

COST ANALYSIS IN OPEN AND DISTANCE LEARNING

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COST ANALYSIS OF OPEN AND DISTANCE LEARNING

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FOREWORD

Starting from correspondence courses, a few decades ago, teaching and learning through non-conventional and non-traditional modes, have undergone very dynamic and impressive changes to improve the quality of education. The emerging systems and trends are inherently flexible, widely accessible and endowed with immense capability to cater to the need of large target group of learners. In view of such unique and distinctive features, these systems are now identified as the open and distance learning systems (ODL). It is now very well realized and understood that for effectiveness and success of the ODL systems, very well trained faculty, media professionals and distance educators are all required to work together as a cohesive team. In the past decade, the ODL system has attracted considerable attention and acceptance of policy makers with the result that it is getting considerable support. It is now being seen as a compulsion for training, retaining and education for life long learning. This has become possible due to the contemporary developments in Information and Communication Technologies (ICT) and their application to the system of education. It is becoming very apparent that in recent years the ODL has very meaningfully absorbed the ICT for the betterment of the system, to make it more cost effective and accessible so as to bring in equity in education.

The ODL has been growing at a very fast rate and massive human resource training in the Open and Distance Learning System is required to handle the system efficiently. Keeping in view the above requirements of manpower development, the Staff Training and Research Institute of Distance Education (STRIDE) has brought out an series of Handbooks on different themes of ODL. These Handbooks should be useful for the teachers and other functionaries of the ODL. This Handbook addresses one of the most important issues of Costing of Open & Distance Education in the light of the experiences gained in the years of evolution of ODL system.

(H.P. Dikshit)
Vice Chancellor
IGNOU

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For the User

You may be a learner, teacher or trainer in an educational institution. You may be responsible in some way for yourself or for other people developing and using open and flexible learning. The present handbook, as a part of the STRIDE, IGNOU series on Staff Development in Open Learning, aims to help you improve the way you manage your open and distance learning institution. It will help you understand economics of distance education broadly, as also the different types of costs involved in distance education.

SECTION 1

INTRODUCTION

This is the eleventh handbook in the series of handbooks of STRIDE, IGNOU meant for those educational managers of Open and Distance Learning (ODL) Institutions, who are seeing how to use open and distance learning more effectively. It examines the comparative costs of various educational technologies, and suggests how we can control costs. The ODL system has expanded both horizontally and vertically since last thirty years in India. In many countries, six to twelve per cent of all enrollments in tertiary education are of learners studying through ODL systems. India has now eleven open universities and one hundred and four dual mode distance education institutions at the tertiary level, providing education, training, extension and research programmes at a distance.

Open and Distance Learning

Both open learning and distance learning have been in common use in education and training situations over the last about thirty years. The concepts having some close relations such as, flexible learning, flexible study, supported self-study, resource based training and so on. If we review literature on open and distance learning, we will find several definitions on this concept. For an elaborate discussion, see IGNOU Handbook 1 on '*Open and Distance Education*'. Here, we mention only the most widely accepted definitions or descriptions of open learning and distance learning.

Open Learning

"Open learning is a state of mind rather than a method with particular characteristics" (Jack, 1988: 52).

If we analyse further what Jack noted above, we may find that open learning is both a process, which focuses on access to educational opportunities, and a philosophy which makes learning more client - and student-centered. It is the kind of learning which allows the learner to choose, as far as possible, how to learn, when to learn, where to learn and what to learn within the constraints on any education and training provision (Paine, 1989: ix).

Distance Learning

In a distance learning system, *"the learner and the teacher are not face to face. In order for two-way communication to take place between them, a medium such as print, radio, or the telephone has to be used"* (Perry and Rumble, 1987: 1).

Later, Rumble (1997) defined open and distance learning system comprising at least of three sub-systems:

- ◆ the regulatory sub-system: such as human resources, purchase, finance, equipment and building;
- ◆ the material sub-system: such as production and distribution of learning material;
- ◆ the students support system: such as to enroll students, collection of fees, allocation of study and exam centre.

The above classifications on the concept of open learning and distance learning shall facilitate you to study the cost analysis of distance education system. For further, study, see Handbook 1 on Open and Distance Education.

Cost Analysis

For learning cost analysis, it is not necessary that you should be a graduate or a postgraduate in economics. It requires only analytical mind and interest in this particular task. Also, it requires some knowledge about fundamental statistical techniques and analytical skills. It will help if you also know the basic cost concepts and how to apply them.

After going through this handbook, you should be able to:

- (a) define different concepts of costs used in economics in general and education in particular;
- (b) describe the cost factors used in open and distance learning system;
- (c) analyse case studies of open and distance learning institutions which will help you as a decision maker to decide what kind of costing is needed; and
- (d) analyse the methodology of costing and cost estimation.

Costing in Economics

For understanding costing, you must distinguish between the cost and the expenditure. Generally, the terms cost and expenditure are used for the same purpose. But in economics, there is a difference between these two terms. The *expenditure* on education is defined as the money spent on any item relating to the education process. The *cost* is defined as the value of all the inputs that go into the education process, i.e., the value of not only those inputs on which money is spent but also those for which no expenditure is incurred, for instance, the economic value of the 'free' broadcast time allotted for educational use. We can say, *expenditure is expressed only in monetary terms, while costs can be expressed in monetary as well as in real or physical terms.*

Educational Expenditure/Budget

We have mentioned earlier, that there is a difference between cost and expenditure. Before calculating the costs, let us first discuss how expenditure is categorised in the budget.

What is an Educational Budget?

Educational budget is a statement of income and expenditure of an educational institution for a given financial year.

Types of Budget

Item specific budget: This type of budget focusses attention on specific items, which make up a programme, such as books, equipment, building etc. It may be a teacher education programme or vocationalisation of education or universalisation of education programme and so on. This type of budget does not provide for what broad purposes and objectives the resources are allocated. We cannot, therefore, identify unit cost in this case.

Performance budgeting: This kind of budget will enable performance to be monitored and evaluated in relation to the physical achievement and the monetary expenditure.

Programme and planning budget: This type of budget is essential for the relationship between goals, objectives and resources available or anticipated for achieving the goals.

Zero-based budget: This is the latest budgeting system available to planners to prepare educational budgets. It is an operating, planning and budgeting process which requires an institutional head (may be principal of school or college and director of the institute) to justify his/her entire budget request in detail from scratch (hence zero base); and shifts the burden of proof to each concerned person to justify why he/she should spend any money at all. This approach requires that all activities be identified in 'decision package', which will be evaluated by systematic analysis and ranked in order of importance.

Different Heads of Educational Expenditure

Plan and Non-Plan Budgeted Expenditure

Educational budget is, generally, divided into two heads: i.e. plan and non-plan. You can show the *anticipated expenditure* of the new programmes under the classification of *plan* expenditure and the *expenditure on ongoing programmes in non-plan expenditure*. This type of separation enables the head of the institution to be aware of accounting and budget control. It is also called developmental (plan) and non-developmental (non-plan) expenditure. Table 1.1 shows the two kinds of expenditure.

Table 1.1: Plan and non-plan expenditure

Developmental or Plan Expenditure	Non-Developmental or Non-Plan Expenditure
It includes development	Under this head, are included the

<p>of new programmes and activities. Under this head, details of item-wise expenditure should be shown.</p>	<p>maintenance of existing facilities of activities and programmes which are not included in the setting up of new budget, e.g. salaries of teaching and non-teaching staff, allowances, etc.</p>
---	---

Recurring and Non-recurring Expenditure

The recurring expenditure is defined as those expenses that are incurred every year: for instance, expenditure on teaching and non-teaching staff salary. The non-recurring expenditure is incurred, generally, once for all: for instance, expenditure on of construction a building and purchasing equipments. Recurrent expenditure may be referred to as a baseline expenditure (Rumble, 1997: 10). On the other hand, non-recurring expenditure is incurred on buildings, for instance, payments paid for the purchase of schools, colleges/ other institutions' buildings) or an expenditure on items for a short period: for instance, expenditure on projects, where, once the project is over, the expenditure on all the items which were used during the projects like staff salary, rented building and stationary items etc., is over. Salary expenditure on staff or payment to consultants is called non-recurrent expenditure.

Capital and Revenue Expenditure

The expenditure incurred on equipment/building/furniture/ is called the capital expenditure. But the life time of these items varies from item to item. For instance: a new floppy of a computer is expected to have a usage life less than one year and a new building is expected to last for more than three years. In this case those consumable items which have an expected life time of more than one year are called capital costs; those items which have usage life time less than one year are called recurrent expenditure.

Revenue Expenditure (Operating Costs)

Revenue expenditure is an expenditure that will provide a benefit only during the current accounting period. For instance, expenditure on staff's salary's during given financial year 2002-03.

Resources Versus Money Expenditure

Educational inputs are expressed in terms of real resource expenditure when they are measured in physical units, for example: number of teaching and non-teaching staff employed in a university and number of books purchased, etc. Inputs can also be measured in terms of monetary value and expressed as financial or money expenditure.

Total Expenditure

The total expenditure for a given financial year is the sum of current and capital expenditures. It is a rough, but important, point of the real resources inputs used by an educational system during a given period. For example: expenditure on teaching and non teaching staff salaries,

allowances, part time staff salaries, maintenance and repairs, student hostel expenses, stationery, postage, construction of new buildings are included in total expenditure. We use 'rough point' here because official budgetary accounts always overstate and understate the real situation. For example: the approved or provisional education budget for the coming year and the actual expenditure during that year has always overstate and understate the real situation.

Activity

✍ 1. Define the meaning of educational budget.

2. Identify recurring and non- recurring expenditure of your institution.

SECTION 2

COST ANALYSIS IN EDUCATION

Cost analysis can contribute significantly to decision-making, planning, and monitoring in education. The different concepts of costs explain how they can contribute to improve policy-decisions in education. The purpose of this section is to introduce you to the different types of educational cost analysis and explain how they can contribute to improved policy-decisions in education.

Classification of Costs of Education

Costs can be classified into two types:

- (a) Individual or private costs
- (b) Institutional or public or social costs

(a) Individual Costs or Private Cost

Individual costs or private costs of education are those costs of education incurred by a learner or by his/her parents/guardians or by the family as a whole. Individual costs are of two types: direct and indirect.

Direct costs: These are those costs that are directly visible. They include all money expenditure incurred on different items by the student. For example, expenditure on tuition fees, other fees and charges, purchase of books, stationary, uniforms, hostel expenses and transport.

Indirect costs (opportunity costs): Indirect costs are those costs which are not directly visible. These costs are sometimes called 'opportunity costs or foregone earnings'. Opportunity costs refer to the value of students' time or earning forgone to continue the study. The detail of this concept has been explained in the later part of this section heading 'types of costs'

Institutional Costs of Education or Public Costs of Education

Costs incurred at the institutional level (government, private or mixed) are called institutional costs or public costs of education. Public costs are those that include financing by the government on the basis of taxes, loans and other public revenues. The institutional costs of education are, generally, analysed using the following variables.

- Variable and fixed costs of education.
- Recurring and non-recurring costs of education.
- Current and capital costs of education.

We shall discuss these costs while discussing various costs types.

