
UNIT 1 PROJECT APPRAISAL

Structure

- 1.1 Introduction
- 1.2 Projects: Meaning and Concept
- 1.3 Difference between a Project and a Programme
- 1.4 Project Preparation
- 1.5 Project Cycle Management
- 1.6 Project Appraisal Techniques
 - 1.6.1 Non-Discounting Techniques
 - 1.6.2 Discounting Techniques
- 1.7 Let Us Sum Up
- 1.8 References and Selected Readings
- 1.9 Check Your Progress – Possible Answers

1.1 INTRODUCTION

In the previous block, you have read about programme planning, needs assessment, participatory programme planning and participatory methods. This unit deals with the project appraisal techniques. Projects often provide the base for sustainable development interventions. Project appraisal is a generic term that refers to the process of assessing, in a structured way, the case for proceeding with a project or proposal. It often involves comparing various options, using economic appraisal or some other decision analysis technique. A good appraisal justifies spending money on a project. It is an important tool in decision making and lays the foundation for delivery and evaluation. Appraisal asks fundamental questions about whether funding is required and whether a project offers good value for money. It can give confidence that public money is being put to good use, and help identify other funding to support a project.

After studying this unit you should be able to:

- explain the meaning, concept and differences between project and programme;
- discuss major aspects to be considered in preparation of a project; and
- describe project cycle management and project appraisal techniques.

1.2 PROJECTS: MEANING AND CONCEPT

What are Projects?

Projects are the cutting edge of development. Projects are an investment activity in which financial resources are expended to create capital assets that produce benefits over an extended period of time.

UNIDO defines a project as a proposal for an investment to create and develop certain facilities in order to increase the production of goods/services in a community during a certain period of time.

The Chartered Management Institute define a project as “an activity that has a beginning and an end which is carried out to achieve a particular purpose to a set quality within given time constraints and cost limits”.

A project may be defined as an activity for which money will be spent in an expectation of returns and which logically seems to lend itself to planning financing and implementation as a unit. It is the smallest operational element prepared and implemented as a separate entity in a national plan of programmes of development.

A project is also defined as a proposal for an investment to create, expand and develop certain facilities in order to increase the production of goods and services in a community during a certain period of time. Furthermore, for evaluation purposes, a project is a unit of investment, which can be distinguished technically, commercially and economically from other investments.

1.3 DIFFERENCE BETWEEN A PROJECT AND A PROGRAMME

Many people are uncertain about the difference between a project and a programme. A project is a temporary entity established to deliver specific (often tangible) outputs in line with predefined time, cost and quality constraints. Whereas, a program is a portfolio comprising of multiple projects that are managed and coordinated as one unit with the objective of achieving (often intangible) outcomes and benefits for the organization.

Table 1.1 summarizes the main areas of differences between a project and a programme.

Table 1.1: Difference between Project and a Programme

Parameter	Project	Programme
Objectives	Outputs are tangible; relatively easy to describe, define and measure; tending towards objective.	Outcomes are often intangible; difficult to quantify; benefits often based on changes to organizational culture and behaviours; introducing new capabilities into the organization; tending towards subjective.
Scope	Strictly limited; tightly defined; not subject to change during the life of the project.	Not tightly defined or bounded; likely to change during the life cycle of the program.
Duration	Relatively short term; typically three to six months.	Relatively long term typically eighteen months to three years.
Risk profile	Project risk is relatively easy to identify and manage. The project failure would result in relatively limited impact on the organization relative to program risk.	Program risk is more complex and potentially the impact on the organization if a risk materializes will be greater relative to project risk. Programme failure could result in material financial, reputational or operational loss.

Nature of the problem	Clearly defined.	Ill-defined; often disagreement between key stakeholders on the nature and definition of the problem.
Nature of the solution	A relatively limited number of potential solutions.	A significant number of potential solutions with disagreement between stakeholders as to the preferred solution.
Stakeholders	A relatively limited number of potential solutions.	A significant number of potential solutions with disagreement between stakeholders as to the preferred solution.
Relationship to environment	Environment within which the project takes place is understood and relatively stable.	Environment is dynamic; and programme objectives need to be managed in the context of the changing environment within which the organization operates.
Resources	Resources to deliver the project can be reasonably estimated in advance.	Resources are constrained and limited; there is competition for resources between projects.

