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## UNIT 3 COST ANALYSIS IN EDUCATION

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### 3.0 INTRODUCTION

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The problem of limited resources available for education in relation to the enormity of the tasks involved in educational development for India as well as for many other developing countries has been receiving considerable attention in recent years. In India, for example, though the actual plan outlay by the Central government has increased from Rs. 1,530 million in the First Plan of 1951-56 to Rs. 196,000 million in the Eighth Plan of 1992-97, much remains to be done in the task of educational development both in quantitative and qualitative terms. Therefore, it becomes essential to carry out educational cost analyses which will ensure efficiency in the allocation of resources to education. Such cost analyses may help us in making optimum use of available resources and may enable us to make the expenditure on education meet the criteria of cost-benefit and cost-effectiveness.

Generation and utilisation of resources is also important for educational institutions. Utilisation of resources for various sectors and levels of education would mean expenditure to meet certain set objectives. Such expenditures as would reduce regional disparity, and provide for equality of educational opportunity may be incurred. The ultimate considerations when these expenditures are incurred will be the costs involved and the benefits received from them. Moreover, it is also essential to examine both cost-effectiveness and cost-efficiency in order to evaluate the work of an educational programme. In the present Unit, we shall discuss these aspects of educational costs.

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## 3.1 OBJECTIVES

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

- define and describe different terms pertaining to costs which are generally used in economics;
- distinguish between cost-efficiency and cost-effectiveness;
- define cost-benefit analysis, and describe different approaches to this analysis; and
- describe the application of cost-benefit analysis to educational projects and list its uses and limitations in decision making.

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## 3.2 COST CONCEPTS

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Before looking into the various educational costs, it is essential to understand the concept and types of costs involved in an educational enterprise. Let us start with the terms 'expenditure' and 'cost'.

### 3.2.1 Expenditure vs. cost

Expenditure on education and cost of education are not the same. Information on expenditure on education is more easily accessible and available from budgets and accounts of the Central and State governments. There is a tendency to use the terms expenditure and cost interchangeably. Cost of education refers to the amount of money spent to acquire or impart education. From the point of view of the individuals, costs refer to the amount of money spent during a particular period (generally a year) to acquire education. From the point of view of the state, it refers to the expenditure incurred on education during a year. The term cost and expenditure are used interchangeably, but more popularly, we use the term 'cost' and refer to cost per student pertaining to a particular level (primary, secondary, higher secondary or university). Similarly, cost per student to the state for a particular course or level is calculated. But cost per student in the state may include expenditures incurred on staff salaries, equipment and buildings, maintenance costs of apparatus, library books, sports, etc. From the point of view of the individual, cost of acquiring education does include expenditure on books and stationery, school fees, travel cost and in case of students making use of hostels, it will also include rent of hostel accommodation, mess charges, etc.

Since educational costs are available in current prices, it would be necessary to deflate them by a common deflator with a bench mark, so as to study whether real cost per student or per course is increasing or decreasing over a period of time. In other words, for purpose of comparisons, costs should be calculated at constant prices, rather than at current prices, to eliminate the effect of change of prices.

In an educational enterprise, we have to measure the cost incurred by the supplier of education and by the consumer of education separately. This necessitates a re-consideration of cost in economics so that it can suitably be applied to education. In fact, when we try to apply the concept of cost to

education, three difficulties arise due to the inherent nature of the activity of education. These difficulties are:

- the definition of 'production' resulting from education;
- the identification of the 'economic transactors' connected with education; and
- the fact that education has the character of a 'public service'.

Let us now turn to the difference in the meaning of cost as applied in economics and as it is applied in education.

### 3.2.2 Cost in economics and in education

In economics, cost is used when reference is made to the production of goods and services. It implies the cost of resources utilised in the production of goods and services. It can be expressed in monetary terms. It has always to be with reference to, or for, an economic transactor such as a producer, or seller, or buyer/consumer. Literature in economics has distinguished between real cost and money cost. *Real cost* is said to correspond to the sacrifice of resources or inputs needed to produce goods and services. Therefore, real cost corresponds to opportunity cost; because, as we have noted above, opportunity cost refers to the foregone output that could have been produced had the input been utilised in the next best way.