Types of Costs

The real nature of cost could be understood only when we understand the different concepts related to the ‘costs’ of education. As mentioned earlier, cost is the actual expenditure of money incurred on, or attributable to, a specific thing or activity. For instance: on a query from learner as to how much cost would be for his/her graduation, the institution specifies the cost to be about Rs. 20,000/- per annum (about US \$ 450), this is called a *notional cost*. But his/her cost was Rs. 30,000 (US \$ 675) when he/she completed his/her graduation; this is called the *actual cost* (which depends upon all kinds of prices incurred during his graduation including private costs).

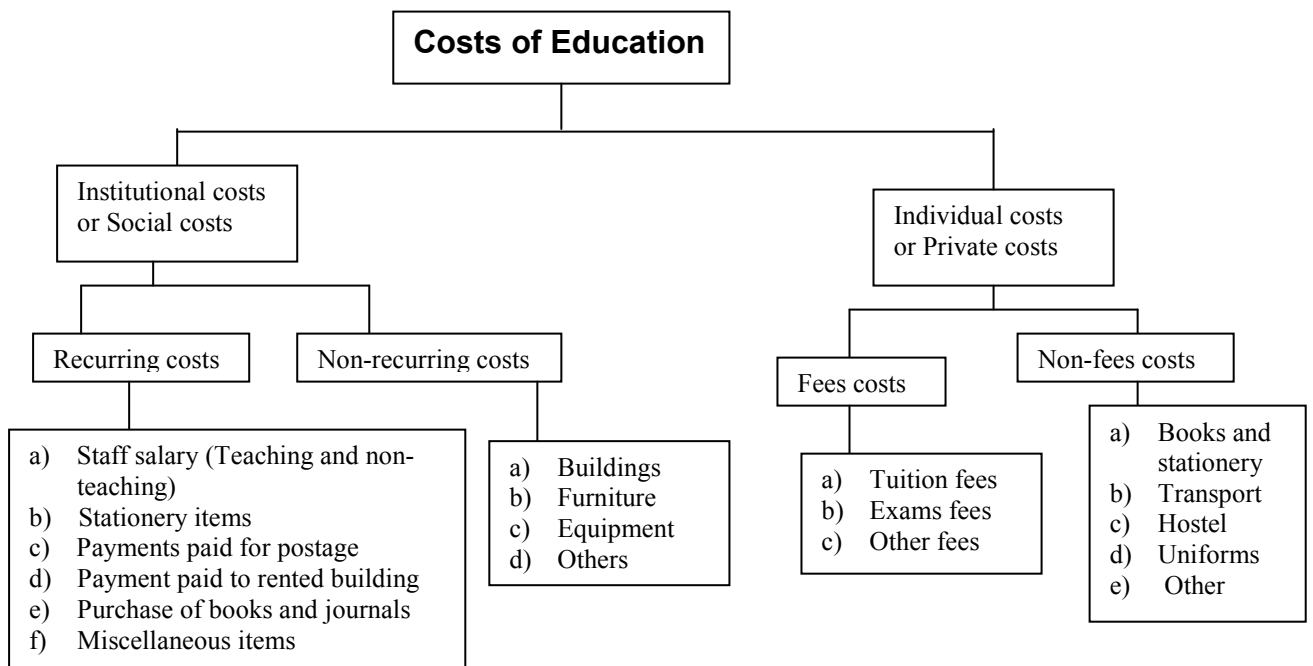


Figure 2.1: Classification of costs

Total Cost

The ‘total cost’ is the sum of all fixed costs and all variable costs.

$$TC = TFC + TVC$$

Where,

TC = total costs,

TFC= total fixed costs and

TVC= total variable costs

Let’s describe the two types of costs further.

Total Fixed costs and Total Variable Costs

Fixed costs are defined as those that do not change with a change in the number of learners, e.g., costs on institution’s building. In other words, the costs that do not increase or decrease with the changes in the level of activity of the institution are known as the fixed costs as shown in Figure

2.2. Variable costs vary with every change in number of learners. e.g., costs on teachers, laboratory materials, stationary items. Therefore, total cost is an increasing function of enrolments i.e. enrolments increase, total cost increase as shown in Figure 2.3. However, one cannot argue that certain costs are fixed, and others are variable for all time to time. For example, what will happen if the number of learners increases to a great extent? In this situation, not only the number of teachers has to be increased, but an additional number of classrooms may also have to be constructed. If, the number of learners increases by a small amount, the variable costs on teachers may not change, in which case this may be called fixed cost.

These concepts are represented graphically in Figure 2.2 and 2.3. In the graph, in the 'y' axis is presented monetary value (in Rs) and in the x-axis is presented the measure of volume of activity or output (for instance, number of learners enrolled). Sometimes we also use terms like short run fixed costs and long run fixed costs. For example, the cost of buildings forms long run fixed costs and the cost on teacher salaries is referred to as short run fixed costs. The fixed costs include the costs of the following items:

- (a) purchase and construction of land and buildings;
- (b) purchase of furniture ;
- (c) purchase of durable equipment; etc.
- (d) costs on other non-recurring items.

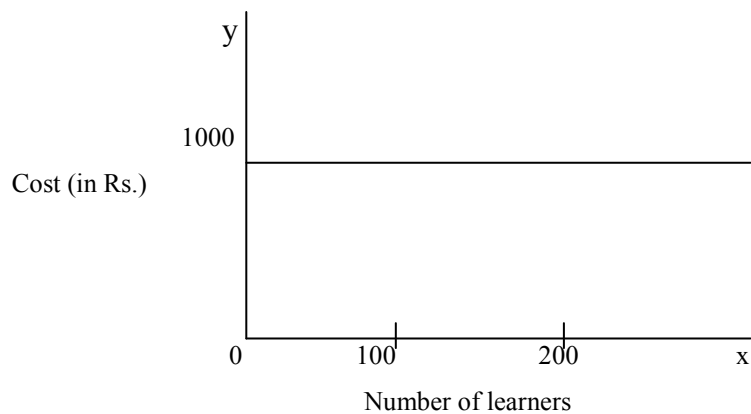


Figure 2.2: Fixed costs

Figure 2.3 represents the variable costs of an organization, which rises as the number of learner increases.

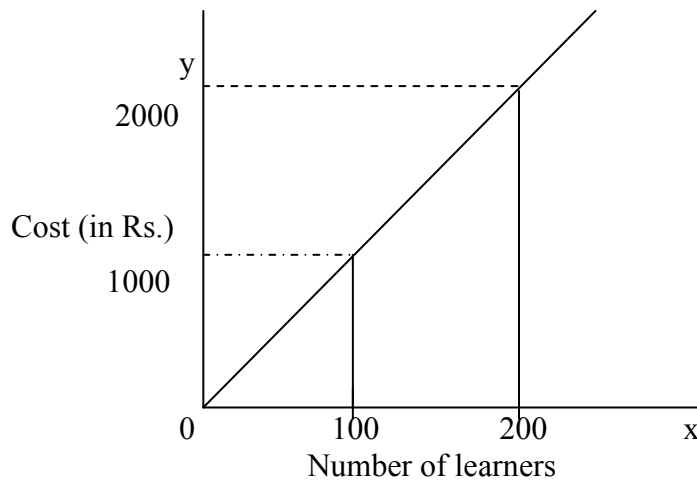


Figure 2.3: Variable costs

While the cost of buildings forms fixed or non-recurring costs, the rent or even depreciation forms recurring costs. On the other hand, variable or recurring costs may include (i) salaries and allowances of the teaching staff, (ii) salaries and allowances of the non-teaching staff, (iii) scholarship and fee concessions, (iv) purchase of non-durable or consumable material (like stationary items), (v) expenditure on maintenance and repairs of buildings, furniture and equipments, etc.

Annualisation factor

It is difficult to calculate the unit costs per year with regard to the fixed costs. Generally, in most of the studies, it is either ignored, or the rate of depreciation is calculated. If required data are available, fixed or non-recurring costs per annum can be calculated using the following formula:

$$\text{Annual fixed cost} = \frac{r(1+r)^n}{(1+r)^n - 1} \dots\dots\dots (I)$$

Where,

- r = the discount rate,
- n = the life span of the asset and 1 is the initial capital (fixed) investment.

For example, I purchased a CD player by Rs. 10,000 with the assumption that the life of the CD player is six years. If the same money had not been used for this purpose, I would have earned 5% interest (prevailing rate of interest) on it. Therefore, the total future value of my money would have been:

$$\begin{aligned} a(r, n) &= \frac{r(1+r)^n}{(1+r)^n - 1} \\ &= \frac{0.05(1+0.05)^6}{(1+0.05)^6 - 1} \times 10000 \end{aligned}$$

$$\begin{aligned}
&= \frac{0.05(1.1970) \times 10000}{(1.1970)} \\
&= \frac{0.05985 \times \text{Rs.}10000}{0.1970} \\
&= \text{Rs. } 3038.07
\end{aligned}$$

Therefore, the total future value of the present decision to invest Rs. 10,000 in a CD player is Rs. 3038.07 per year over six years.

The value of the annualization factor can be derived from the following Table 2.1, which can be used to estimate the annual fixed cost.

Table 2.1: Annualisation factors for determining annual fixed cost for different periods of depreciation and interest Rates

Lifetime of Assets n	Interest Rates (r)		
	5%	10%	15%
1	1.050	1.100	1.150
2	0.538	0.576	0.615
3	0.367	0.402	0.438
4	0.282	0.315	0.350
5	0.231	0.264	0.298
6	0.197	0.230	0.264
7	0.173	0.205	0.240
8	0.155	1.187	0.223
9	0.141	0.174	0.210
10	0.130	0.163	0.199
15	0.096	0.131	0.171
20	0.080	0.117	0.160
30	0.065	0.106	0.152
40	0.058	0.102	0.151
50	0.055	0.101	0.150

The above figures can be used not only in estimating annual fixed cost but also in depreciation and the opportunity cost of capital.

From economists' point of view buildings' costs provide an example of both direct and indirect (opportunity) costs. Direct cost is the capital cost that is paid as a price for the purchase of a building. For perspective planning purposes, we take the annual depreciation cost of buildings, taking into consideration the life-time of the building. This indicates the annual value of the use of the buildings in general. However, we should take into account the opportunity costs of the investment in the purchase of the building. The opportunity cost indicates the economic usefulness of the asset.

Current Costs and Capital Costs

Most of the time, capital costs and current costs are synonymously used with fixed costs and variable costs respectively. For the purpose of cost analysis, we should be aware whether the expenditure figures being used

include capital outlays or only current operating costs. Current costs are incurred on consumable items within a given financial year. Capital costs refer to costs incurred on durable items like land, buildings, equipment and so on that rendered useful service over a period of years. But expenses on books, which last for several years, could be counted as capital equipment and, therefore, capital cost but these are almost always counted as current costs. In practice, the distinction between the two is often one of the administrative convenience: expensive and long-lasting items such as buildings are paid for out of separate budget. But they are necessarily a part of capital costs.

Opportunity Costs or Foregone Earnings

The concept of opportunity cost emphasizes the factor of choice. Because the resources are scarce, we are forced to choose. If we choose to have more of one thing, we shall have to accept less of another thing. This type of cost plays a very important role in decision-making. By the opportunity cost of decision is meant the sacrifice of alternatives required by that decision. If there are no sacrifices, there is no cost. As we mentioned earlier, opportunity costs can be calculated in education from an individual's point of view and, as well as, from an institution's point of view.