1.4 PROJECT PREPARATION

The preparation of a project entails consideration of many aspects. The major aspects to be considered in preparation of a project are:

1. Technical
2. Institutional
3. Organizational
4. Managerial
5. Social
6. Commercial
7. Financial
8. Economic

Let us now discuss each of these aspects of project preparation.

1. Technical Aspects

The technical aspect of any project considers the technical feasibility of any project. It concerns with the technical aspect of a project form both input supply side and output delivery side. For example if you want to take up an agricultural project in a region, you may have to examine the soil type of the region, water availability, crops grown, livestock breed suitable for the area, pests prevalent in the area etc. This information can be used in estimating the possible

yield and income from agriculture. Such information can be collected through soil surveys, groundwater surveys, collection of hydrological data, primary surveys of farmer households etc. The information regarding marketing and storage facilities responsible are needed to assess the possibility of marketing and processing of the products.

2. Institutional Aspects

The institutional aspect of a project deals with the framework within which the project will have to operate. A complete knowledge of the institutional aspect helps identifying the components of institutional framework that will have a bearing on the project. Some of the elements that constitute the institutional framework include government institutions, project authority, corporate bodies, land tenure systems, banking and credit institutions, religious customs, practices and social mores. There is a need to understand the administrative system of the region where the project has to be undertaken.

3. Organizational Aspects

Here the term organization refers to the structure of the body that would undertake the task of project execution. The proposed organization must have the capacity to carry out the assignments given to it. Some of the basic principles to be followed include:

1. There must be clear lines of authority running from top to bottom of the organization and the chain of command should be clear.
2. The responsibilities of each authority should be clearly defined in writing.
3. The decision making power should be placed as near as possible to the scene of action.
4. The number of levels of authority should be kept at minimum.
5. The organization should be kept as simple as possible and should be flexible to adjust to changing conditions.

4. Management Aspects

The main task of management is to implement the project objectives within the framework of organizational structure. For good management, a clear definition of functions and activities are required. There is also a need for allocating responsibilities to various agencies for various project activities. A suitable mechanism for coordination of the activities of participating agencies should also be developed. Besides, proper staffing also comes under the purview of the management.

5. Social Aspects

It is very important to assess the social patterns, customs, culture, traditions and habits of the clientele. Various aspects like changes in living standards, material welfare, income distribution etc. In selecting some projects, weights are assigned for income distribution so that the projects which benefit the lower income group are benefitted. The adverse effect of the project on particular group is

also examined. Preserving the environment and wildlife habitats is given high priority.

6. Commercial Aspects

The commercial aspects of a project involves the arrangements of marketing the output produced by the project and ensuring supply of inputs needed for the project to operate. There is a need to assess the effective demand of the project output and the prices that may prevail under the demand and supply situations. The analyst also needs to cautiously evaluate the impact of product supply on the price of the product and the viability of the project under such changed price situation.

7. Financial Aspects

Decisions about undertaking any project depend a lot on financial analysis of a project. As there could be many beneficiaries/participating agencies of any project, there is a need for separate financial analysis each.

Check Your Progress 1

Note: a) Use the spaces given below for your answers.

b) Check your answer with those given at the end of the unit.

1. What are projects? How do they help in development?

.....

2. What are the technical aspects to be considered while preparing a project?

.....

1.5 PROJECT CYCLE MANAGEMENT

Project cycle, also called project life cycle is the natural sequence in the way projects are planned and carried out (Fig. 1.1). It is a seven stage process through which practically every major project goes through:

- i. Identification stage:** Here one project-idea out of several alternatives is chosen and defined.
- ii. Preparation and analysis:** Defined idea is carefully developed to the appraisal stage.
- iii. Appraisal:** Every aspect of the project idea is subjected to systematic and comprehensive evaluation, and a project plan is prepared.
- iv. Presentation:** Detailed plan is submitted for approval and financing to the appropriate entities.
- v. Implementation:** With necessary approvals and financing in place, the project plan is implemented.
- vi. Monitoring:** At every stage the progress of the project is assessed against the plan.

vii. Evaluation: Upon completion the project is reassessed in terms of its efficiency and performance.