The producer of education may be a government, an institution (public or private), a teacher or a family. The consumers are the students, and their families who are the buyers of education. Thus, we can speak of cost for both the agencies producing education and the persons consuming education. There can be differences between cost and expenditure because of government subsidies to education, tax relief on institutions, income foregone by students while studying, etc.

### 3.2.3 Determinants of educational costs

A knowledge of the major determinants of educational costs is essential for anyone thinking of improving the level of education in the society. The cost of an educational plan or innovation is often expressed in terms of its *total cost* to indicate the value of the total resources devoted to it. But for diagnostic and evaluative purposes, *unit cost* is more meaningful. *Unit cost* is cost per educational unit, e.g., cost per student, cost per school, cost per teacher, etc. But education has multiple outputs measured variously in terms of student achievement, number of graduates passed, and so on. Hence, while estimating unit cost, due care should be taken to avoid ambiguity. For example, cost per student may imply:

- a) cost per student enrolled;
- b) cost per student actually attending school; or
- c) cost per student successfully completing a given course.

The problem of deciding on the unit cost has to be solved carefully. Choosing the number of students may not always be the right thing to do because all costs do not vary with the number of the students; for instance, the teachers and their salaries, the number of square meters of building space, etc. Hence, cost per teacher or cost per school should also be considered.

Educational costs may be divided into three categories:

- those related to the students;

- those related to the teachers; and
- those related to buildings and equipment.

In a normal growing state, a composite unit including all three could be adopted. Unit costs are likely to rise due to changes in the price level, increase in learner population, rise in the educational standards, demand for education as well as the pressure for raising the level of school-going age. In making long term forecasts, we have to take note first of the increase in the number of students, teachers and schools and secondly, of the rise in cost per unit.

It is essential to break up the expenditure on education, both by the government and private institutions, into different components like recurring expenditure and capital expenditure. Recurring expenditure (or cost) as the name suggests takes place regularly at certain intervals. Capital expenditure or costs, on the other hand, are one time investments. Cost depends on:

- the level and structure of the teachers' salaries;
- the average pupil-teacher ratio at each level;
- the non-salary costs of education; and
- the capital cost for buildings and other equipments.

Of course, each of these factors are themselves determined by a number of other factors like availability of funds, teacher, student enrollment, etc. It is because of the variation in these factors that countries or states and districts within the country differ with regard to their educational priorities and the corresponding expenditure.

**Check Your Progress 1**

Distinguish between cost, as used in economics and education in six sentences.

- Note: a) Space is given below for writing your answer.  
b) Compare your answer with the one given at the end of the Unit.

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**3.2.4 Behaviour pattern of educational costs**

There are evidences from all over the world including India that have identified certain behaviour patterns of educational costs. You may note that total cost increases with an increase in the number of students, teachers and institutions. Unit cost, on the other hand, may increase, decrease or remain constant as expansion takes place. In order to study the behaviour of costs of education, we can calculate them along different dimensions:

- cost by level (like primary, secondary, higher education, etc.);
- cost by region (like rural and urban);

- total cost;
- unit cost;
- fixed and variable costs; and
- average and marginal costs.

The type of cost analysis will depend upon the purpose for which it is needed. For instance, in a study of Bikaner district in Rajasthan state of India, it was found that for the government upper primary schools cost per pupil enrolled (normal cost) was Rs. 554.08 and cost per successful pupil (effective cost) was Rs. 794.97. Ideally, the cost per pupil enrolled and the cost per successful student should be the same. This, however, is not usually the case because of the prevalence of dropouts. Therefore, cost per successful student is higher than per student enrolled. The difference is a measure of the efficiency of the system, as the lower the difference the more efficient the system.

### 3.2.5 Social and private costs

The very idea of cost immediately poses the question: cost for whom? Cost can be defined from the supplier's point of view as well as from the consumer's point of view. Moreover, cost can also be of various forms. Let us briefly discuss the types of costs below.

#### *i) Private costs*

These concern individuals in families and represent costs which the individuals and the families must bear in return for the education received. Examples of such expenditure are:

- tuition and examination fees and other such fees;
- institutional supplies;
- manuals and books;
- transport;
- uniforms;
- foregone earnings.

