Chapter 3

Project Appraisal

Although, we are familiar with tools such as Gantt chart, PERT, CPM, IRR, NPV and others associated with project management. Yet when it comes to real project scenario, we find practical problems which could bring deviations. This is not to suggest that the tools and techniques are inadequate, but assumptions on which the project reports are prepared are either invalid or unrealistic. A review of the Ministry of Programme Implementation has shown that about 70% of project time or cost overruns are due to unrealistic assumptions at the project formulation stage. It is therefore necessary to pay attention to this, often overlooked, but vital aspect of project formulation. Project appraisal is the process of analyzing the technical feasibility and economic viability of a project proposal with a view to financing their costs. Project appraisal enables to take a decision on investment with long term effects. During the appraisal stage, measurement of costs and benefits are difficult as these are spread over a long term with high degree of uncertainty. The figure below shows types of appraisal generally required for a project.
Meanings of Project Appraisal

Technical Appraisal

Determines whether the technical parameters are soundly conceived, realistic and technically feasible. Technical feasibility analysis is the systematic gathering and analysis of the data pertaining to the technical inputs required and formation of conclusion therefrom. The availability of the raw materials, equipment, hard/software, power, sanitary and sewerage services, transportation facility, skilled manpower, engineering facilities, maintenance, local people etc., depending on the type of project are coming under technical analysis. This feasibility analysis is very important since its significance lies in planning the exercises, documentation process, risk minimization process and to get approval.

Checklist

- Physical scale
- Technology used & Type of equipments & Suitability conditions
- How realistic is the implementation schedule
- Labour intensive method or others
- Cost estimates of Engineering Data
- Escalation are taken care of or not
- Procurement arrangement
- Cost of operation & Maintenance
- Necessary raw material & Inputs
- Potential impact of project on human & physical Environment

Financial Appraisal

To determine whether the financial costs and returns are properly estimated and whether the project is financially viable. Following minimum details are determined in the financial appraisal;

1. Total Cost
2. O & M Expenditure
3. Opportunity costs
4. Other costs
5. Returns on Investment over project life
6. NPV
7. CBR
8. IRR

Institutional Appraisal

To determine whether the implementing agencies as identified in the report are capable for effective implementation, monitoring, and evaluation of the scheme. Managerial competence, integrity, knowledge of the project, the promoters should have the knowledge and ability to plan, implement and operate the entire project effectively. The past record of the promoters is to be appraised to clarify their ability in handling the projects.

Checklist
• Whether the entity is properly organised do the job
• Strength to use capability and take initiatives to reach the objectives
• Openness to new ideas and willingness to adopt long term approach to extend over several projects

**Commercial Appraisal**

The demand and scope of the project among the beneficiaries, customer friendly process and preferences, future demand of the supply, effectiveness of the selling arrangement, latest information availability on all areas, government control measures, etc. The appraisal involves the assessment of the current demand/market scenario, which enables the project to get adequate demand. Estimation, distribution and advertisement scenario also to be here considered into.

**Environmental Appraisal**

To see any detrimental environmental impacts and how to minimise the impacts. Environmental appraisal concerns with the impact of environment on the project. The factors include the water, air, land, sound, geographical location etc.

**Economic Appraisal**

How far the project contributes to the development of the sector, industrial development, social development, maximizing the growth of employment, etc. are kept in view while evaluating the economic feasibility of the project.

**Legal Appraisal**

To determine whether the project satisfies the legal issues related to land acquisition, title deed, environmental clearance etc.

**Project Appraisal - A Methodology**

**Approach**

The cost and returns, estimated after discussions with concerned Engineers, are projected for its life period of ten to fifteen years for which the loan is taken. The Net Present Value (NPV) shows the percentage recovery of the capital cost within its project life period. The Internal Rate of Return (IIR) indicates the percentage returns of the individual projects over a fixed period for town.

Once the cost estimate is made and the cost of construction is known, the annual returns are assessed. With the expenditure, construction period and the returns per annum are known, the financial appraisal of the project-including the annuity of loan repayment is assessed. Depending on the financial viability of the project.

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. It is mandatory for the Project Authorities to undertake project
appraisal or at least give details of financial, economic and social benefits. Projects are examined for technical, institutional/organizational/managerial, financial and economic point of view depending on nature of the project. On the basis of such an assessment, a judgment is reached as to whether the project is technically sound, financially justified and viable from the point of view of the economy as a whole.

The concerned Technical Section in consultation with other technical sections undertake the technical appraisal, wherever necessary. This covers engineering, commercial, organizational and managerial aspects, while the Economic Appraisal Section carries out the pre-sanction appraisal of the development projects from the financial and economic points of view. Economic appraisal of a project is concerned with the desirability of carrying out the project from the standpoint of its contribution to the development of the national economy. Whereas financial analysis deals with only costs and returns to project participants, economic analysis deals with costs and returns to society as a whole. The rationale behind the project appraisal is to provide the decision-makers with financial and economic yardsticks for investment in the projects.

The techniques of project appraisal includes discounted techniques that takes into account the time value of money and include (a) Net Present Value (NPV), (b) Benefit Cost Ratio (BCR), (c) Internal Rate of Return (IRR) (d) Sensitivity Analysis. Economic viability of the project is invariably judged at 12 percent discount rate/opportunity cost of capital. However, in case of financial analysis, the actual rate of interest i.e. the rate at which capital is obtained is used. For the government-funded projects, the discount rate is fixed by the Government. In case the project is funded by more than one source, the financial analysis is carried out on the weighted average cost of capital (WACC) for each project. Normally, if the project is financed through foreign grants, the financial analysis is undertaken at zero discount rate. However, the economic analysis is undertaken at 12% discount rate.