There tends to be a natural sequence in the way projects are planned and carried out, and this sequence is often called the “project cycle.” As was the case with aspects of project analysis, there are many ways-all equally valid-in which this cycle may be divided. Here we will divide it into identification, preparation and analysis, appraisal, implementation, and evaluation. The sequence is adapted from an article by Baum (1978).

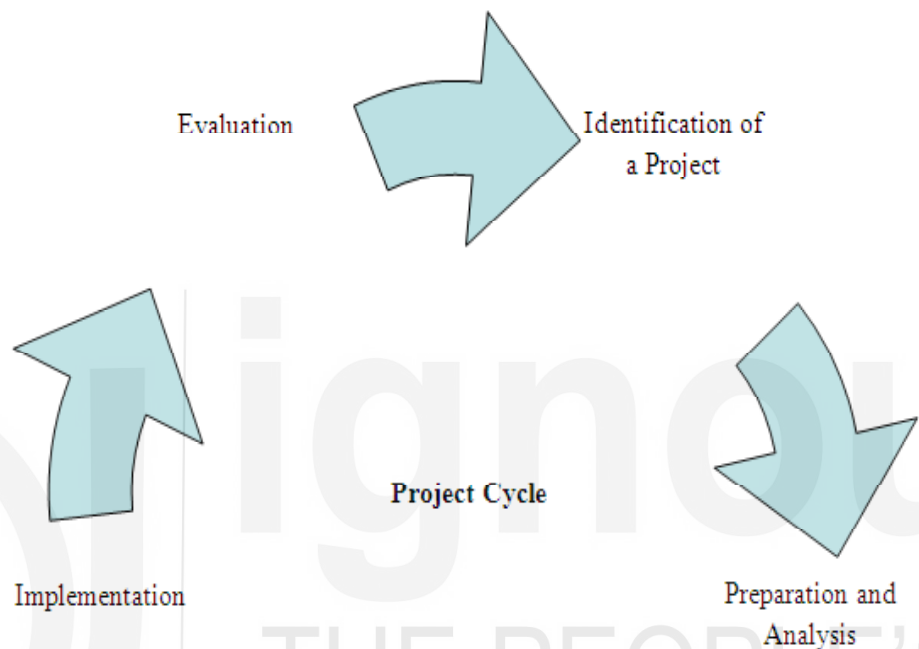


Fig. 1.1: The Project Cycle Management

(i) Identification

The first stage in the cycle is to find potential projects. There are many, many sources from which suggestions may come. The most common will be well-informed technical specialists and local leaders. While performing their professional duties, technical specialists will have identified many areas where they feel new investment might be profitable. Local leaders will generally have a number of suggestions about where investment might be carried out. Ideas for new projects also come from proposals to extend existing programs. A program to develop water resources will probably lead to suggestions of additional areas for irrigation. An existing land settlement program will probably generate suggestions of new areas for settlement.

Suggestions for new projects usually arise because some agricultural products are in short supply-or will be in a few years if production is not expanded or imports increased. The analysis may be based on general knowledge or upon a more systematic examination of market trends and import statistics. In addition, many countries have development banks intended to encourage growth of domestic industry. Often local firms will come to these banks with food processing proposals for which they are seeking finance.

Frequently, a separate sector survey of the current situation in agriculture will indicate what initiatives are needed. Such surveys may be undertaken with the help of an international agency or some agency for bilateral assistance. The sector survey will examine the current status of agriculture, project future needs for agricultural products over the next decade or so, and consider programs to improve the quality of rural life. It will examine prospects for expanding agricultural exports by considering potential increases in production and the outlook for marketing possibilities, and it will identify the gaps in existing plans and programs. The survey will probably generate suggestions about new areas for investment and the relative priority to be given different initiatives. It may even identify specific projects, especially larger ones, that merit consideration for future investment.

Occasionally one hears that there is a lack of projects available for investment in developing countries. Usually there is no shortage of proposals for projects that have been identified. But there may be a shortage of projects prepared in sufficient detail to permit implementation.

(ii) Preparation and analysis

Once projects have been identified, there begins a process of progressively more detailed preparation and analysis of project plans. This process includes all the work necessary to bring the project to the point at which a careful review or appraisal can be undertaken, and, if it is determined to be a good project, implementation can begin. In the preparation and analysis of projects, consideration will be given to each of the aspects discussed earlier.