#### *ii) Social costs*

These costs concern society, and refer to such costs (or expenditure) as are borne out as a result of all education and training activities in a society at a given point of time. See Table 3.1 for various components of private and social costs of education.

Table 3.1: Social and private costs of education

Social costs	Private costs
<i>Direct:</i>	<i>Direct:</i>
i. Teachers' salaries	i. Fees minus average value of scholarships
ii. Other current expenditure on goods and services	ii. Books, etc.
iii. Expenditure on books, etc.	iii. Travel cost
iv. Imputed rent	
<i>Indirect:</i>	<i>Indirect:</i>
v. Earnings foregone	iv. Earnings foregone

You may observe two things from Table 3.1. The first is that social costs may fall under two categories. They are direct costs and indirect costs to the society. The second observation you might make is that 'earnings foregone' is repeated under private costs as well as social costs. Earnings foregone by one individual is a private cost 'paid' by that individual for the sake of getting educated. At the same time, earnings foregone by individuals in a broader perspective are earnings foregone by the nation or the society. Hence, earnings foregone constitute an indirect cost to the society which plans to have its members educated.

### 3.2.6 Opportunity cost

Opportunity cost is the cost of alternatives foregone.

Let us consider a concrete but hypothetical example. Suppose you are working in a leather manufacturing company and by offering your service you are paid Rs. 6,000 a month. Had you not joined the above company, let us suppose that you could have joined a textile firm with a monthly salary of Rs. 3,500. This means that your value in the next best alternative use is Rs. 3,500. From the individual point of view, this is called *transfer earning*. Note that transfer earning is similar to opportunity cost. From the societal point of view, this is called opportunity cost which is Rs. 3,500 in keeping you employed in the leather manufacturing company.

The three cost elements given above (i.e., social cost, private cost and opportunity cost) can easily be combined to give an estimate of the annual cost per student for each level or type of education. If there were no wastage or repetition, this would be sufficient for a cost-benefit calculation.

### 3.2.7 Fixed and variable costs

Whatever the production level, a firm always bears certain *fixed expenses* viz., rent of premises occupied, maximum staff salary requirement, etc. and certain *variable expenses* which depend on the production level or, in other words, which vary according to the number of units produced.

The same distinction can be drawn in the field of education. In the case of a teaching establishment like a school or a university, the fixed expenses include, for example, the capital cost of the building, the equipment and furnishing or their corresponding annual rents, etc. The variable expenses include school books, teaching staff salaries, etc. But for all practical purposes, expenditure on permanent staff salaries (both teaching and non-teaching) for permanent staff can be treated as fixed cost.

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## 3.3 ESTIMATING EDUCATIONAL COSTS

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One of the important purposes of the cost analysis is to enable one to estimate future costs of education. For this purpose, a thorough analysis of the present cost is essential. In analysing and diagnosing the present situation, the following concepts and techniques are essential.

### 3.3.1 Normative and actual costs

Very often, it so happens that positive or actual costs prevalent for each level and type of education are different from the normative or expected or planned costs. Such normative costs are generally laid down by the respective public

authorities like the Central or State Government or local bodies. There are norms with regard to, for example, salaries. Salary scales of teachers, the number of students per teacher, total amount of money to be spent per teacher, etc. are planned on expected lines. But these norms may not necessarily match the cost or expenditure actually incurred.

### 3.3.2 Effectiveness

Education in any country has different objectives. Some of these result in direct economic benefits (such as salary earned or taking up employment) while others result in indirect benefits (such as life satisfaction). For example, the salary of an employed graduate is the direct benefit of education received. Besides salary, education increases the geographical mobility of a person leading to increasing adaptability and employability. This can be considered an indirect benefit of education. In cost-benefit analysis, attention is focused on direct economic benefits resulting from education. On the other hand, **cost-effectiveness** also tries to take into account the indirect benefits of education, in addition to direct benefits. [There are benefits of education which cannot be measured in monetary terms. These are called intangible benefits.] Cost-effectiveness is a concept which is useful in measuring the success of an educational system in meeting the intended benefits (direct and indirect or intangible). But in both cost-benefit and cost-effectiveness analyses, the essential principle is that an attempt is made to judge the costs of both the project and its output or outcomes.