Opportunity costs refer to the earnings that would have been earned, had the student chosen not to go for education but to the job market. For instance, opportunity costs of graduates are treated as equivalent to the earnings of the workers of the age-group 19-21 (i.e., the relevant age group of graduates).

The reason of this approach is that since any country or community or individual has only a limited supply of economic resources to use in any given period, a decision to use some of them for a specific purpose, such as for education, means sacrificing the opportunity to spend those same resources on something else (Coombas and Hallak, 1987: 13). This is called *transfer earning from society* (or institution or from public).

Therefore, the three cost concepts mentioned above, i.e., individual costs i.e. private costs and institutional costs i.e. public or social and opportunity costs can be combined for the estimation of the annual cost per student for each level of education. It can also be used in the cost-benefit analysis, provided there is no wastage or repetition. But, opportunity cost or forgone earning cannot be combined in the cost of part-time education or open learning system of adult learner. Empirically, opportunity costs of graduates are treated as equivalent to the earnings of the workers of the age group 17 –21 years (the relevant age group of graduate) with senior secondary education. Therefore, it cannot be estimated in the case of the part time education or open learning system of adult learner.

Social or Total Costs of Education

The sum of individual costs and institutional costs is called the total social costs of education. While estimating the social costs of education, it is

necessary to see that no double counting of any item is made. If there are transfers, e.g., in terms of fees (a transfer from the institution to the individual), it is important that social costs of education takes into account only the net of transfers. Therefore,

- i) Individual costs = Household expenditure on education + opportunity costs
- ii) Institutional costs = Recurring costs + non-recurring costs
- iii) Social costs = Individual cost + institutional costs+ net of transfers

It can be summarized in the form of the following equation.

$$TC = C_{ind} + C_{inl} \quad \text{----- II}$$

Where,

- TC = total social costs of education,
- C_{ind} = individual costs of education,
- C_{inl} = institutional costs of education.

Following Table 2.2 given as illustration of individual, institutional and social costs of education.

Table 2.2: Social costs of education (per student and per annum)

Types of cost	Costs (in Rs.)
<u>Individual Costs</u>	
1. Household Expenditure	300.52
2. Opportunity Costs	168.32
Total Individual Costs.....(1)	468.84
3. Institutional Recurring Costs	356.78
4. Institutional Non-Recurring Costs-	-
5. Total Institutional Costs.....(2)	356.78
6. Social (Total) Costs (1+2)	813.62

Source: Tilak, J.B.G. (1995) Analysis of Costs of Education, National Institute of Educational Planning and Administration, New Delhi.

Unit Costs of Education

Unit costs of education means costs per unit i.e. per student, per graduate, per credit, etc. Generally, unit in unit costs means the total number of learners enrolled in a course in a particular year. Sometimes, it is said that the number of learners actually attending the classes should be taken for the purpose of calculation of unit costs and not the total number of learners on roll. Alternatively, unit costs refer to the unit of output i.e. successful learner or graduate. This is called *effective costs* of education. This type of cost calculation education takes care of wastage in education too. The difference between the effective costs and the normal costs of education reveals the efficiency of the given level of educational system.

Thus, We can calculate alternative forms of unit costs of education. These are:

- (i) Cost per learner (unit cost of education) = $\frac{\text{Total expenditure}}{\text{Total enrolment}}$
- (ii) Cost per learner actually attending the school = $\frac{\text{Total expenditure}}{\text{Total expenditure}}$

No. of student $\frac{\text{attending classes}}{\text{attending classes}}$

$$(ii) \text{ Cost per successful learner (effective unit costs of learner)} = \frac{\text{Total expenditure}}{\text{Number of pass-out learners}}$$

$$(iii) \text{ Cost of education per capita} = \frac{\text{Total expenditure}}{\text{Total population}}$$

In all the above examples, the total costs include total recurring costs plus annual fixed costs as estimated in Equation I. If there is absence of data on annual fixed costs, then unit costs can be estimated through only annual recurring costs.

Feature of Unit Costs Analysis

- For manpower planning and related purposes, the ‘effective unit costs’ is important.
- The selection of unit in unit costs analysis depends upon the purpose. As the costs are generally found to be highly sensitive to the number of students, the student is most often considered as the unit. But while calculating costs of classroom equipment, the class forms the right unit.
- Generally, unit costs of education are calculated per year. It is unreasonable to calculate the unit costs for one level by the duration of a five year time period, and for another level/type of 3 year time period.

However, it is necessary to note that all the above mentioned concepts of unit costs are nothing but average costs of education. As an illustration, some of these costs are calculated and are given in the Table 2.3. For instance, total recurring expenditure of a college is Rs. 10,000,00 and enrolment 2000, average attendance 1200 and number of students qualified for the next class is 1000. These costs would be:

Table 2.3: Costs of a college during 2000-01

Items	Cost
Total Institutional Recurring Expenditure	Rs. 10,000,00
Unit Costs (Based on enrolment 2000)	Rs.500
Unit Costs (Based on attendance=1200)	Rs.833
Effective Unit Costs (Based on qualified learners=1000)	Rs.1000

A variety of other types of unit costs measure exits that are valuable for certain purpose, and keeping them is also important. For example, the average cost per teacher, the average cost per classroom, the average cost per school, the average cost per course. As mentioned earlier, the suitable unit to use for costing depends upon the particular item with which we are concerned. If we are costing the number of pens and textbooks needed, then the individual student is the most suitable unit because, in these cases, cost varies in direct proportion to the number of students.

To sum up, costs can be classified in different ways i.e. by source, type, items, and function as given below.

Table 2.4: Classification of costs

Source	Private (individual), institutional and social costs.
Type	Variable (recurring), fixed (non-recurring), capital and current cost etc.
Items	Salaries, maintenance, repairs, teaching, supporting material, books, incentives like uniform, etc
Function	Teaching activities, administration, media, etc.

Costs function at current and constant prices

The costs of education can be expressed either at current prices or at constant prices. Costs at constant prices take care of price-inflation and represent as real costs of education. It is necessary, when we are computing costs of education for a time period. We calculate the costs of education at constant prices so that the changes in the value of money are taken into account. On the other hand, computing costs of education at current prices, when compared over a period of time, gives a false picture, because during the same period, the prices of goods and services might have increased, resulting in increase in real costs of education. In practice, costs at current prices can be converted into costs at constant prices, with the help of the following:

- *National/state income deflators*: it is ratio of state domestic product at current and constant prices.
- *Wholesale price index*: The wholesale price index (WPI) is an indicator designed to measure the changes in the price levels of commodities that flow into the wholesale trade intermediaries.
- *Consumer price index*: is also known as cost of living index, in which numbers are, generally, intended to represent the average change over time in the prices paid by the ultimate consumer of a specified basket of goods and services. In fact, The CPI is used to calculate how prices have changed over the years.
- *Education price index*: prices for goods and services of education have risen.

The education budgets are largely salary budgets, may justify the use of the consumer price index. But the education system involves other capital goods such as iron, steel, cement etc. in which case, the use of wholesale price index or national/state income deflators is more justified. However, the use of any general price index or national/state income deflators are the most widely used in conversion of current prices into constant prices.

Relationship Between Total, Average and Marginal Costs

An analysis of the relationship between total, the average and marginal costs provides information regarding the economies of scale and the optimum size of the institution, which is a very valuable information for the future planning of education in general, and open and distance education in particular.

Total cost (TC) is an increasing function of enrollments, i.e., as enrollments increase total cost also increase as shown in Figure 2.4. A cost function expresses the relationship between ‘cost’ and its determinants. Several factors influence cost when their relationship to cost is expressed in a functional or mathematical form. It is called cost function. Symbolically,

$$C_e = f(E)$$

Where,

C_e = costs of education

E_n = enrolment

There is a functional relationship between, TC, average cost (AC) and marginal cost (MC).

Average Cost

As mentioned earlier, the average cost is the same as the unit costs or cost per student. The AC is derived by dividing the total cost by the number of units (enrolments). The average cost per student falls as student number increases as presented in Figure 2.5. Whereas the rate of decline in average costs is relatively large to begin with, it quickly falls off. It indicates the fact that the most significant economics of scale are reaped in the early stages of expansion.

We know,

$$TC = TFC + TVC$$

Where,

TC = total cost;

TFC = total fixed cost;

TVC = total variable cost

$$AC = \frac{TC}{N} \dots\dots\dots(1)$$

Where,

AC= average costs,

N = number of students enrolled.

AC is the same as the unit cost or cost per student. We can also calculate three measures of AC: (i) AFC (ii) AVC (iii) ATC, given as follows:

$$AFC = \frac{TFC}{T_N} \dots\dots\dots(II)$$

Where,

AFC= average fixed cost,

TFC= total fixed cost,

ATC= average total costs, and

T_n = total number of learners enrolled.

Therefore,

$$AVC = \frac{TV}{T_n} \dots \dots \dots (III)$$

We know that $TC = TFC + TVC$. Therefore, by putting the value of this in equation I it can be written as:

$$AC = \frac{TC}{N} = \frac{TFC + TVC}{N} \quad \text{or}$$

$$AC = \frac{TFC}{N} + \frac{TVC}{N} \quad \text{or}$$

$$AC = AFC + AVC$$

Marginal Cost

Marginal cost refers to the cost incurred on an additional learner or the additional cost attributable to an extra learner. We can express it symbolically as:

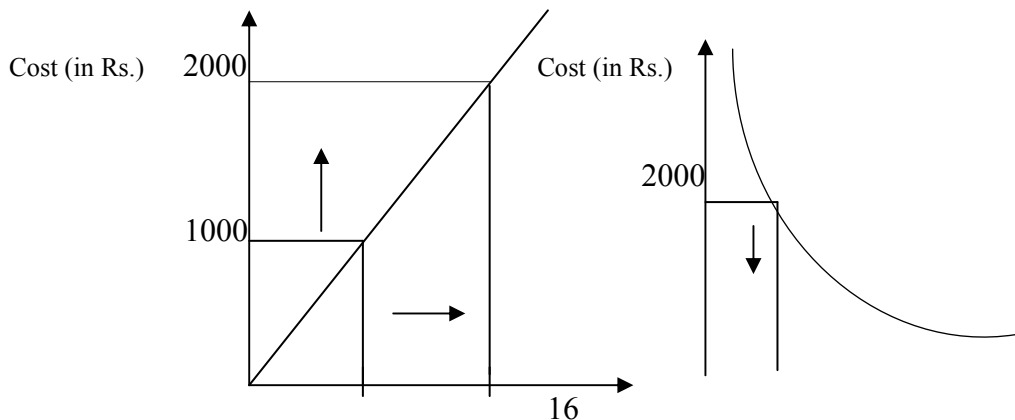
$$MC_n = TC_n - TC_{n-1}$$

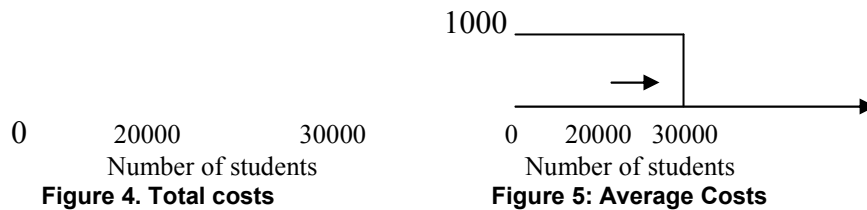
Where,

- MC = marginal cost,
- n = enrolments in a year,
- n-1 = enrolment in previous year.