The usual first step in project preparation and analysis is to undertake a feasibility study that will provide enough information for deciding whether to begin more advanced planning. The detail of the feasibility study will depend on the complexity of the project and on how much is already known about the proposal. Quite often a succession of increasingly detailed feasibility studies will be needed. The feasibility study should define the objectives of the project clearly. It should explicitly address the question of whether alternative ways to achieve the same objectives may be preferable, and it will enable project planners to exclude poor alternatives. The feasibility study will provide the opportunity to shape the project to fit its physical and social environment and to ensure that it will be high yielding.

Even at this early stage, the kind of financial and economic analyses discussed in this unit should be brought into play. As projects are planned in greater and greater detail, the investment of time and money becomes more and more substantial, and the expectations of vested interests continue to grow. Being faced only at a late stage in the planning process with the decision to accept or reject a project on financial or economic grounds is obviously an uncomfortable position to be in. Far better that the financial and economic analyses enter early in the planning process, so that the feasibility studies introduce these aspects in the project plan.

The staff needed to work on feasibility studies will depend on how complex the studies are. To start, a single staff member may make a preliminary

estimate in a relatively short time. Later the services of a small team, or perhaps outside consultants, may be engaged.

Once the feasibility studies have indicated which proposed project will likely be worthwhile, detailed planning and analysis may begin. By this time the less promising alternatives will have been eliminated, but even at this point the selected project will continue to be redefined and shaped as more and more becomes known. This is the stage at which detailed studies will commence—the carefully done soil surveys, the detailed hydrological analyses, the thorough examination of cropping patterns, the month-by-month estimates of labor requirements, the detailed farm budgets, and so forth. Again, all the aspects of analysis noted in the last section must be considered and correlated so that realistic estimates can be made of how the project might be implemented and of its likely income-generating capacity.

Detailed planning takes time, often a year or two or longer for complex agricultural projects. It may also be quite expensive. In agriculture, preparing the detailed project plan may well cost 7 to 10 percent of the total project investment. Yet thorough preparation increases a project's efficiency and helps ensure its smooth implementation in the future, so that the additional time and money required will probably be returned many times over by the increased return from the investment. Hastily prepared, superficial analyses will very likely yield projects that fall behind schedule, have lower returns, and waste scarce resources.

Preparation of the plan should itself be planned so that delays can be avoided and resources conserved. The timing of special studies needs to be considered, and the services of outside consultants should be scheduled so they will be available when needed—but not before the consultants' specialized knowledge can be used. The project may be prepared by a special team assembled for the purpose and given sufficient time and resources, or it may be prepared by a consulting firm or a technical assistance agency such as the Investment Centre of the Food and Agriculture Organization (FAO).

(iii) Appraisal

After a project has been prepared, it is generally appropriate for a critical review or an independent appraisal to be conducted. This provides an opportunity to reexamine every aspect of the project plan to assess whether the proposal is appropriate and sound before large sums are committed. The appraisal process builds on the project plan, but it may involve new information if the specialists on the appraisal team feel that some of the data are questionable or some of the assumptions faulty. If the appraisal team concludes that the project plan is sound, the investment may proceed. But if the appraisal team finds serious flaws, it may be necessary for the analyst to alter the project plan or to develop a new plan altogether.

If a project is to be financed by an international lending institution such as the World Bank or by a bilateral assistance agency, such an external lender will probably want a rather careful appraisal even if it has been closely associated with earlier steps in the project cycle. The World Bank, for

example, routinely sends a separate mission to appraise proposed projects for which one of its member governments intends to borrow.

(iv) Implementation

The objective of any effort in project planning and analysis clearly is to have a project that can be implemented to the benefit of the society. Thus, implementation is perhaps the most important part of the project cycle. It is also clear, however, that considerations of implementation and project management are far too extensive for discussion here. Yet there are some aspects of implementation that are of particular relevance to project planning and analysis. The first, obviously, is that the better and more realistic a project plan is, the more likely it is that the plan can be carried out and the expected benefit realized. This emphasizes once again the need for careful attention to each aspect of project planning and analysis.