### 3.3.3 Cost-efficiency and cost-effectiveness

Efficiency is the ratio of output to input. A method or system is cost-efficient if its cost per unit of output is less than another method or system. Cost-efficiency of a system increases when its outputs increase with less than proportionate increase in inputs (Rumble, 1997). In a word, it emphasises that the output is produced as economically or cheaply as possible; and it is concerned with the quantitative relationship between inputs and outputs.

An institution or educational mode, as the case may be, is said to be cost-efficient if the present level of cost can be minimised further without reducing the output, or if output can be increased with the present cost level.

Cost-effectiveness is concerned with both the quantitative and qualitative relationship between inputs and outputs. It takes into account decision alternatives for both costs and consequences, and attempts at (higher) achievement of predetermined objectives or targets within the given cost and as economically as possible. It also ascertains the most efficient means of attaining particular educational goals (Levin, 1995). And, even the qualitative improvement of outputs should be achieved as economically as possible.

The cost-effectiveness approach, however, does not suit broad educational decisions like, for example, comparing the science graduates, of say polytechnics with those of conventional universities or open universities, or to find out which type of institution is the cheapest to expand (for which cost-efficiency approach is used). The cost-effectiveness approach is more appropriate at the level of the institution, the classroom or even the lectures delivered in the classrooms, as at such levels, objectives can be more precisely defined. It can be particularly used to decide about teaching methods when the objective is to bring the students up to some measurable

level of competence, say in speaking a foreign language or in the use of mathematical techniques, for instance. There will often be alternative teaching techniques (lectures with traditional text books, small tutorial groups, self study with a programmed text, computer-aided instruction, etc.) capable of achieving these objectives. If the end results are the same, the cheapest methods should be chosen.

**Check your progress 2**

Identify the type of "cost" to which each of the following items belongs from among the four alternatives: opportunity cost, private cost, social cost, and fixed cost.

- i) Expenditure by the ninth grade student for purchasing recommended course book on economics . . . . .
- ii) Expenditure incurred by the Government of the state of Sikkim to pay salaries to the primary school teachers of that state . . . . .
- iii) Monthly salaries sacrificed by a post-graduate commerce student on account of his not joining a private concern as junior accountant after completing B.Com. . . . .
- iv) Expenditure incurred by a higher secondary student to become a member of the voluntary members library of his /her school. . . . .

**Note :** a) Compare your answers with those given at the end of this unit .

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### 3.4 COST- BENEFIT ANALYSIS

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This is a technique that has been used for the purpose of choosing a project from among a number of projects on the basis of a consideration of their cost-benefit relationship. In applying this technique, one has to be careful about both the concepts of costs and benefits as well as their measurement. Cost-benefit analysis provides a measure of the profitability of education as an investment for society, or for the individual student or his/her family. It will act as a general guide for resource allocation and enable the comparison of the profitability of different types of education. One has to be clear about the social and private benefits of education, and its social and private costs. Essentially cost-benefits analysis relates the educational cost with the benefits measured in monetary terms. On the other hand, cost-effectiveness analysis relates the costs in education with various measures of educational objectives, not expressed in terms of money (e.g. test scores, reading achievements, etc.).

Before we discuss the details of such analysis, let us look into the meaning of cost-benefits analysis more clearly.

#### 3.4.1 Cost-benefit defined

The term *cost-benefit analysis* implies a systematic comparison of the magnitude of the costs and benefits of some form of investment in order to assess economic profitability. All forms of investment involve a sacrifice of the present consumption in order to secure future benefits in the form of higher levels of output or income. Cost-benefit analysis provides a means of appraising these future benefits in the light of the costs that must be incurred at present. The purpose of such analysis is to provide a measure of the expected yield of the investment, as a guide to the rational allocation of resources. The importance of such an analysis can be understood from its underlying assumptions given as follows:

- resources are scarce;
- these scarce resources can be used for alternative purposes;
- decision makers want to use them in a rational way, i.e., where they provide the maximum benefit; and
- their costs and benefits can be measured.