It is also called an incremental cost. It may be emphasized that in cost analysis in education, total cost and average cost are used extensively. On the other hand, the use of marginal cost in education is limited.

There are three possible relationships between average and marginal costs, which provide valuable information to the educational planner,





particularity regarding the economies of scale and optimum size of the institution. These are:

- i) Constant return to scale: When average and marginal costs are equal ($AC=MC$) regardless of enrolment. P is the point of constant return to scale in Figure 2.6.
- ii) Economies of scale (Increasing return to scale): where AC falls due to increase in the enrollments increase, because marginal costs are lower than average costs as shown in Figure 2.6 at 'A' point.
- iii) Diseconomies of scale (Decreasing return to scale): where marginal costs are higher than average costs, and therefore, AC increase as the enrolment increase as shown Figure 2.6 at 'B' point.

The above three relationships are presented with the help of a hypothetical example in Table 2.6 and Figure 2.6.

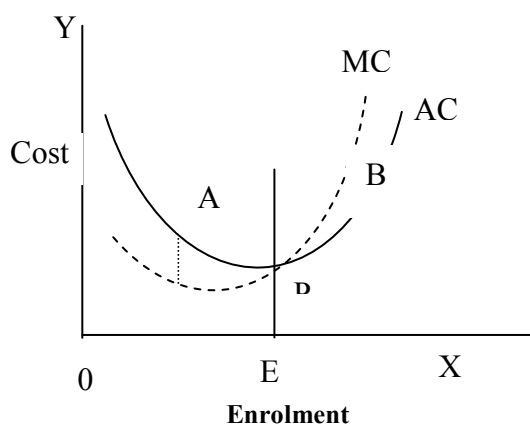


Figure 2.6: Relationship between average and marginal cost

With increase in the average cost, marginal cost also rises at a faster rate. Beyond OE level of enrolment, MC. The MC curve goes above the curve of AC as shown in Figure 2.6.

Table 2.6: Hypothetical Cost Function: Total, Average and Marginal Cost

Number of Students	Total Cost (TC) (in Rs.)	Average Cost (AC) (in Rs.)	Marginal Cost (MC) (in Rs.)
0	0	0	0
1	200	200	200
2	310	155	110
3	430	143	120
4	572	143	142
5	708	143	143
6	880	147	165
7	1080	154	200

8	1330	166	250
9	1620	180	290
10	1960	196	340

In the above table, the optimum size is five, when AC=MC. Both AC and MC of education can also be computed with reference to various other units. For example, per class, per teacher, etc. Thus, an analysis of the relationship between AC and MC provides us the required knowledge about the economies of scale and of the optimum size of the institution, which is a very valuable information for the prospective planning of education in general and open distance learning in particular.

Activity



1. The total costs of an institution are Rs.12340, Rs. 13245 and Rs. 14560 during 1995-1997 and enrolment were 875, 1000 1300 respectively during the same period. Define the relationship between average cost and marginal costs of this institution.

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.....

.....

.....

Cost Benefit and Cost Effectiveness Analysis

Cost-benefit analysis and cost effectiveness analysis can help us in evaluating the alternative uses of resources. The estimation of a unit cost is necessary, if one has to make a cost-benefit or cost-effectiveness analysis. In a cost-benefit analysis, the output is measured in monetary terms, and in cost-effectiveness analysis, the output is addressed in terms of the level of achievement of the objectives.

Cost benefit analysis is also known as “rate of return” analysis. For example, if a computer printer’s cost is Rs. 10,000 to acquire, and yields on annual constant income of Rs. 1200, and has a life expectancy of 10 years, the rate of return of investment on this printer is equal to about 3%. This is found by solving the following equation.

$$C = \frac{B_1}{(1+r)} + \frac{B_2}{(1+r)^2} + \dots + \frac{B_{10}}{(1+r)^{10}}$$

Where,

- C =represents the cost of the computer printer,
- B = annual benefits, and
- r = rate of return.

We can define 'cost benefit' as a tool, which measures, in economic terms, the benefits of education to the individual or to society. In order to use this technique, it is necessary to measure both the costs and benefits in economic or financial terms. On the other hand, in 'cost effectiveness analysis', the output of education can be measured in terms of scores in cognitive achievement tests, examination results, etc. (For detail, you may like to see Block 2, Course ES-317, STRIDE, IGNOU). We can also analyse different types of return given as follows.

Private rate of return: A private rate of return is estimated when the benefits and costs refers to the individual undertaking the investment. For detail on this concept, please refer Block 1, Course ES-317, p.69.

Social rate of return: It is used for educational planning purposes. The social rate of return on education measures the extent to which the society receives a positive payoff on its investment in education. Although the social benefits of education are, usually, estimated by using the same average earnings streams as in the private rate estimates. (Carnoy, M, 1995: 365).

Cost effectiveness analysis: Cost effectiveness analysis is a technique for measuring the relationship between the total inputs, or costs of a project or activity, and its outputs or objectives. Both costs and effectiveness must be quantified, but it is not necessary to measure them in monetary terms (Woodhall, M, 1987: 348).

However, it may be noted that the cost benefit and the cost effectiveness analysis help in evaluating the alternative use of resources. Estimation of units costs, is necessary, if we have to make a cost benefit or cost effectiveness analysis. Generally, the cost effectiveness analysis is used to address only those questions that relate to the internal efficiency of the resources invested, while, the cost benefit analysis examines the external efficiency of the investment made. Both terms are used for the economic evaluations, in the latter case, output are measured in monetary terms such as labour market rewards for education, while in the former case, they are measured in terms of the physical output, such as, level of achievement (Tilak, J.B.G. 1995).

The procedure for estimating a rate of return for investment in education depends upon the availability of data and the degree of desired accuracy of data.

Cost Efficiency and Cost effectiveness Analysis

As is discussed above, the concept of the cost effectiveness refers to the relationship between a systems' output (for example, learning achievements) corresponding to the inputs (for example, teaching cost). When the objectives are same, say for two institutions, cost effectiveness analysis is used to identify as to which institution (or even type of teaching), produces the desired output at a lower cost. On the other hand, efficiency is the ratio of output to input; and a system is cost efficient if, relative to another system, its output cost of per unit is less than that of per unit of input. We can say that a system increases its cost efficiency when

it maintains output with a less than proportionate increase in inputs (Rumble, 1997:120).

It is possible that cost can be effective without being efficient, but it is not possible to be efficient without being effective. Effectiveness depends upon the quantity and the quality of the output. Efficiency depends not only on these factors but also on the use of resources as an input to the system. For example, if two universities produce an equal number of graduates, the university, whose teaching performance is better, (as indicated from the examination results, or some measures of learning achievements of graduates) would be cost effective since the university attains its objectives in quantitative and qualitative terms. If the costs of producing their graduates are also less than the costs incurred by the other university, then the university could be said to be cost efficient as well (Ansari, M, 1992:71).

SECTION 3

COST ANALYSIS IN OPEN AND DISTANCE LEARNING

In the section two, you studied about various basic concepts of educational costs. This understanding shall help you appreciate better the discussion in this section on various types of costs applied in open and distance learning system. We talked about in the previous section the concept of 'economies of scale', which is very important in cost estimation of open and distance learning system. There is a common belief that open and distance learning is more cost effective than traditional face to face (F2F) classroom teaching. That is, if the number of learner's is increased in the distance education institutions, the cost per student would be lower. This may or may not be true because it depends largely on the type of media used and the enrolment size.

The objective of this section is to apprise you about:

- ◆ the different types of costs used in ODL;
- ◆ cost terminology and methods for cost estimation;
- ◆ what kind of costing you may need to carry out;
- ◆ how different types of costs affect ODL with different media choice.

Why Study Cost of ODL?

Cost analysis is concerned with establishing costs functions, which attempt to relate costs to measure of output. In fact, the aim of cost analysis is to study how costs change as input or output variables change. It can help in a number of ways. For instance, one can

- ⇒ decide whether, the budget is adequate for specific programme or not;
- ⇒ compare the estimated cost of the proposed programme with that of available alternatives;
- ⇒ find out the effectiveness of the programme delivery;
- ⇒ study the behaviour of the resources used;
- ⇒ ensure that ODIs are getting value for their money.

Major Activities in ODL

Costing in ODL is based on various activities in the system. These are: production and delivery of print and audio/video materials, administrative

and academic support services, assessment and evaluation. In the cost analysis, you can find out how much it costs, for each activity, set a budget, determine the price, and compare the costs of different alternatives.

Resources Used in ODL

The resources used in ODL system include the following:

- ◆ staff, (teaching and non-teaching);
- ◆ printed material (paper, publication, staff involved in this activity);
- ◆ production of audio/video material;
- ◆ launching online programmes;
- ◆ learner support service (staff at headquarter., at regional centre, study centre, etc.);
- ◆ equipment and furniture (durable items like staplers papers/pans and pencils and consumable items, computer and furniture);
- ◆ buildings (purchase of land, construction of buildings, renovation of buildings, rented buildings/ accommodation, maintenance costs of buildings);
- ◆ library (books and periodicals), inventory items/resources, store (storage of printed/audio-video/ material, stationary items and raw material);
- ◆ travel and postage, etc.

What will be Your Role in Estimating Costing?

You may be a decision maker or a researcher or a faculty member in your institution. At the level of specialization, your role may be that of course designer/producer of learning material/audio-video/multimedia programme. As a course deliver, your task is to provide support services and facilities to the learner. Your role may be different from the above said activities. But, you have to decide on which cost ingredients are going to be included in the study and which excluded. For example,

- ◆ should student costs be included or not?;
- ◆ if a system developed elsewhere is generated, should you include or exclude the costs of development?;
- ◆ have an additional supplementary costs and the costs that were incurred in old system but will no longer be incurred in the new, both been identified.

All the above said activities depend upon the availability of data and information. Collect the data and information from the institution's accounts, since this tell us what has actually been spent. The limitation of the data should be understood carefully. Is this an estimate, or an actual cost? If it is a notional cost, is it reasonable or not? It is much better to collect data the ways that will enable it to be aggregated later, if necessary.

You should be clear as to the purpose of the costing exercise, and decide how this will affect the analysis. For example, how accurate are the

findings? What assumptions have been built in? If the assumptions have to be changed, what affect will this have on the findings? What are the findings? How reliable are they?

You have also to see the evaluation aspects of your report. For example, is the management of your institution satisfied with the findings of your study. Did they feel that their questions were answered and accept the methodology?

Cost Analysis of ODL

There is a general thought, that open learning means learning on the cheap. This may or may not be true. It largely depends on which media are used and how many learners are involved. Those planning a ODL system in the hope that they will get in economies of scale must ensure that:

- ◆ the variable cost per student is less than that found in conventional system;
- ◆ the number of students should be higher to bring down the average costs per student to a level where it is lower than the average cost in the conventional system; and
- ◆ Drop out rate is kept reasonably at the low level.