Second, project implementation must be flexible. Circumstances will change, and project managers must be able to respond intelligently to these changes. Technical changes are almost inevitable as the project progresses and more is known about soils, their response to nitrogen applications, susceptibility to waterlogging, and the like. Price changes may necessitate different cropping patterns or adjustments in inputs. Other changes in the project's economic or political environment will alter the way in which it should be implemented. The greater the uncertainty of various aspects of the project, or the more innovative and novel the project is, the greater the likelihood that changes will have to be made. Even as project implementation is under way, project managers will need to reshape and replan parts of the project, or perhaps the entire project. All of the general considerations we have discussed, as well as the analytical tools we will take up in detail in the following chapters, must be brought into play once again. Implementation is a process of refinement, of learning from experience-in effect, it is a kind of "mini-cycle" within the larger project cycle we have outlined.

Project analysts generally divide the implementation phase into three different time periods. The first is the investment period, when the major project investments are undertaken. In agricultural projects this usually extends three to five years from the start of the project. If the project is to be financed with the assistance of a loan from an external financing agency, the investment period may coincide with the agency's period for loan disbursements. Then, as its production builds up, the project is spoken of as being in the development period. This often takes an additional three to five years, but it may be extended if the project involves cattle herds, tree crops, or other investments with long gestation. The duration of the development period reflects not only physical factors but also the rate of adoption at which farmers take up new techniques. Once full development is reached, it continues for the life of the project. Usually the project life is keyed to the normal life of the major asset, although for practical reasons a project life rarely exceeds twenty-five to thirty years. Both the financial and economic analyses of the project relate to this time horizon.

(v) Evaluation

The final phase in the project cycle is evaluation. The analyst looks systematically at the elements of success and failure in the project experience to learn how better to plan for the future. Evaluation is not limited only to completed projects. It is a most important managerial tool in ongoing projects, and rather formalized evaluation may take place at several times in the life of a project. Evaluation may be undertaken when the project is in trouble, as the first step in a re-planning effort. It may be appropriate when a major capital investment such as a dam is in place and operating, even though the full implementation of the plan to utilize the water and power is still under way. Careful evaluation should precede any effort to plan follow-up projects. And, finally, evaluation should be undertaken when a project is terminated or is well into routine operation.

Evaluation may be done by many different people. Project management will be continuously evaluating its experience as implementation proceeds. The sponsoring agency-perhaps the operating ministry, the planning agency, or an external assistance agency-may undertake evaluation. In large and innovative projects, the project's administrative structure may provide a separate evaluation unit responsible for monitoring the project's implementation and for bringing problems to the attention of the project's management. Often the evaluation unit will include persons with planning skills who enable the unit to take part in any necessary re-planning. The evaluation unit may also be responsible for planning follow-up projects.

In many instances, the project's management or the sponsoring agency will want to turn to outside evaluators. University staff may be well suited to undertake the task. Whoever does the evaluation will want to read the relevant documents carefully and then have extensive conversations with those who have had a part in the project-planners, project managers, operating staff, farmers participating in the project, or local people affected by the project.

The extent to which the objectives of a project are being realized provides the primary criterion for an evaluation. The objectives cannot be accepted uncritically, however; the inquiry should consider whether the objectives themselves were appropriate and suitable. The evaluators will want to know if these goals were made clear to the planners and to project management.

The project plan should be reviewed to see if it was an appropriate one in light of the objectives set forth. Each objective should be examined to determine whether it was considered carefully and whether appropriate provision for it was made in the project plan. Was the technology proposed appropriate? Were the institutional, organizational, and managerial arrangements suited to the conditions? Were the commercial aspects properly considered? Were the financial aspects carefully worked out on the basis of realistic assumptions, and were the economic implications properly explored? How did the project in practice compare with each aspect of the project analysis?

The evaluation should consider the response of project management and the sponsoring agencies to changing circumstances. Did management respond

quickly enough to changes? Was its response carefully considered and appropriate? Did the institutional and organizational structure in the project permit a flexible response? How could the project's structure be altered to make the response to change more flexible and appropriate in the future?

From the evaluation should come carefully considered recommendations about how to improve the appropriateness of each aspect of the project design so that plans for project implementation can be revised if the project is ongoing and so that future projects can be better planned if the project evaluated has been completed.

