Monograph No. 2
- Rumble G 1986 Costing Distance Education Commonwealth Secretariat, London
- Rumble G 1991 Topic 3: Budgeting and Economic Analysis in Distance Education in Deakin University 1991 Management of Distance Education Deakin University, Geelong
- Rumble G 1992 The Management of Distance Learning Systems UNESCO/IIEP, Paris
- Rumble G 1992 The Comparative Vulnerability of Distance Teaching Universities Open Learning 7-(2) pp 31-45
- Rumble G 1994 Mixed Modes of Teaching and Learning: Structures, Resources and Developments in Thorpe M and D Grugeon 1994
- Rumble G 1994 The Comparative Vulnerability of Distance Teaching Universities: a Reply Open Learning 9-(3) pp 47-49
- Rumble G 1997 The Costs and Economics of Open and Distance Learning Kogan Page, London
- Rumble G On-line Costs: Interactivity at a Price in Mason, Kaye (eds.) 1989
- Rumble G, M Neil and A Tout 1981 Budgetary and Resource Forecasting in Kaye A and G Rumble (eds.) 1981
- Rumble G. Topic 4: Financial Management in Distance Education in Deakin University 1991 Management of Distance Education Deakin University, Geelong
- Schultz TW Education and Economic Growth in Henry NB (ed.)

- Sen AK 1980 Equality of what? In The Tanner Lectures on Human Values Vol1 Salt Lake City
- Snowden BL and JS Daniel 1979 The Economics of Small Open Universities in Open University Conference on the Education of Adults at a Distance, Paper 4 OU, Milton Keynes
- Sparkes J 1984 Pedagogic Differences between Media in Bates A (ed.) 19..
- Tate O and A Hiiri 1993 Funding and Spending: What Price Distance Education? in Scriven B (et al) Distance Education for the twentieth Century: Selected Papers from the 16th World Conference of the International Council of Distance Education, Thailand, ICDE Queensland University of Technology, Queensland pp 345-352
- Taylor JC and VJ White 1991 The Evaluation of Cost effectiveness of multimedia mixed mode teaching and Learning Australian Government Publication Service, Canberra
- Temple H 1995 Cost Effectiveness of Open Learning for Small Firms: A Study of first Experiences of Open Learning Department for Education and Employment Research Series No. 63
- Thomas H 1990 Education, Costs and Performance A Cost-Effectiveness Analysis Cassell, London
- Tuijnman (ed.) 1996 International Encyclopedia of Adult and Continuing Education Pergamon, Oxford
- UNESCO 1980 The economics of educational media Vol. 2 Cost and effectiveness UNESCO Paris
- UNESCO 1982 The economics of educational media Vol. 3 Cost and effectiveness overview and synthesis UNESCO Paris
- Vazey K (et al) 1971 The Costs of New Educational Technologies Gulbenkian Foundation, Lisbon
- Wagner L 1974 The Costs of Large Scale Computer-Assisted Instruction. A Study of Plato (Mimeo)
- Wagner L 1972 The Economics of the Open University, Higher Education, Vol. 1 pp159-183
- Wagner L 1977 The Economics of the Open University Revisited Higher Education, Vol. 6 pp 358-381
- Wagner L 1980 Cost analysis and Educational Media Decisions Polytechnic of Central London, Research Working Paper Number Nine
- Wagner L 1982 The economics of educational media The Macmillan Press, London
- Wells SJ 1976 Evaluation Criteria and the Effectiveness of Instructional Technology in Higher Education Higher Education 5 pp 253-75

- White V 1992 Responses to Greville Rumble's article "the Competitive Vulnerability of Distance Teaching in Open Learning Vol. 7, No3 p 61
- Young M 1988 Education for the New Work in N Paine 1988
- Young M et al 1980 Distance Teaching for the Third World: The Lion and the Clockwork Mouse International Extension College, Cambridge

6.1.1.1 Appendix 1: Distance Education Cost Models

(The following is based on Curran 1995 pp 27-31; however, to keep better consistency between the different models there is a deviation in terminology.)

$TC(s) = F + V*s \quad (1)$ <p>Total costs (as a function of student numbers) =</p> <p>□ Fixed costs + (Variable costs * number of students)</p>	$TC(s) = F + V(s) \quad (1')$ <p>Total costs (as a function of student numbers) =</p> <p>Fixed costs + (Variable costs as a function of</p>
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In the second case we concede that the relation of number of students and variable cost need not to be linear but that the variable costs are a function of the number of students. This is more realistic since e.g. science students are given a science kit but philosophy students not. However it is less practical and we may use an 'weighed' value to retain (1).

$TC(s, c) = F + V*s + C*c \quad (2)$ <p>Total costs (as a function of student number and number of courses) = Fixed (institutional) costs + Variable costs * number of student + Course costs * number of courses □</p>	$TC(s, c) = F + V(s) + C(c) \quad (2')$ <p>Total costs (as a function of student number and number of courses) = Fixed (institutional) costs + Variable costs as a function of student numbers + Course costs as a function of number of courses</p>
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(2) and (2') is attributed to *Wagner 1977*. Curran quotes (2') whereas Perraton gives an example based on (2). Again (2') is more realistic but less practical and if we can assume that development costs are similar we might uses (2). (Compare Perraton 1982, 43)

Now, following *Snowdon and Daniels 1980*, we split C (Course costs) into D and M, Development costs and Maintenance costs of courses, c1 and c2 representing respectively the number of courses in development or being merely maintained:

$TC(s, c1, c2) = F + V*s + D*c1 + M*c2 \quad (3)$ <p>Total cost (as a function of student numbers, number of courses to be newly developed, number of courses merely to be maintained) =</p> <p>Fixed (institutional) overheads + Variable costs * student numbers + Development costs * number of courses in development + Maintenance costs * number of courses merely to be maintained.</p>	$TC(s, c1, c2) = F + V(s) + D(c1) + M(c2) \quad (3')$ <p>Total cost (as a function of student numbers, number of courses to be newly developed, number of courses merely to be maintained) =</p> <p>Fixed (institutional) costs + Variable costs as a function of student numbers + Development costs as a function number of courses in development + Maintenance costs as a function of number of courses merely to be maintained.</p>
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(3) is attributed to *Snowden and Daniels*. There are in fact some shifts in interpretation in s and V. Since it is clear that the linear relationship of variable costs across all the courses does not

hold and we want to keep a handy linear expression, we have to weigh V and s. s hence means 'weighted course enrolments' and V means 'delivery costs per weighted course enrolment'.