The above conditions have very significant implication for the choice of media, the resources put into student services and resources put into fixed costs of the institution. Thus, it is not necessary ODL system is cheap learning. It depends on the choice of media, number of students enrolled, quality of the printed material used, number of staff employed and time of the staff (who produce the material, support the students and time of the learners themselves). It is clear that ODL systems have a high absolute cost and that it is cheaper to use conventional methods where student numbers are restricted.

Factors affecting the costs of ODL

Studies have established that in F2F teaching, most part of the expenditure is on teacher's salary. It increases with automatic promotion in the pay structure of the teachers as in India. There is a tendency for the teacher costs to rise over time. The choice of media also affects cost in ODL. Since distance education maximizes accessibility to educational opportunities, a variety of media, like the printed material, radio, TV/CDs/Internet / telephone, fax are used for imparting instruction. The costs of the teaching through different media vary mainly due to the influence of factors like fixed and variable costs, the composition of which significantly varies for different media. For instance: fixed costs are much higher for TV than for radio. It can be lowered if existing broadcasting installations are used.

In case of small audience size, small media like slide projector or tape recorder have greater cost advantages than the big media like TV and computer based instruction or Internet. The choice of media mix is very

crucial for promoting the distance teaching-learning process. For taking a decision on media choice, other socio-cultural and political objectives of imparting education are also taken into account besides the economic costs. It has been apparent from the foregoing discussion that the cost of ODL depends on the extent of the utilization of resources, the types of technology, the size of enrolment and the number of courses offered. It also depends on the quality and the quantity of the paper used for printed media and the quality of equipment for electronic media or the extent of multimedia use in computer-based instruction. Therefore, costs in ODL can be expressed symbolically as

$$C = f(E_n + C_n + S_n + M_c + E_{nq} + F_p)$$

Where,

C = costs,

f = function

E_n = number of learner enrolled;

C_n = number of courses/programmes offered;

S_n = number of staff (teaching and non-teaching);

M_c = choice of media;

E_{nq} = quantity and quality of media;

F_p = part time faculty (counsellors/coordinators).

To conclude, the most important factors affecting the cost of ODL are:

- (a) number of learners enrolled;
- (b) number of courses/programmes offered;
- (c) number of teaching and non-teaching staff;
- (d) choice of media;
- (e) quantity and quality of equipment; and
- (f) part - time faculty (coordinator/counsellors).

Few studies have been conducted in unit costs analysis of ODL. For example, Pillai and Naidu (1997) analyse the unit costs of IGNOU. Ansari (1992) and Datt, (1994), analyse per student cost of conventional universities in comparison to institutions of distance education. The cases of these studies have been presented in Section-5 of this handbook.

Cost Functions in ODL

Generally, in F2F classroom teaching, teaching costs are treated as variable cost and it is directly related to the output of learners. Therefore, fixed costs (those that are not directly related to output) in relation to total costs in F2F teaching are very small in comparison to ODL. In ODL, the expenses are incurred on printing of learning material; audio/video/information technology, television/radio/telephone/fax etc and other media are called variable cost. The costs are incurred irrespective of the number of learners to be enrolled in the system. The cost function of ODL can be expressed as:

$$TC = FC + VN \dots \dots \dots \text{Eq.I}$$

Where,

TC = total cost,
 FC = fixed costs,
 V = variable cost per unit of output,
 N = learner (number of learner)

The average cost is derived by dividing the total cost by the number of units.

$$AC = \frac{TC}{N} \dots\dots\dots \text{Eq.II}$$

By putting the value of TC from equation I to equation II, alternatively the AC can be expressed in following

$$AC = \frac{FC}{N} + V \dots\dots\text{Eq.III}$$

An Illustration

For example, the School of Sciences (SOS) of IGNOU offers B.Sc. (Animal Sciences) programme. At present, 1000 learners are enrolled in this programme, but it is expected that the enrolment may increase upto 2500 during the next few years. Let us assume that the Director of the school is to prepare a projected budget for the course, based on the current enrolment, with an assumed growth of learners to 1500, 2000 and 2500 learners in the next three years respectively. The projected budget has presented in the Table 3.1.

Table 3.1 : Projected budget of the B Sc Programme (Non-Plan) In Rupees.

Sr. no	Item (Variable costs)	Unit Cost	Enrolment-1 1000	Enrolment-2 1500	Enrolment-3 2000	Enrolment-4 2500	Enrolment-5 3000
1.	Learning material cost	20	20,000	30,000	40,000	50,000	60,000
2.	Printed Assignment (Evaluating)	50	50,000	75,000	1,00,000	1,25,000	1,50,000

3.	Postage and packing (learning material /assignment)	10	10,000	15,000	20,000	25,000	30,000
4.	Student Support Service*	20	20,000	30,000	40,000	50,000	60,000
5.	Total	100.00	1,00,000	1,50,000	2,00,000	2,50,000	3,00,000

Note: Includes counsellor's and coordinator costs.*

Table 3.1 indicates how the budget prepared by the Director of SOS for the next five years. He/she estimated budget on the basis of the current unit costs and also the projected enrolment for the next five years.

Relationship between Total, Average and Marginal Costs in ODL

By now, you must have understood the concepts and the relationship between total costs, average costs and marginal costs. This type of relationship is slightly different in ODL, in comparison to conventional mode of teaching. As a general rule, the fixed costs of ODL system are high when compared to conventional system, but the variable costs per student are low. Whereas, the rate of decline in AC is high at initial stage and then quickly falls off at later stage. You should note that the marginal cost is always equated with the direct costs. This is very useful when we are considering small expansions of our system.

Break-Even Point

As mentioned earlier, cost function depends on various factors like choice of media and technology. Each media and technology has different cost structure. One medium of instruction may have a high fixed cost, while another may have low fixed cost; on the other hand, the first medium may have a high variable cost per unit of output, while the other may have a low variable cost, or even none at all (Rumble, 1997:37).

Further, to examine whether telecasting or web-cast or online programme is cheaper in comparison to using CD/audio/video and F2F learner support, we have to see the number of learners to be covered through this means. This gives a *break-even point* at which the cost of the two options is the same. Let us understand this concept in the following illustration.

An illustration

Suppose, IGNOU wants to conduct an orientation programme for its Regional Directors. The costs for transmission of 25 minutes programme via satellite comes to about Rs. 0.2 million which is a fixed costs in relation to the number of students covered. If IGNOU chooses to use cassettes/CDs, (which include material, equal to six transmitting

programmes) it has to incur costs on buying CDs, copying the programme, packing and postage costs etc. and it comes to Rs. 400, which is an average cost of sending CDs to each learner. IGNOU would like to know the number of users of the CDs before sending it.

We can analyze this result by using the formula

$$B = F \div V$$

Where,

B = break even point;

F = fixed cost of transmitting or web casting the programme;

V = variable costs of sending a videocassette or CDs to each study centers.

From the above illustration

Fixed cost is = Rs. 2,00,000, and Variable cost is = Rs. 400

We can generalize this result by using the above formula:

$$B = F \div V$$

$$B = 200000 \div 400 = 500$$

The above example is presented in Figure 3.1.

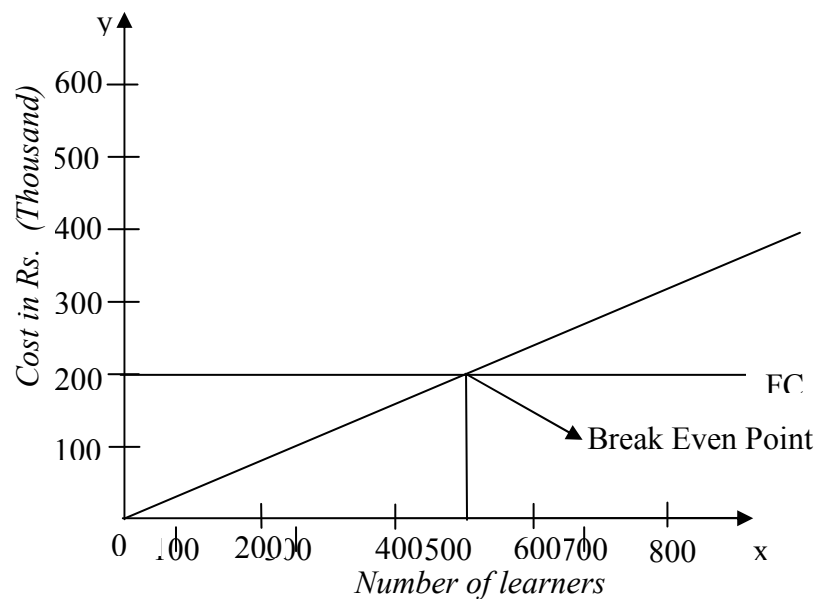


Figure 3.1: Comparative costs to show break-even point for delivery of programme between satellite transmission and through audio video/CDs.

Figure 3.1 shows that if there are less than 500 students, it is cheaper to send out CDs; if there are more than 500 students, it is cheaper to transmit the programme by satellite.

By now you must have understood the concept and how to choose alternative delivery mechanism keeping in mind the cheaper costs. Let us

now understand whether ODL system is cheap in comparison to F2F classroom teaching.

Now let us discuss about the break even point, which helps us in deciding about the expansion of the system and allied activities. The break-even point is calculated using the following equation.

$$B = \frac{F_1 - F_2}{V_2 - V_1}$$

Where,

B = the break even point,

F₁ = the fixed cost of ODL,

F₂ = is the fixed cost of a traditional system,

V₁ = variable cost of ODL,

V₂ = variable cost of the traditional system (Rumble, G., 1997:40).

An Illustration

Let us assume that: the Delhi School of Economics (DSE) teaches an Economics course through F2F mode of teaching. The fixed cost of this course for 20 learners is Rs. 10,000 and variable cost is Rs. 15,000 per learner. The management of DSE decide to accommodate 100 more learners. But, it is reluctant to expand staff and provide more space to accommodate 100 learners due to limited resources. Let us further assume that they decide to launch this programme through the ODL system, which brings down to the variable costs to Rs. 3000. However, they estimated that the total investment for developing self-instructional material will be Rs. 4,00,000. The Director of the School asks the course coordinator to provide the number of learners needed to break-even such that per student cost of teaching is less by ODL than F2F learning.

We can calculate the break even of the above scenario by applying the following formula

$$B = \frac{F_1 - F_2}{V_2 - V_1}$$

Where,

F₁ = fixed cost of ODL = Rs. 4,00,000

F₂ = fixed cost of traditional system = Rs. 10,000

V₁ = variable cost of ODL = Rs. 3000

V₂ = variable cost of traditional system = Rs. 15,000

$$\begin{aligned} B_1 &= \frac{(400000 - 10000)}{(15000 - 3000)} \\ &= \frac{390000}{12000} = 32.5 \end{aligned}$$

The above calculation suggests that DSE needs to increase its enrolment from 20 learners to 33 learners to cross the 'break even' point. At this stage, launching the course through ODL will prove to be cheaper than traditional F2F teaching.

To conclude, open and distance learning is not necessarily an economical method of learning. When we use costly techniques (satellite technology/computer/Internet etc.) it can be very expensive. As mentioned earlier, it depends on economies of scale. Decision makers would not invest on high technology, if there were only a few learners to benefit from it. If we adopt high tech for course delivery and if we include private cost of the distance learner in our cost calculation, ODL wouldn't perhaps be an cheap learning.