1.6 PROJECT APPRAISAL TECHNIQUES

Project Appraisal

Project appraisal is the effort of calculating a project's viability. Appraisal involves a careful checking of the basic data, assumptions and methodology used in project preparation, an in-depth review of the work plan, cost estimates and proposed financing, an assessment of the project's organizational and management aspects, and finally the viability of project. The project appraisal criteria can be divided under two heads:

(1) Non-Discounting Technique

Urgency

Payback Period

Accounting Rate of Return

Debt Service Coverage Ratio

(2) Discounting Criteria Technique

Net Present Value

Benefit Cost Ratio

Internal Rate of Return

Annual Capital Charge

Now we will discuss each of the techniques in detail

1.6.1 Non-Discounting Techniques

(i) Urgency

According to this criterion, the projects that are more urgent get preference over those that are less urgent. However, one of the problems in using this criterion is to judge the urgency of any project. The decision taken may be subject to the personal bias of the decision maker. In view of this limitation, it should not be used for investment decision making.

(ii) Payback Period

In simple terms, the payback period is the length of time required to recover the initial cash outlay on the project. If the cash inflows are constant, then the payback period is calculated by dividing the initial outlay by the annual

cash inflow. For example, a project which has an initial cash outlay of Rs 10,00,000 and a constant annual cash inflow of Rs 3,00,000 has a payback period of : $10,00,000 / 3,00,000 = 3.5$ years.

If the cash flow is not constant, e.g. if a project involves a cash outlay of 6,00,000 and generates cash inflow of Rs 1,00,000, Rs 1,50,000, Rs 1,50,000 and Rs 2,00,000 in the first, second, third and the fourth years respectively, its payback period is four years because the sum of cash inflow during four years is equal to the total outlay.

Decision making:

According to the payback period criterion, the shorter the payback period, the more desirable is the project. Firms using this criterion, generally specify the maximum acceptable payback period.

Evaluation of this method:

It is simple in concept and application.

It favours those projects that generate substantial inflows in earlier years and discriminate against projects that bring substantial cash flows only in later years.

As this criterion emphasises on earlier cash flows, it may be a good criterion when the firm is pressed with the problem of liquidity.

- It fails to consider the time value of money thus violating the most basic principle of financial analysis which says that cash flows occurring at different points of time can be added or subtracted only after suitable compounding and discounting.
- Since payback period is the measure of a project's capital recovery, it may divert attention from profitability.

In spite of the shortcoming of not using the time value of money, payback period is used with advantage in appraising investments for the following reasons:

- The payback period may be considered roughly as the internal rate of return when annual cash flow is constant and the life of the project fairly long
- The payback period is somewhat akin to the breakeven point.
- The payback period also gives information about the rate at which the uncertainty associated with the project is resolved. The shorter the payback period, the faster the uncertainty associated with the project is resolved.

(iii) Accounting Rate of Return

The accounting rate of return or the simple rate is the measure of profitability which relates income to investment, both measured in accounting terms. As there are various ways of measuring income and investment, there are a large number of measures for accounting rate of return. The commonly used ones are given:

- 1) Average income after tax

Initial investment

- 2) $\frac{\text{Average income after tax}}{\text{Average investment}}$
- 3) $\frac{\text{Average income after tax but before interest}}{\text{Initial investment}}$
- 4) $\frac{\text{Average income after tax but before interest}}{\text{Average investment}}$
- 5) $\frac{\text{Average income before interest and taxes}}{\text{Initial investment}}$
- 6) $\frac{\text{Average income before interest and taxes}}{\text{Average investment}}$

Decision making:

The higher the accounting rate of return, the better the project.

Evaluation:

- It is simple to calculate.
- It is based on accounting information which is readily available.
- It considers benefits over the entire life of the project.
- Though the income data of the entire life of the project is required, one can work out accounting rate of return even if the complete income data is not available by taking income from a typical year.

Disadvantages of accounting rate of return:

- It does not take into account the time value of money.
- There are numerous measures of accounting rate of return which can create confusion.

(iv) Debt Service Coverage Ratio

The debt service coverage ratio is generally used to find the financial worthiness of the projects which need long term financing. The formula is $[\text{net profit} + \text{interest (on long term loan)} + \text{depreciation}] / [\text{interest (on long term loan)} + \text{principal loan}]$.

Decision Making: Generally, the financial institutions regard a debt service coverage ratio of 2 as satisfactory.