The following model is attributed to *Perraton 1982*. It is somewhat modified here since the original version does not include institutional overheads anymore. The model keeps the distinction between maintenance and development of a course and introduces a new distinction between students enrolled in formal courses s_1 and in non-formal courses s_2 . The variable costs of teaching students enrolled in formal courses is T and the variable costs of teaching students enrolled in non-formal courses is N. The model furthermore introduces R as cost of running a radio series and r as the number of radio series. Here we omit the (more realistic but less practical) functional notation.

$$TC(s_1, s_2, c_1, c_2, r) = F + T*s_1 + N*s_2 + D*c_1 + M*c_2 + R*r \quad (4) \text{ Perraton 1982}$$

Total costs (as a function of number of students enrolled in formal courses, ...non-formal courses, number of courses in development,...in maintenance, number of radio series) = Fixed (institutional) overhead costs + (teaching costs for formal students * their number) +(teaching costs of the non-formal students * their number) + (cost of course development * number of courses in development) + (cost of course maintenance * number of courses maintained) + (cost of operating radio series * number of radio series)

Perraton explains the use of such formulas. Planners generally know their budgets and can (partially based on experience) attribute values for F, T,N,D,M,R and project the expected enrolment figures s_1 and s_2 . Then assuming different values for c_1 , c_2 and r allows to gauge the impact of each decision on TC.

A further detailed account is given of the model used in NDEC, Curran's own institution. The model, again a bit complemented here, is given by the following formula:

$$TC = \sum_{i=1}^t \sum_{j=1}^t A_{ji}$$

whereas A_{ji} signify cost of activity j in year i (which may be imagined as an entry in a cell of a double entry table). The activities embrace all sorts of things: staffing costs, course development costs, course delivery costs etc. Each cell entry can be expressed further. Curran gives the example of the delivery costs of a course. A course here is considered to consist of a number

(say m) of modules costing M_i . Each module cost is composed of tutorial cost per module T_i , costs incurred at the respective study centres where the module is presented C_i , and the average costs of producing and disseminating the module specific materials to the respective students registered for this course l_i . Hence

$M_i = T_i + C_i + l_i$ are the cost of module i . Then $D = \left(\sum_{i=1}^m M_i\right) + P + E$ with P signifying the

advertising costs and E the evaluation cost, is the cost for the delivery cost of all the course modules. However, taking the example of T_i , the tutorial costs of the i th module of the above course, Curran demonstrates that this term itself can be expressed in greater detail:

cost of tutorial = (number of tutorial groups * standard tutor allowance) + (number of assignments completed * standard fee for assignment) + (% of re-monitored assignment * standard monitoring fee) + (number of tutorial groups * number of hours at study centre * tutor fee per hour) + average cost of tutor induction)

number of tutorial groups: s_M / G where s_M is the overall number of students registered in the module and G the group size, generally 15 at NDEC.

standard tutor allowance: x_1

number of assignments completed: $a * s_M$ where a signifies the average number of assignments completed by the students

standard fee for assignment: x_2

% of re-monitored assignment: $\% (a * s_M)$

standard monitoring fee: x_3

number of tutorial groups: s_M / G

number of hours at study centre: h

tutor fee per hour: x_4

average cost of tutor induction: k

Altogether we have:

$$T_i = (s_M / G) * x_1 + (a * s_M) * x_2 + \%(a * s_M) * x_3 + h * (s_M / G) * x_4 + k$$

This being all implemented in a spreadsheet allows an efficient monitoring of costs and is at the same time an efficient planning tool.

6.1.1.2 Appendix 2 Orivel's cost spreadsheets

1 Yearly recurrent costs of production				
	nature of input	quantity	standardised quantity	yearly costs
	Professional staff	full time		
		part time		
	Support staff	full time		
		part time		
	Non-salary recurrent	observed expenses		
		shadow prices		
	Purchase of programs from outside			
	Total			

2 Yearly capital costs of production						
		quantity	annualized costs or shadow price			shadow price
		discount rate	0%	7,50%	15%	
	building	office space				
		technical building				
	equipment	item 1				
		item 2				
		item 3				
		item 4				
		item 5				
	Total					

3 Yearly recurrent cost of diffusion				
	network	number	full time equivalent	yearly costs
	Professional staff	full time		
		part time		
	Support staff	full time		
		part time		
	Non-salary recurrent	observed expenses		
		shadow prices		
	Total			
	audio/video duplication/circulation			
	Professional staff	full time		
		part time		
	Support staff	full time		
		part time		
	Non-salary recurrent	observed expenses		
		shadow prices		
	Total			

4 Yearly capital diffusion costs						
	network	life expectancy	annualized costs or shadow price			shadow price/rental costs
		quantity	0%	7,50%	15%	
	building					
	transmitters					
	other equipment					
	audio/video duplication/	building				
	circulation	equipment				
	Total					