Cost Effectiveness and Cost Benefit Analysis in ODL

You may have by now understood the concept of cost effectiveness and cost benefit analysis as discussed in the previous section. We know that cost effectiveness analysis is a technique for measuring the relationship between the total input or costs of a project or activity, and its outputs or objectives. Both cost and effectiveness must be quantified, but it is not necessary to measure them in monetary terms. On the other hand, cost benefit analysis, attempts to measure both the costs and benefits of a project in financial terms by means of a rate of return.

Very few attempts have been made by the researchers to analyse cost-benefit in open and distance learning system. It is, generally, estimated by applying different approaches. It also depends upon the availability of required data. Some researchers use intuitional data for estimating cost and analyze individual earnings for estimating individual benefit. And, private rate of return can be estimated by the earning differentials.

This approach measures the difference in earnings between individuals who have had different level of education. For instance, we wanted to know how much graduates earn in comparison to non-graduate? The assumption is that the earnings differentials between educated and under-educated individuals are entirely due to education and not to other factors. (Rumble, 1997:182).

Benefit to Individual

Woodley (1995) found for UKOU graduates who had obtained their Bachelor degree between 1985-89: 74 percent of them were in full-time employment when they commenced studies, and 8 percent in part time employed; 34 percent had in fact moved from one occupation category to another; and overall more than four in ten of UKOU graduates reported some kind of occupational benefit. On the other hand, Gaba (1999) found, that 416 graduates who completed their graduation (BA / B Com) between 1992 to 1995 from IGNOU, 56.2 percent were in full time employment; about 13 percent were unemployed; and 11 percent were fresh students who just passed out from both formal education institutions and the open learning system; and 12.82 percent were self employed before joining IGNOU. The survey showed that those who were in full time employment

got promotion at their respective institutions; the unemployed got job after passing out from IGNOU. Apart from these occupational benefits, the learners reported personal benefit e.g., self-confidence and got married after their education.

Benefits to the Employer for ODL

Research studies show that use of distance teaching methodology can help reduce employer's cost of giving education and training to their employees in comparison to traditional F2F teaching. Research in UKOU shows that learning can take place at the individual's own time and own pace, thus enabling individuals to work and study at the same time (Rumble, 1997: 191). Gaba (2002) found that only a few employers gave preference to graduates for further promotion who got education on the job from ODL system. However, this system enhanced employee's skills on the job and at lower cost without losing the productivity of the industry.

In the next section, we shall discuss the steps for estimating the costing of distance learning institution.

SECTION 4

METHODOLOGY FOR COST ESTIMATION

We have so far discussed, the concept and structure of costs, relationships among various costs types and factors affecting costs of ODL system. In this section, we shall discuss the steps in calculating the costs of open and distance learning.

The various methodologies for assessing the costs of ODL were developed by different authors like Jamison and Klees (1973), Klees and Wells (1977), Orivel (1980, 1987) and Eicher (1980), Rumble (1987, 89, 97, 2001) and Perraton (1982) and World Bank. You will find below a general format for estimation of cost, which has been designed on the basis of the review of above works.

- (a) identify the scope of the study;
- (b) identify what types of costs are involved;
- (c) decide from where the data will come from;
- (d) decide on the basic format of the analysis; and
- (e) presentation of the report

Costs of self-instructional Printed Material

You may be producing self-instructional printed material or electronic material for your institution/organization. But, you have to estimate costs at different stages. The stages may vary from institution to another institution. Some of the stages are: (i) pre production , (ii) production (iii) post-production (iv) delivery and (v) training.

A. Estimation of Pre-production Costs

You have to estimate cost of preliminary work before you even begin to develop your material? For example,

- i) carrying out need assessment study or market research;
- ii) interview with the learner;
- iii) preparing draft proposal;
- iv) training of new course writers;
- v) stationery, transport expanses;
- vi) meetings and workshops;
- vii) miscellaneous activities.

B. *Estimation of Production Costs*

- (i) Printed self-instructional costs: For the development of new material, you have to pay experts in house or outsiders for subject or ODL system expertise and instructional designer. In addition to this you have to pay instructional designers, unit writers, typing/data entry/proof reading/editing, illustrator, copyright fees and others.
- (ii) Media production costs: For the production of audio/video, what cost might you incur for the Media production i.e. payment paid for the purchase of audio video (cassettes), audio video production costs i.e. payment to actors / resource persons /artist, Music, travel, teleconferencing cost (equipment & telephone expenses) and videoconferencing cost (satellite / broadcast expenses).
- (iii) Information and communication technology production costs: If you introduce web based education (online) or multimedia at your institutions. You incur on equipments like computer, Internet cost, CDs, programming, CBT design and software.

C. *Post -Production Costs*

After the production stage, you may also incur for post-production cost. For example:

- ◆ storage of printed and electronic material;
- ◆ producing multiple copies of the printed and electronic material;
- ◆ expenses incurred on pre-testing the material before delivery;
- ◆ packing the material;
- ◆ update the material.

D. *Delivery Costs*

After developing the course, the next step is to deliver the programme. You may be thinking about delivering support services for the learners of your institutions. For this, you have to estimate cost of learner support services. In fact, delivery costs depends on institutional policy. However, you should identify the following items which are common to institutions and on which some expenditure is incurred.

- ◆ Postage the material /supply the material to the learner.
- ◆ Support service to learners in general and differently abled learners in particular.
- ◆ Analysing learner needs.
- ◆ Training to support staff, etc.
- ◆ Counselling, assignment administration and other related activities.
- ◆ Miscellaneous activities.

E. *Training Cost (multi-purpose costs)*

Training is an important aspect in ODL systems. If you are a decision maker of your ODL institutions, you need to know about the costs in order to choose

an appropriate form of training. This means you require cost comparisons between training through conventional means and ODL means. The following questions are, therefore, meant to help you for costing exercise of any form of training.

- ◆ Decide training through conventional mode or open learning mode or combination of both.
- ◆ Some of the equipments may be used for more than one purpose, Identify, how much of the costs should be allocated to this particular programme
- ◆ Use of training room, identify what share to the costs should be allocated to this particular programme?
- ◆ Decide the running cost. For instance : some training institutions or centres or units like STRIDE have their own faculty which contact training sessions. Sometimes outside experts are called to take up sessions, and for which honorarium is paid. In this case, count in an appropriate fraction of their job costs (annual salary plus allowances) for the time they would spend for particular sessions.
- ◆ How much time will the trainees need away from the job? If you can quantify the loss of output, count it as the cost. If not, count in the appropriate factors of their employment costs.

Cost of Media Production

In addition to the above identified variables, you have to take overall administrative costs, which implies the management of the system, the enrollment of the students and their follow up during the time of their enrollment in the institution.

You can also analyse the costs of media production. For example, you wanted to estimate costs of broadcast media such as radio and television. Orivel, F (1987) classified costs of radio and television into four components. These are: (i) administrative costs; (b) production costs; (c) diffusion costs; and (d): reception costs. If we take television as an example, production costs refer to the costs involved in the production of the tapes in a television studio (or outside). Diffusion costs include the broadcasting costs through a terrestrial hertzien network or through a satellite. If video-cassettes are distributed instead, diffusion costs will correspond to the duplication of the tapes and to their circulation. Reception costs, concerns the costs at the user level. Oliver identified following variables in the case, if both media (radio or television) coexist in the system under investigation.

- Recurrent costs of production media (RCPM).
- Capital costs of production media (CCPC).
- Recurrent costs of diffusion media (RCDM).
- Capital costs of diffusion of media (CCDM).
- Recurrent costs of reception of media (RCRM).

➤ Capital costs of reception of media (CCRM).

Recurring costs of production media (radio or television): you may further identify input variables under these heads. For example: RCPM include inputs: salary costs (professional staff and supporting staff, full time and part time), non-salary recurring costs (observed expenses and shadow prices) and purchase of programmes from outside. It all depends on quantity, quality and time i.e. yearly costs.

Capital costs of production media (radio or television): Discount rate of building and equipment. Building costs can be estimated on the basis of office space used during the period of media production. It can be quantified in square meter. It can be estimated on the basis of present rented value and annualized costs or shadow prices. We have already explained in detail in section 2.

Delivery cost of the programme: Orival give following tables, which are produced and diffused by ODL system.

Table 1: Production

	Total Stock	Last year production	Average production
TV Programmes (in hours)			
Radio programmes (in hours)			
Printed materials (in pages)			
Handwritten correspondence	Number of corrected exercises		

Source: Orivel, F. (1987) Cost and Effectiveness of Distance Teaching System: a methodological approach, Universite de Bourgogne-Dijon

We can calculate production costs of hour of television or radio programme by following equation.

$$\frac{\text{RCPM} + \text{CCPM}}{\text{Last year production/ Table 1}}$$

Where, RCPM= recurring costs of production media
CCPM= capital costs of production media

Similarly, production cost of one page of printed material can be calculated by

$$\frac{\text{RCSIM} + \text{CCSIM}}{\text{Last year production/ Table 1}}$$

Where, RCSIM= recurring cost of self-instructional printed material
CCSIM= capital cost of self-instructional printed material

and, broadcasting cost of one hour of TV or radio programme can be calculated by

$$\frac{\text{RCDM} + \text{CCDM}}{\text{Number of TV/Radio programme} \times \text{No. of broadcast hour during last available year}}$$

Where, RCDM= recurring costs of diffusion media

CCDM = capital costs of diffusion media

In this way, you can identify cost questions and add them to the list for purpose of your cost analysis. You include following input while estimating your total fixed costs and total variable costs.

Total Fixed Costs: Production of TV and radio; Broadcasting of TV and radio; production of printed materials and Administrative costs.

Total Variable Costs: Duplication and circulation of TV and radio programmes; reception costs multiplied by the number of students (registered), duplication and distribution of printed materials; face-to-face and correspondence.

Tips for Cost analysis

A. Collection of Data and Information

- Collect data and information from original records like institution's budget copy etc.
- Check meaning of data; define average, variable and fixed costs carefully.
- Understand the limitation of data, i.e., estimates or actual data.
- Record the data in ways that will enable it to be aggregated later, if necessary.

B. Data Analysis

- The purpose of the costing exercise should be clear, and decide how this will affect the analysis.
- Decide the items, which need to be included in the analysis and also what should be excluded?
- How accurate are the findings? Did the findings give answers of all questions?

You will appreciate that costing is like statistics; sometimes it can be useful, and sometimes it cannot be. But the findings would have to be carefully evaluated and interpreted by decision makers/policy makers.

SECTION 5

CASE STUDIES

This section sensitises you to specific costing problems and issues related to ODL system particularity in the developing world. The selection of the following mini case studies in this section has been made a view to providing different methodologies adopted in these studies. The information gained from this case study helps you develop a fairly comprehensive idea about the cost pattern of Open University system in the country.

Case Study-1

Economics of Distance Education: The IGNOU Experience

(Source: IGNOU(2001) Block 5, Course 317,STRIDE,)

Pillai and Naidu (1994) conducted a study on 'Economics of Distance Education: The IGNOU Experience'. They have analysed the direct, indirect, fixed and variable costs. In the present case, we shall specifically talk about cost per student and cost per course.