Drawback:

In DSCR, both the numerator and the denominator consist of a mixture of post tax and pre tax figures (profit after tax in the numerator and loan repayment instalment in the denominator are post tax figures and interest in both numerator and denominator is pre tax figure). It is difficult to interpret a ratio that is based on a mixture of post tax and pre tax figures.

1.6.2 Discounting Techniques

(i) NPV

The difference between the present value of cash inflows and the present value of cash outflows. NPV is used in capital budgeting to analyze the profitability of an investment or project. NPV analysis is sensitive to the reliability of future cash inflows that an investment or project will yield.

The formula for **NPV** is:

$$NPV = \sum_{t=0}^n \frac{(\text{Benefits} - \text{Costs})_t}{(1 + r)^t}$$

where:

r = discount rate

t = year

n = analytic horizon (in years)

Decision making:

If the NPV of a prospective project is positive, it should be accepted. However, if NPV is negative, the project should probably be rejected because cash flows will also be negative.

Features of NPV:

- The NPV is based on the assumption that the intermediate cash inflows of the project are re-invested at a rate of return equal to the firm's cost of capital.
- The NPV of a simple project decreases as the discount rate increases, the decrease in NPV however is at a decreasing rate.

Merits of NPV

- It takes into account the time value of money.
- It considers the cash flow stream in its entirety.
- The NPV's of various projects can be added. The NPV of a scheme consisting of two project A and B will simply be the sum of NPV's of these projects individually.

$$NPV (A+B) = NPV(A) + NPV(B).$$

To illustrate the calculation of net present value, consider a project which has the following cash flow stream:

Year	Cash Flow
0	-10,00,000
1	2,00,000
2	2,00,000
3	3,00,000
4	3,00,000
5	3,50,000

The cost of capital k for the firm is 10 percent. The net present value of the proposal is:

$$\begin{aligned} \text{NPV} &= 10,00,000 + 2,00,000 + 2,00,000 + 3,00,000 + 3,00,000 + 3,50,000 \\ &\quad (1.10)^0 \quad (1.10)^1 \quad (1.10)^2 \quad (1.10)^3 \quad (1.10)^4 \quad (1.10)^5 \\ &= -5273 \end{aligned}$$

Since the decision rule associated with the net present value is to accept the project if the net present value is positive and reject if it is negative, in this example, the decision should be to reject the project.

(ii) IRR

The discount rate often used in capital budgeting that makes the net present value of all cash flows from a particular project equal to zero. Generally speaking, the higher a project's internal rate of return, the more desirable it is to undertake the project. As such, IRR can be used to rank several prospective projects a firm is considering. Assuming all other factors are equal among the various projects, the project with the highest IRR would probably be considered the best and undertaken first.

IRR is sometimes referred to as "economic rate of return (ERR)". It is the discounted rate in the equation:

$$0 = \frac{CF_0}{(1+r)^0} + \frac{CF_1}{(1+r)^1} + \dots + \frac{CF_n}{(1+r)^n} = \sum \frac{CF_t}{(1+r)^t}$$

CF_t = cash flow at the end of the year t

r = discount rate

n = life of the project

In the internal rate of return, we set the net present value equal to zero and determine the discount rate which would also be the internal rate of return.

E.g. Consider the cash flow of a project

Year	Cash Flow
0	-1,00,000
1	30,000
2	30,000
3	40,000
4	45,000

The internal rate of return is the value of r which satisfies the following condition.

$$1,00,000 = \frac{30,000}{(1+r)} + \frac{30,000}{(1+r)^2} + \frac{40,000}{(1+r)^3} + \frac{45,000}{(1+r)^4}$$

The calculations of r consist of a process of trial and error. We try different values of 'r' till we find that the right hand side of the above equation is equal to the left hand side. By putting the value of 'r' as 12 we get 1,07,773, for 14 it is 1,03,046, for 15 it is 1,00,802 and for 16 it is 98,641. Since at 16 percent, the value is less than 1,00,000, we conclude that the value of 'r' lies between 15 % and 16%.

A 1 percent difference (between 15 and 16 percent) corresponds to a difference of 2161 (1,00,802 – 98,641). The difference between the net present value at 15% (1,00,802) and that at present target value (1,00,000) is (1,00,802 – 1,00,000) is Rs.802. This difference will correspond to a percentage difference of $802/2131 = 0.37$.