To the extent that these assumptions are not valid in any particular case, cost-benefit analysis will have its limitations. However, in practice, what we are taking into consideration is only a part of the costs and benefits involved. For instance, when a child goes to school, both the child and the parents have to spend a lot of time in effecting his/her education. Besides the time devoted to this which involves cost, certain other preparations like personality development, personal and social adjustment of the child also involve cost. The types of costs involved are intangible in value and cannot be measured in terms of money. Similarly, in the case of benefits, there could be certain non-pecuniary and intangible benefits accruing to both the individuals as well to society, viz. improved communication, social mobility, the pleasure of acquiring further knowledge, improved social adjustment, etc. Therefore, in cost-benefit analysis, we take into account that part of cost and benefit which can be measured in terms of money.

As you know, investment is made at the present to reap some benefits in the future. And investment is viable when benefit exceeds cost. There are different methods to assess the viability of a particular investment, and these assessment procedures like benefits-cost ratio and rate of return (viz. social, private and internal) come under cost-benefit analysis. Let's start with the method of rate of return. We will take up benefit-cost ratio in sub-section 3.4.3 below.

### **3.4.2 Rates of return: social and private**

Rates of return are statistical measures of the relationship between costs and earnings. Rates of return can be either private returns or social returns. They are called private returns when they accrue to an individual, and when they accrue to society, they are called social returns. Monetary returns accruing to society out of investment in education arise from higher productivity as reflected in higher earnings of the educated.

Let us now see the steps followed while calculating the rates of return. The first practical step in such calculation is data collection. Ideally, the following data are required:

- a) data on the earnings of a representative sample of individuals classified by age, educational level, type of course, length of schooling, occupation, sex, social background, location of employment and some measure of natural ability, viz., areas in intelligence test (such as verbal, numerical or logical);
- b) data on current expenditure on educational institutions by level (primary, secondary, higher);
- c) estimates of capital value of educational buildings and equipment by level;
- d) estimates of private expenditure on education by level;
- e) average income tax rates; and

- f) data on labour market conditions, increasing rates of employment and labour force participation by age, sex, and educational level.

These data can be used to consider age earning profiles and to provide estimates of private and social costs of education. If the data are not available, we have a sample survey giving details of the earnings classified by age and level of education. Data on earning by level of education and age provide average earnings profile. From this profile we can estimate the annual earnings differential associated with education. Also we can estimate the earnings foregone during education for calculating social rates of return. These earnings differential provides a measure of the benefits of education after adjustment towards personal direct taxes, such as income tax. The actual calculation of the rates of return (both private and social) can be done by using certain formulas. The following formula is for calculating the private rate of return:

$$\sum_{t=1}^n \frac{E_t}{(1+i)^t} = \sum_{t=1}^n \frac{C_t}{(1+i)^t}$$

or

$$\sum_{t=1}^n \frac{E_t - C_t}{(1+i)^t} = 0$$

Where :  $E_t$  = earnings in year t  
 $C_t$  = private costs incurred in year t  
 $i$  = internal rate of return or the discount rate as per the rate of interest.

When  $C_t$  is replaced by  $S_t$  (i.e., social costs incurred in year t), the above formula can be used to calculate social rate of return.

In the following sub-section, we have presented an example of how to carry out cost-benefit analysis in education. But before looking at the example, answer the following question first.

**Check Your progress 3**

Define cost-benefit analysis in education in about ten lines.

- Notes:** a) Space is given below for writing your answer.  
 b) Compare your answer with the one given at the end of the this Unit.

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### 3.4.3 Cost-benefit analysis: an illustration

What you find below is an example or an illustration of a cost-benefit analysis. The object of cost-benefit analysis in this illustration is to determine whether more resources should be used for the development of secondary education or higher education. It should be noted that, at any time, the choice is not between investing in secondary education or higher education, but out of the given resources, how much more has to be spent on the secondary education rather than the higher education. The choice is only at the margin. When there are more than two lines of action or investment to choose from, the rule is that all investment must yield equal returns. This is called the principle of **equimarginal return**. And to make this choice we find out the cost-benefit ratio; and whichever line of action has a higher benefit-cost ratio is to be preferred. Thus, if secondary education has a higher benefit-cost ratio, it has to be preferred to higher education.