Cost Per Course

Development of print material

The calculation of course costs was based on the data collected from a sample of 10 courses from various schools of studies. The costs under different heads are given in Table 5.1.

Table 5.1: Cost for development of course materials of an 8 credit course

Course heads	Expenditure (Rs.)	%
Organising expert committee meetings	25,752	12.74
Fees paid to course writers	28,000	13.86
Fees paid to editors	7,334	0.365
Faculty salaries	1,40,978	69.75
Total	2,02,114	100.0

Table 5.1 indicates that the major chunk goes to the faculty salary (69.75%) followed by fees paid to course writers, organizing expert committee meetings, and the editorial charges.

Production of print materials

The expenditure incurred at this stage includes payments made for data entry operator, illustration work, designing and composing of text, paper, printing and binding (these later four heads being variable with the number of

students. The costs for the production of 8-credit course is given below in Table 5.2 based on the 10 sampled courses of the University.

Table 5.2: Cost of production an 8-credit course

Heads	Costs	%
Typing charges paid to agencies other than University staff	3,849	3.27
Internal staff salary(for typing, data processing, etc.)	30, 975	26.28
Charges for illustrations, drawing, etc.	5,504	4.58
Charges for designing of texts	18,750	15.91
Charges for composing of texts	58,880	49.96
Total	1,17,859	100.00

Table 5.2 indicates that about 50 percent expenditure was incurred on composing of 8 Blocks, consisting of 512 A4 size pages.

Development and production of audio and video programme

The costs heads for Communication Division were categorized into five types:(i) staff salary, (ii) material like cable, etc., (iii) consumable like tapes bulbs/tubes etc., (iv) software used for producing the programme, and (v) programme production. The total expenditure was incur Rs. 40,24,729 on all five categories. The cost of ten audio programmes was considered equivalent to that of one video programme. Therefore, the expenditure per video programme(or say a video equivalent programme) was Rs. 55,899 (through the cost of an audio programme was Rs.,5,410 i.e. ten audio programmes were made equivalent to one video programme in terms of cost). In the calculation of the cost of audio video programmes, 63 video and 93 audio programmes produced in the year 1989-90 have been considered. The 93 audio programmes have been made equivalent to 9 video programmes, therefore, the costs calculation is based on 72 video programmes. The university had fixed a standardized provision of 4 video and 5 audio programmes per 8 credit course. Therefore, the cost of audio and video programmes for 8 credit course comes to Rs, 250, 644.

Now, we can find out the annual fixed costs under all the heads of expenditure and for the 8 credit course as a whole in Table 5.3.

Table 5.3: Total fixed costs and annual fixed costs of an 8-credit course

Heads	Total fixed cost (Rs.)	%	Annual Fixed cost (Rs.)
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Development of print material	2,02,114	35.42	49,922
Setting the text for printing	1,17,859	20.65	29,111
Five audio programmes (production)	27,048	4.74	6,681
Four video programme (production)	2,23,596	39.19	55,228
Total cost	5,70,617	100.00	1,40,942

The life of a course (print, audio and video) has been assumed to be 5 years. Therefore total cost is 5 years, and the annual fixed costs has been calculated from the total fixed cost by taking into account the interest rate (i.e.7.5% in this case) and the life time of the materials (i.e. 5 years in this case). If these courses run for more than 5 years (i.e. without any major revision), the annual fixed cost would automatically get reduced. For instance, if the course can be offered for 10 years without any major revision, the annual fixed cost under different heads noted in Table 5.3 would get reduced by 50 per cent under each head.

Unit cost

The unit cost in the present case, is based on the annual recurrent cost, viz., semi-variable cost, directly variable cost, fixed costs and indirect cost (or the institutional overheads) for the financial year 1989-90, in relation to the number of students enrolled to various programmes for that year.

The total and per student recurrent costs (i.e., fixed costs, semi-variable costs, variable costs, and indirect costs) are presented in Table 5.4

Table 5.4: Total and per student annual recurrent costs (total number of students=45,859)

Costs	Total costs (Rs. in '000')	% to total	Unit costs (Rs.)
Fixed costs	1,48,32	17.67	323.42

(direct)			
Semi-variable costs	1,25,08	14.91	272.75
Variable costs	2,73,81	32.63	597.07
Indirect costs	2,91,97	34.79	636.67
Annual recurrent costs	8,39,18	100.00	1829.91

Table 5.4 indicates that the fixed costs (direct and indirect) accounted for 52.46 percent, and the total variable costs (semi variable and variable costs) accounted for the rest i.e. 47.54 percent. This cost pattern reveals that both the total recurrent cost and the per student recurrent costs were highest in the case of indirect costs, followed by, in rank order, variable costs, fixed direct cost and semi variable costs. The per student annual recurrent costs for 1989-90 was Rs. 1829.91.

Case Study 2:

Distance Education versus Traditional Education: A Cost Comparison

Higher Education

(Source: Datt, R. (1987) 'Distance education versus traditional higher education: A cost comparison', in Kaul, B.N. et al. (Eds.) *Studies in Distance Education, New Delhi: AIU and IGNOU*).

Rudar Datt compared the cost of distance education versus traditional higher education during 1988. He analyzed the per student cost of ten conventional colleges affiliated to Delhi university and the school of correspondence Course of Delhi in Table 5.5.

Table 5.5 Cost of education per student in selected colleges in Delhi and School of Correspondence Courses, Delhi (1984-85) (In Rs.)

Institutions	Number of students	Cost per student	Fee income student	Subsidy per student
Conventional colleges (n=10)	13,648	3,516	257	2259

SCC, 1983-84	13,825	613	259	354
SCE-1984-85	18,520	552	232	320

Source: Compiled from the data provided by Datt Ruddar (1987) in his chapter 'Distance education versus traditional higher education: A cost comparison' in B.N.Koul et al (Eds.) *Studies in Distance Education*, AIU and IGNOU, New Delhi.

Table 5.5 shows that the per student (recurrent cost) in 10 conventional colleges and School of Correspondence Courses (SCC) of University of Delhi. The data reveals that for the year 1984-85, the average costs per student in the conventional colleges under study was as high as Rs 3,516, while the average fee charged was as low as Rs. 257. In relative terms, fee component of the cost was merely 7.3 percent whereas the share of the state support accounted 92.7 percent. As against the data pertaining to the SCC the cost per student showed a declining trend as enrolment showed an upward trend from 1983-84 to 1984-85. The economies of scale do become operative in the case of SCC which was not possible in the case of conventional colleges. It would also be worth noting that fee income as a proportion of costs was as high as 42 per cent in the SCC.

Case Study 3

School Education

(Source : Gaba, Ashok (1997). 'Is open schooling in India really cost effective?', in M. Mukhopadhyay, and, M. Parhar (Eds) *Open and Distance Education*, New Delhi: Jawahar Publications and Distributors).

Gaba (1997) analysed the student open schooling (institutional) cost versus formal schooling in Table 5.6.

Table 5.6 Comparisons between formal schooling and open schooling

Type of Institution	No. of Learners	Per learner Institution costs (In Rs.)
Kendriya Vidhayala	30,990	904.52
Stat Govt. Schools	17,741	1019.04
Aided Schools	74,115	0704.63
NIOS (formerly known as National Open School)	40,884	0637.00

Table 5.6 gives a broad idea of the cost per student (recurring) in three formal schooling systems in comparison to NIOS (providing school education though ODL system). You will notice that the cost of formal schooling is higher in all the three types of formal schooling than that of open schooling. The state government school spends more than the rest. The expenditure on salary of the teaching and non-teaching staff is higher in the government and the government aided schools (about 70 to 95 percent) as to NIOS (about 8 per cent).

Case Study 4:

Costs of Developing Online Learning Materials

(Rumble, G. (2001) *The costs and costing of networked learning*,
http://www.aln.org/alnweb/journal/vol5_issue2/Rumble).

Rumble (2001) emphasized that in virtual education institutions overhead costs will be obvious, but in dual mode systems there is the possibility that these costs can be set aside in order to give the e-education system a 'free education'. Such free education will not survive expansion, nor can they be ignored in cases where comparative costing between online and other systems are being attempted.

Therefore, the institutional costs of a fully developed e-education systems would include: (1) developing e-materials; (2) teaching (and assessing) students online; (3) accessing the web site; (4) administering students online; (5) providing the infrastructure and support within which e-education can operate; (6) planning and managing e-education at the macro-level.

He further emphasized that for many years distance educators have known that not only media and technologies have their own cost structures, but also that some media are more expensive than others. The broad differences in media costs are carried through into the development of internet-based courses. Arizona Learning Systems found a wide variation in the costs of developing a course, of from US\$6000 to \$1,000,000 for a three unit internet course, depending on the approach used. Much of this is the cost of academic and technical labor. The cheapest approach involved the presentation of simple course outlines and assignments; the most expensive, at \$1,000,000, involved virtual reality as shown in Table 5.7

Table 5.7: Cost of developing a three-unit internet course (US\$)
(Arizona Learning Systems, 1998)

Heads	Amount
Course outlines and assignment	6,000
Text	12,000
Text with reference material	18,000
Text with reference material and images	37,500
Audio and video	120,000
Simulations	250,000

Virtual Reality	1,000,000
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Comparing e-education costs with the costs of other forms of distance education

Rumble also analyses the cost comparison with other forms of distance education? He referred to Australian study of Inglis which shows that the online version of a course was less cost efficient at all levels of enrolment than a print-based distance education course as presented in the following Table 5.8.

Table 5.8 Average cost per student of print and online viewers of course

Volume of students	Average cost per student: 1999 (in Aus \$)	
	Print version	Online
50	169.84	217.71
100	125.38	171.63
150	110.56	156.27
200	103.15	148.59

Case Study 5

(Source: Jung, I. (2000)'Technology innovations and the development of distance education: Korean experience', *Open Learning* 15 (3), 217-32.)

Jung (2000) compared the costs of standard three credit courses at the Korea National Open University. The course involving textbooks, CD-ROM and electronic tuition was more expensive than the courses using textbooks, radio and face-to-face tuition, or those using textbooks, television and face-to-face tuition. However, dropout was only 10% on the e-course, compared with 60% on the other two types as shown in Table 5.9.

Table 5.9: Costs of distance education at the Korea National Open University

	TV-based course	Radio based course	Web based course
Rating	16 week, 3 credit	16 week, 3 credit	16 week, 3 credit
Media	Textbook, TV programmes and F2F tuition	Textbook, radio programmes and F2F tuition	Textbook, video-and audio-clips, electronic tuition
Number of students	1000	1000	30
Cost to produce and deliver (in US \$)	80, 000	35,000	13,000

Cost per student (in US \$)	80	35	434
Drop out rate (%)	60	60	10
Cost per completed course (in US\$)	200	87.5	482

These studies suggest that e-education is leading to the costs of distance education up. Some of these additional costs burden are being passed onto the shoulder of the students. As Rumble stated “And while no doubt the costs of the technology will come down, the fact remains that those who are not able to afford e-education are being written out of the game”.

Case Study 6:

Costs Benefits and Return on Investment for Technology-based Training

(Source: Constantine Osiakwan and David Wright (2001) Distance Training for Operating Equipment: A Cost-Benefit and Return on Investment Analysis in *The American Journal of Distance Education*, 15(1).)