Adding this number to 15 percent we get the value as 15.37 percent.

You can think of IRR as the rate of growth a project is expected to generate. While the actual rate of return that a given project ends up generating will often differ from its estimated IRR rate, a project with a substantially higher IRR value than other available options would still provide a much better chance of strong growth.

IRRs can also be compared against prevailing rates of return in the securities market. If a firm can't find any projects with IRRs greater than the returns that can be generated in the financial markets, it may simply choose to invest its retained earnings into the market.

The discount rate often used in capital budgeting that makes the net present value of all cash flows from a particular project equal to zero. Generally speaking, the higher a project's internal rate of return, the more desirable it is to undertake the project. As such, IRR can be used to rank several prospective projects a firm is considering. Assuming all other factors are equal among the various projects, the project with the highest IRR would probably be considered the best and undertaken first.

(iii) Benefit-Cost Ratio (BCR)

A Benefit Cost Ratio is an indicator, used in the formal discipline of [cost-benefit analysis](#), that attempts to summarize the overall [value for money](#) of a project or proposal. A BCR is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs, also expressed in monetary terms. All benefits and costs should be expressed in [discounted present values](#).

The benefit-cost ratio (BCR) represents the ratio of total benefits over total costs, both discounted as appropriate. The formula for calculating BCR is:

$$\text{BCR} = \frac{\text{PV}_{\text{benefits}}}{\text{PV}_{\text{costs}}}$$

where:

$\text{PV}_{\text{benefits}}$ = present value of benefits

PV_{costs} = present value of costs

In other words, since the present value of costs is nothing but the initial investment, the BCR may be defined as the ratio of present value of benefits to initial investment.

To illustrate the calculation of this measure, let us consider a project which is being evaluated by a firm that has a cost of capital of 12 percent.

The initial investment in the project is Rs1,00,000.

Year	Benefits
Year 1	25,000
Year 2	40,000
Year 3	40,000
Year 4	50,000

The benefit cost ratio of this project will be

$$\begin{aligned}
 \text{BCR} &= \frac{25,000}{(1.12)} + \frac{40,000}{(1.12)^2} + \frac{40,000}{(1.12)^3} + \frac{50,000}{(1.12)^4} \\
 &= \frac{1,00,000}{1.145}
 \end{aligned}$$

Decision making:

- If BCR is >1, the project should be accepted and would be beneficial.
- If BCR =1, we interpret it as being indifferent.
- If BCR <1, the project should be rejected.

The BC ratio is preferable to NPV as this criterion measures per rupee of outlay and it can discriminate between large and small investments.

Check Your Progress 2

- Note:** a) Use the spaces given below for your answers.
 b) Check your answer with those given at the end of the unit.

1. What are the advantages of payback period?

2. Write the three phases in extension programme planninWhat is Benefit Cost ratio? What is the decision making criteria while using BC ratio?

1.7 LET US SUM UP

Projects are the cutting edge of development. In this unit we discussed about the meaning of projects and various aspects to be considered while preparing the project. Many people are uncertain about the difference between a project and a programme. In this unit we have discussed in detail the difference between a project and a programme. This unit also discussed in detail the various stages of project cycle. The various discounting and non-discounting techniques of project appraisal have also been discussed.

1.8 REFERENCES AND SELECTED READINGS

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1.9 CHECK YOUR PROGRESS – POSSIBLE ANSWERS

Check Your Progress-1

1. Projects are an investment activity in which financial resources are expended to create capital assets that produce benefits over an extended period of time.
2. The technical aspect of any project considers both input supply side and output delivery side. For example if you want to take up an agricultural project in a region, you may have to examine the soil type of the region, water availability, crops grown, livestock breed suitable for the area, pests prevalent in the area etc.

Check Your Progress-2

1. Payback period is used with advantage in apprising investments for the following reasons:

The payback period may be considered roughly as the internal rate of return when annual cash flow is constant and the life of the project fairly long

The payback period is somewhat akin to the breakeven point.

The payback period also gives information about the rate at which the uncertainty associated with the project is resolved. The shorter the payback period, the faster the uncertainty associated with the project is resolved.

2. A BCR is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs, also expressed in monetary terms. The benefit-cost ratio (BCR) represents the ratio of total benefits over total costs, both discounted as appropriate.