#### *Costs of education*

For purposes of the cost-benefit analysis of an investment, it is necessary to define costs in terms of the total cost of a project such as secondary education, i.e., all real resources that are used up by the project. These are called the **opportunity costs** since every investment represents the sacrifice of alternative opportunities of using the resources either for present consumption or for some form of investment. There are other opportunity costs which accrue on account of the students attending schools instead of helping their parents in their occupations like farming. Such opportunity costs are called **foregone earnings**, and they are measured by what students could have earned had they been employed. This cost item is also considered for calculating the total cost of education. In our illustration, let us assume that the cost of secondary education (grades VIII to X) and higher education (three years of undergraduation) are Rs. 100.00 and Rs. 200.00 respectively per year that includes private cost, social cost and foregone earnings.

#### *Benefits of education*

An important objective of investment in education is to identify and measure the benefits of education, which is more difficult than the measurement of costs. Just as there are private and social costs, there are also private and social benefits that accrue, i.e., benefits to the individual and those that accrue to the society. Further, there are also other non-economic benefits both to the individual and to society.

If education is an investment, it contributes to future incomes by imparting skills and knowledge to the educated manpower, thus improving the productivity of labour. If the productivity of the educated workers is higher than that of the uneducated workers, it will be reflected in a higher output and in higher earnings of the educated. Therefore, we require an estimate of the additional life time earnings of the educated people. Ideally, these data should be collected by comparing the earnings of the educated and uneducated workers over their whole working lives. The total life time earnings differential would then provide an estimate of the higher productivity of the educated. Generally, it is not easy to collect sample data on the earnings over a period of time, of more educated and less educated workers. Therefore, the usual practice is to use cross sectional data (data across various sections of earners at a particular point of time) to estimate average age-education-

earning-profile for the workers of the same age with different levels of education and for workers of the same level of education with different age groups.

Let us assume that the benefits for secondary education and higher education are Rs. 600.00 and Rs. 1200.00 respectively per year. Let us further assume that these benefits would accrue to the individual concerned for 20 years (i.e., twenty years of employment), and that the rate of interest for these years remains at 6 per cent per annum.

We have to calculate the benefit-cost ratio (BCR) which is an indicator of the investment options on education: the higher the ratio, the higher the profitability of investment for that level of education. The **benefit-cost ratio** for both secondary education and higher education is calculated using the following formula:

$$BCR = \frac{\sum_{t=1}^n B_t (1+i)^{-t}}{\sum_{t=1}^n C_t (1+i)^{-t}} \quad \text{(Gillis et al, 1983)}$$

Where :

- $B_t$  = benefit per annum (Rs.600/- for secondary and Rs. 1000/- for higher education)
- $C_t$  = cost per annum (Rs. 100/- for secondary and Rs. 200/- for higher education)
- $i$  = rate of interest (6% per annum)
- $t$  = time (3 years cost time, and 20 years benefits time)
- $\sum^n$  = sum total of the years of costs incurred and benefits received

**Benefits-cost of secondary education**

The BCR formula given above can be rewritten as:

$$BCR = \frac{\sum_{t=1}^n B_t / (1+i)^t}{\sum_{t=1}^n C_t / (1+i)^t}$$

The benefit formula  $\sum_{t=1}^n B_t / (1+i)^t$  can be further simplified as follows:

$$\frac{B_1}{(1+i)^1} + \frac{B_2}{(1+i)^2} + \frac{B_3}{(1+i)^3} + \frac{B_{20}}{(1+i)^{20}}$$

Similarly, the cost formula can be further simplified as follows:

$$\frac{C_1}{(1+i)^1} + \frac{C_2}{(1+i)^2} + \frac{C_3}{(1+i)^3}$$

Let us now calculate the benefits-cost ratio for secondary education:

$$BCR = \frac{\frac{600}{(1.06)^1} + \frac{600}{(1.06)^2} + \dots + \frac{600}{(1.06)^{20}}}{\frac{100}{(1.06)^1} + \frac{100}{(1.06)^2} + \dots + \frac{100}{(1.06)^3}}$$

$$BCR = \frac{566.04 + 533.99 + \dots + 187.08}{94.34 + 88.99 + 83.96}$$

$$BCR = \frac{6881.95}{267.30}$$

$$= 25.75$$

**Benefit-cost of higher education**

$$BCR = \frac{\frac{1000}{(1.06)^1} + \frac{1000}{(1.06)^2} + \frac{1000}{(1.06)^{20}}}{\frac{200}{(1.06)^1} + \frac{200}{(1.06)^2} + \frac{200}{(1.06)^3}}$$