Constantine Osiakwan and David Wright (2001) analyze cost benefit and return on investment analysis of equipment vendor that is providing distance training on its equipment. Authors analysed the fixed and variable costs per course and derived break-even points for Remote Access Distance Learning (RADL -training provided over a voice) and data network and classroom-based training (CBT). Using the current costs of training plus the capital cost of RADL, they derived profitability points and return on investment (ROI) figures.

Fixed Costs:

The fixed costs of CBT include the costs of course material and assumed that the course runs for two years or that the content of the material is revised every two years. *Variable Costs:* It is assumed that the instructor travels to another location to teach. The variable costs CBT for a two day course attended by eight students include the costs of the instructor, subsistence, travel, printing and shipping of course material, and registration and billing. The distribution of the fixed and variable costs for RADL and CBT are given in Table 5.10.

Break-Even Analysis

The Variable costs of RADL increase more rapidly than those of CBT, primarily because of costs of a facilitator and for support. The variable costs are calculated on a per year basis and vary with the number of sessions per year. Total costs (variable and fixed costs) of CBT and RADL differ and

increase when the number of sessions per year increases. As such, there is no break-even point between RADL and CBT.

Benefits of RADL

The benefits of RADL discussed are considered to be from the perspective of the training centre. These are:

- ◆ RADL eliminates the instructors’ need for travel and subsistence, resulting in cost and saving;
- ◆ the instructor has more time to obtain up to date course content for training, it is needed;
- ◆ the benefits of RADL for employees and customers include the travel costs (flight, car rental) and accommodation (hotel and meals) costs;
- ◆ student can take courses when they feel comfortable;
- ◆ each student has a PC to himself/herself for the hands-on-experience;
- ◆ employees and customers have easy access to training.

Table 5.10: Distribution of fixed and variable costs of RADL and CBT

Heads	Percentage
<u>Fixed costs of RADL</u>	
(a) Course material preparation	27
(b) Incoming ISDN PRI	27
(c) Studio room	26
(d) Lease of 8 workstation	20
<u>Variable costs of RADL</u>	
	35
(a) Facilitator	29
(b) Printing and shipping	24
(c) Instructor	6
(d) Test calls	3
(e) Support	3
(f) Registration & billing	
<u>Variable costs of CBT</u>	
(a) Air travel estimates	43
(b) Printing and shipping course material	20
(c) Instructor	19
(d) Subsistence	14
(e) Registration & billing	4

Source: Compiled from the data provided by Constantine Osiakwan and David Wright (2001) in their article on Distance Training for Operating Equipment: A cost benefit and return on investment analysis in *The American Journal of Distance Education*, 15(1).

To conclude here, authors found that the variable costs and fixed costs of RADL are higher than the corresponding costs of CBT. However, the profit RADL is higher than that of CBT because it is possible to charge a higher price. The return on investment for RADL increases less rapidly than that for CBT. They suggested four methods for the improvement of ROI. These are: (a) reducing fixed costs; (b) reducing variable costs; (c) increasing the price of the courses; and (d) increasing the number of sessions per year.

SECTION 6

A BRIEF REVIEW OF STUDIES ON COSTING OF OPEN AND DISTANCE LEARNING

In the previous sections, you studied about the various concepts and different types of costs, and the methodology for cost estimation in general, and in open and distance learning system in particular. In this section, we shall specifically highlight some of the important cost studies conducted by various authors. These studies are deliberately selected to give you a fairly wider view on the cost of open and distance education. These studies would help you understand the cost of open and distance learning of in different countries/institutions.

Institutional Costs

Studies conducted by Indian scholars mostly pertain to the analysis of sources of income and expenditure of the system, unit cost analysis, especially, in comparison to the F2F stream. The studies conducted by Biswal, B.N. (1979), Sahoo (1985), Datt (1994), Gaba (1997, at the school level distance education) show that the major source of finance of ODL institutions was 'students fees', and sometimes funds raised through grants from other sources.

Pandey, (1980), Ram (1984), Gupta (1985) and Gaba (1997, at the school level ODL) found that the unit costs of correspondence courses were much lower than the regular courses. Datt (1988) further added that not only the unit costs but also the state subsidy was higher. Ansari (1987) analyzed cost efficiency and cost effectiveness of the ODL system. He found that per student cost of distance education is merely 15 to 20 per cent of the cost in formal system. Therefore, the ODL system is cost effective. He also found that it is not certain that ODL is as cost-efficient as the formal education though it is cost effective as the unit costs of education is very low. Datt (1994) calculated the break up of costs into academic costs, non-academic costs and other costs and found that academic costs varied from total costs in different correspondence institutions in India. Pillai and Naidu (1997) analysed the unit costs of IGNOU. They found that the faculty's salary consumed the major chunk of funds while developing of course units and for the production of print materials nearly half of the expenditure was incurred on composing text. They further found that economies of scale can be maintained up to an enrolment 300,000 students. Naidu (2001) analysed the per student costs (including private cost) for the entire duration of the IGNOU's programme. He found that on an average MCA students spend maximum followed by B.Sc., B.A. and PGDHE students.

International scholars provide a further set of cost functions. Wagner (1972) found that an average (recurring) cost of undergraduate programme was £251 with a student enrolment 36500. With this average costs, the UKOU produced undergraduates at about one fourth cost of the conventional universities. Harwood and Kim (1985) noted that the South Korean state spent the equivalent US\$ 10.29 millions on the Korea Air Correspondence University during 1972-81, to produce 33,838 graduates at a cost of just over US\$300 per graduate. On the other hand, 124 conventional colleges graduated 28,000 students at an average cost of \$ 675. Lockheed et al. (1991) in World Bank study found the Sukhothai Thammathirt Open University (STOU), Thailand, produced graduates more cheaply than conventional universities. Nielsen et al. (1991) studied the cost effectiveness of distance education for teacher training in Indonesia and Sri Lanka. They found that the distance education programmes in both Sri Lanka and Indonesia were significantly of lower cost than the F2F conventional teaching. The total annual costs per capita were 1/6th to 3/5th of campus-based programmes. Cumming and Olaloku (1993) found that the unit cost per graduate of the distance education B.Sc. programme was less than that of the regular programme. Rumble (1998) analyzed the cost effectiveness of distance education. He analyzed ODL at secondary level, where there are more systems, some ODL system such as the Correspondence Course Unit, Kenya with from 340 to 2900 students each year) where more expensive than traditional system. At the tertiary level, the cost per graduate at the British Open University (which has an annual enrolment of 20000-25000) is about half of the cost of a graduate at conventional university, while the cost per student per year is about one third that of a student in a conventional university.

Costing of Electronic Media

Quiet a few studies have been conducted on costing of electronic and printed media in education like that of Wells (1976), Jamison et al. (1978), Eicher (1980), Perraton (1982), Fwu et al. (1992), Chambers (1994) and Bates (1995). These studies had drawn some broad conclusions like the following:

- Production costs are higher for film and lower for radio.
- Fixed costs for transmission are much higher for television than for radio. Audiocassettes are likely to be cheaper than radio where the viewers are restricted.
- The costs taxonomy of open and distance learning differs form F2F traditional teaching.

Wagner (1972) and Mace (1978) pointed out that these costs could change significantly, if the media mix is changed. Eicher (1978) has summarized some of the factors, which affect cost levels in media-based distance-learning system. The studies show that the design and production costs are, generally, much higher than the costs of transmission and reception. On the other hand, radio has an advantage over the big size media in respect of the audience size. Charbonneau and Cunningham (1993) found that at Athabasca

University video-conferencing resulted in three types of saving: travel costs, 50 percent reduction in instructional time and costs, and an increase in faculty productivity due to non-traveling. Stahmer (1995) analysed the cost of computer-based training in comparison to classroom-based training through examples. He examined the case of the low development costs, the cost per student of computer-based training was roughly half the cost of F2F training. However, when student wage and travel cost were not a factor, the cost-per-student difference was much smaller.

Costing of Online Learning (E-learning/E-Education)

The development of online courses by both traditional F2F teaching and ODL institutions have raised many questions concerning the costs of online teaching.

Hulsmann (2000) found that costs were forty times as much to produce material in CD-ROM format as in print. Despite this high fixed cost, CD-ROM proved to have lower development costs per student learning hour than video or television. Development costs of CD-ROM may be further lowered if it can be re-used for different purposes. The author set out some indications of the level of costs for communication that emerged from the case studies that he analysed. He assumed that academic labour is paid £ 25 per hour. In order to facilitate comparison, and make it realistic, the following table set out the costs for a notional course that has 5 hours of computer mediated communication, 1 hour of video conferencing, 8 hours of F2F tutorials and four assignments marked by a tutor as presented Table 6.1.

Table 6.1: Costs of communication media (in £)

Communication media	Unit of inputs	No. of units	Cost per unit	Formula Unit costs (Variable costs per student)	Total cost
Computer Mediated Communication	Hour of tutorial time	5	25	$\frac{\text{Cost/UE}}{\text{Group Size}} = \frac{25}{20} = 1.25$	6.25
Video Conferencing	Hour of staff depreciated equipment line time	1	160	$\frac{160}{20} = 8$	8.00
Tutorials	Hour of tutorial time	8	25	$\frac{25}{20} = 1.25$	10.00
TMA	Assignment marked	4	12	Cost/Unit = 12	48
Total					80.25

Note : UE = Unit equivalent

*Source: Thomas Hulsmann (2000). The Costs of Open Learning, : A Handbook
www.uni.oldenburg.de/2ef/literat/t-costs.pdf*

Three important points emerge from Thomas Hulsmann's analysis. These are:

- ◆ The marking of assignments had the highest unit cost in the case of one to one communication.
- ◆ Where, there was an opportunity for group study, cost per student was very sensitive to the size of the group. For example, that a videoconferencing will attract an audience of hundred; if only fifty come, the cost per student doubles.
- ◆ Tutoring through video conferencing was having higher per student costs than F2F tutoring. But it had advantages in some respects: saving of travel costs and the opportunity costs of the time students spending in traveling.

Costing of Virtual University

Bacsich (1999) suggested how costing of virtual university should be estimated; costing and planning of e learning should:

- ◆ be based on the business practice of Activity Based Costing;
- ◆ allow the calculation of the cost effects on additional stakeholders: student, staff (their personal time and resources), parents and employers;
- ◆ use a standardised three-phase model of course development.

Financing of Virtual University

Financing of education is a serious issue in both the developing and the developed countries. The role of governments in funding is decreasing in UK, USA, India and many other countries. The return on investment from education has been lower in the past. Therefore, funding institutions (public – state and central government and private like NIIT in India) are prepared to invest in Virtual Campus in India. The possible funding should be from government, gifts, industries, the students and the employers of graduates.

Conclusion

The analysis of research findings reveals that open and learning system is cost effective compared to traditional F2F classroom system of teaching, and has the advantage of economies of scale. However, studies on costing in open and distance education in India, especially, the costing of audio/video/information technology, are still in its infancy. It is, therefore, worthwhile to point out certain priority areas for undertaking studies on this particular area: cost effectiveness of ongoing programmes of open learning in relation to institutional cost and private cost, cost benefit analysis of online teaching, and cost analysis of alternative media , to suggest a few.

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