$$= \frac{943.39 + 889.99 + \dots + 311.80}{188.68 + 177.99 + 167.92}$$

$$= \frac{12413.32}{534.60}$$

$$= 23.22$$

For any education project to be feasible, the BCR has to be greater than 1 (i.e. BCR > 1.00). The BCRs that we have calculated for our hypothetical examples suggest that both the projects of secondary education and higher education yield higher benefit than cost, and therefore both are feasible. However, our objective was to identify the project in which we should invest more than in the other. The benefit-cost ratios for secondary and higher education suggest that there should be more investment on secondary education than higher education, since the BCR for secondary education was higher than that of higher education.

**3.4.4 Evaluation of cost-benefit analysis**

We shall now point out some of the major limitations of cost-benefit analysis in the process of public decision making in education.

- i) Current benefits, as represented by the rate of returns from education, reflect the profitability of the past level of investment. Can the present rate of return serve as a basis for estimating future profitability? It can do so

only if there are going to be small increases in investment in education. If there is going to be large scale expansion of education designed to fundamentally change the balance between the supply of and the demand for educated human resources including changes in employment opportunities, career prospects, job requirements, technology etc., the present rate of returns cannot be used for such calculations.

- ii) Not all the earnings of the educated can be attributed to education. There were earning differentials due to differences in ability, the amount of the hard work one is ready to put in, etc. and, therefore, adjustment will have to be made accordingly.
- iii) Not all the educated persons succeed in finding jobs immediately. The period of waiting before a job is obtained has to be taken into account.
- iv) All those who are enrolled in a programme do not succeed in getting a degree. Allowance will have to be made for the wastage, since this will add to the initial social cost of education.

In both developed and developing countries, cost-benefit analyses have been carried out taking into account all the above limitations and making appropriate adjustments for them. In fact, returns from investments in primary education have been calculated and compared with returns from investments in higher education for sixteen developing countries, and it was found that in all of them the primary education sector turned out to be more profitable than the sector of higher education (Harbison and Myers, 1964). Even though cost-benefit analysis may not always provide the planner with definite policy guidelines, it does provide him with information which is useful for making rational policy decisions.

Keeping in view the foregoing discussions, we shall point out the following as the ways in which cost-benefit analysis is useful for decision making in education.

- i) It may point out the need for change in resource allocation in favour of those types of education which can offer the highest rates of return.
- ii) Cost-benefit analysis may suggest ways of increasing the profitability of education, either by increasing its benefits or by lowering the costs.
- iii) Finally, cost-benefit analysis provides a conceptual frame-work for the examination of the costs of education in relation to the relative earnings of the educated manpower. (However, the present practice of the human resources forecasting tends to ignore both the above aspects of costs and earnings.)

**Check Your Progress 4**

Given that the average life time earnings (i.e. for thirty years) of secondary school completers as Rs. 500.00 per year, the cost of education as Rs. 300.00 (for three years), rate of interest as 6%, calculate the benefit-cost ratio for secondary education completers.

- Notes : a) Space is given below for writing your answer.  
 b) Compare your answer with the one given at the end of the Unit.

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**3.5 LET US SUM UP**

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In the present Unit, we discussed various aspects of cost analysis in education. After distinguishing between cost and expenditure, a description of cost as used in both economics and education was made. In an educational institution, cost components include those related to students, teachers and buildings. These are taken into consideration to calculate the unit cost of education. These components may be classified into recurring and capital costs. As you have seen, costs may be of three types: social, private and opportunity costs. Social costs concern society, and range from teachers' salaries to the imputed rent; and private costs include expenditures incurred by an individual student to undergo the process of education.

Opportunity cost in education refers, on the one hand, to the earnings foregone by a student by not joining any paid work, and, on the other hand, to the output foregone that would have been produced by the present inputs in the next best use or in other words the cost of the alternatives foregone. Another way of classifying costs is to reckon them as fixed and variable costs. The fixed costs are fixed for every year—capital cost of buildings, cost of equipment, etc., and the variable costs include staff salary, school books, etc. that vary from year to year.

There are three ways of calculating the cost of education depending upon the objectives of such a calculation—cost-effectiveness, cost-efficiency, and cost-benefit. Cost-effectiveness tries to see that the objectives of an educational programme are achieved within the specified cost, whereas in cost-efficiency an attempt is made to achieve the objectives with much lower costs than the one estimated. Effectiveness includes both direct and indirect benefits of education. On the other hand, the cost-benefit analysis tries to find out the magnitude of the costs of education and the benefits in economic or monetary terms. In this analysis four types of costs are involved: resource cost, private cost, social cost and institutional cost. Both social and private rates of return measure the relationship between costs and earnings of individuals. Besides looking into conceptual clarifications, you also studied an example of cost-

benefit analysis each for primary and higher education. At the end of the discussion we observed that the cost-benefit analysis in education suffers from certain limitations, the advantages or usefulness notwithstanding.

### 3.6 CHECK YOUR PROGRESS: THE KEY

1. Cost when used in economics refers to the expenditure incurred to produce goods and services as also the real cost. In education, cost calculation includes both monetary and non-monetary costs incurred by the provider of education (say, the government), the receiver of education (say, the student), and opportunity cost.
2.
  - i) Private cost
  - ii) Social cost
  - iii) Opportunity cost
  - iv) Private cost
3. Cost-benefit analysis tries to analyse the costs involved in any project and the benefits received from it in *monetary terms*. When applied to education, the costs are in terms of money for different items like social costs, private costs, etc., and the monetary benefits are calculated both for the society and the individual concerned. This analysis helps in deciding rationally and from a utilitarian point of view whether to spend money on education, and if to spend, under which type or sector of education.
4. The benefit-cost ratio for secondary education completers is:

$$\begin{aligned}
 \text{BCR} &= \frac{\frac{500}{(1.06)^1} + \frac{500}{(1.06)^2} + \dots + \frac{500}{(1.06)^{30}}}{\frac{300}{(1.06)^1} + \frac{300}{(1.06)^2} + \frac{300}{(1.06)^3}} \\
 &= \frac{7047.67}{1084.42} \\
 &= 6.49
 \end{aligned}$$

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## GLOSSARY

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**Age-earning Profile:** Age-earning profile refers to two-way classification of data on earnings by age, in which age groups are shown in the columns and earning levels are shown in the rows. The number of persons belonging to a particular age group and income level is shown against the intersection of the respective row and column.

**Annual Earnings Differential:** Annual earnings differential refers to the difference in annual earnings by persons belonging to different age groups or different levels of education; for example, the difference between the annual earnings of a graduate and a post-graduate belonging to a particular age group.

**Derived Demand:** Derived demand is the demand for inputs. Inputs can be directly consumed, and are utilised in the production process to obtain the output. The output has a direct demand from the consumer, and in order to produce the output there is a demand for inputs. Hence, the demand for inputs is derived from the demand for output.

**Imputed Rent:** Suppose that the establishment of a school owns a building to operate, and therefore does not have to hire a private building and pay some rent. However, if the school building is offered to be rented out in the hours after classes take place, it has a certain value in the market as rent. This amount (as rent) is termed as imputed value of rent of the school building. Such imputation can be extended to other resources even if they are not marketed.

**Manpower Forecasting:** Manpower forecasting refers to the projection of the future manpower requirements of a country under different heads like engineers, doctors, teachers, managers, technicians, etc.

**Marginal Productivity:** In the process of production, three concepts are involved in the measurement of the output: total product, average product and marginal product. Total product refers to the total units of output produced from the given inputs. Average product/productivity is the units of output per unit of input. Marginal product/productivity of an input refers to the units of output contributed by the last unit (i.e. unit at the margin) of the input. For example, an employer employs 4 units of labour to produce 40 units of output. In that case, the total product is 40 units and the average productivity of labour is  $40/4 = 10$  units per labour. Suppose, the employer engages one more unit of labour (i.e., 5 in total) as a result of which the total product goes up to 47 units. Hence, the marginal productivity of labour as an input is  $47-40=7$  units of the output. As the level of input changes, the marginal productivity also changes, i.e. it may either increase or decrease.

**Real Resources:** Resources cannot always be measured in money terms. Sometimes, the resources may not be marketed or the market price may not reflect the true value of the resources. Hence, in cost-benefit analysis the cost is expressed in terms of the real inputs (other than money).

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