Many investment projects are addition to existing facilities/activities and thus benefits and costs relevant to the new project are those that are incremental to what would have occurred if the new project had not been added. During the operating life of a project, it is very important to measure all costs and benefits as the difference between what these variables would be if no project (without project) were undertaken and what they will be should the project be implemented (with project). It is very common error to assume that all costs and benefits are incremental to the new project when, in fact, they are not. Hence, considerable care must be taken in defining a “base case” which realistically sets out the profile of costs and benefits expected if no additional investment is undertaken.

**Social Costs –Benefits Analysis**

Social Cost-Benefit analysis is an appraisal system that helps selecting socially remunerative projects for implementation. Every project tends to use up resources pre-empting its allocation in other uses. The inputs used up in the projects constitute the social cost of the project. The process of Social Cost-Benefit Analysis consists of determining the social feasibility or profitability of a project by expressing its social benefits and social costs in terms of a common counting device or numeral. If the social benefits of a project exceed its social costs, it is qualified for implementation. Projects emanate from different sources, such as individuals, firms or institutions, and Governments at the state and the
central levels. In instances when the state is not the owner, the traditional yardstick of commercial or financial profitability is used for selection of projects. In these cases the primary criterion is the profit potential for promoter or the owner. But this may not necessarily result in socially most profitable project. But then can decision makers overlook this vital aspect of project evaluation, especially in a developing country?

A project has to be formulated and implemented in a social environment. Its impact on the society in general and to the community in the near vicinity, in particular, is a major concern to be taken into account at the time of project formulation. This includes land acquisition, rehabilitation, loss of livelihood, adequate compensation, building up harmony with the community, through close interaction. All these areas are importance. Yet very few projects have considered it necessary to take these factors into account. Techno-economic parameters are only guidelines for project formulation. But then a project cannot be implemented in a vacuum. It needs an elaborate support system. The Project Manager has to seek outside intervention for the support system. This where, a manager who is essentially aware of the multiple dimensions of a project will be better suited to exercise appropriate control over projects. We may think of the river linking project in India. The project is yet to reach the pre-feasibility stage, and already there is a public opinion building against it. Due to this increased social awareness, project formulation methodology has to take account the social impact of the project. This is a time consuming process. Often project authorities are made to rush through project preparation stage, without spending adequate time on project pre-feasibility study, ultimately leading to time and cost overrun. Projects often face uncertain future, due to intense public opposition and prolonged litigation. Public servants are often required to face the vagaries of public opposition, It is well known that a project has both time and cost dimensions. These two dimensions are interlinked. A time delay often means a cost overrun, and a cost overrun can also lead to time delay, because of budgetary constraints. Time and cost are the dimensions in which projects are measured. But then there are web of other interconnected activities which also impact on the project time and cost flow. Thus the main emphasis on a project, even at the formulation stage is not the technical parameters alone but on the control and coordination aspects.

**Appraisal Methods**

There are appraisal techniques that take into account the variations in the expected inflows and outflows of the project that the project must inevitably face during its life cycle. The crux of these methods lies in their consideration of time.

**Project Analysis as per Cash Flows**

It is common knowledge that projects do not earn the same level of profit every year. In some years, profits are high; in others they are low. In many years, it can be expected that the project will earn no profit at all. The question that confronts planners and administrators is how to examine projects that have different time sequence of costs and benefits, and therefore of profit/losses. Table 1 can be taken as the starting point for examining this question.

Table 1 shows the costs and benefits of a hypothetical project over its life cycle of seven years. In the first year, costs are greater than the benefits; in later years, benefits exceed costs.
Two questions arise with respect to Table 1

Table 1: Costs and Benefits over 7 years (in 000 rupees)

<table>
<thead>
<tr>
<th>Year</th>
<th>Costs</th>
<th>Benefits</th>
<th>Difference between benefits and costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>250</td>
<td>0</td>
<td>-250</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>290</td>
<td>40</td>
</tr>
<tr>
<td>2</td>
<td>250</td>
<td>290</td>
<td>40</td>
</tr>
<tr>
<td>3</td>
<td>255</td>
<td>300</td>
<td>55</td>
</tr>
<tr>
<td>4</td>
<td>260</td>
<td>335</td>
<td>75</td>
</tr>
<tr>
<td>5</td>
<td>260</td>
<td>335</td>
<td>75</td>
</tr>
<tr>
<td>6</td>
<td>260</td>
<td>335</td>
<td>75</td>
</tr>
<tr>
<td>Total</td>
<td>1785</td>
<td>1895</td>
<td>110</td>
</tr>
</tbody>
</table>

1. From the table 1, it is seen that the overall profitability of a project cannot be assessed on a year-to-year basis. Expected profits of this project as shown in the table vary between years. Also, if a year-to-year assessment is attempted, it will be a time-consuming exercise, and may not be able to give any definite conclusion as to its profitability. So, the task for the planners is to reduce the flows into a single figure that can indicate the earning capacity or the profitability of the project in question. How should this be done?

2. How should the “value” of money over time be treated? Should the value of Rs.75,000 that is likely to be the level of net profits in the fourth year of the project (see Table 2) be taken at its face value, or be adjusted to take note of the fall in the value of money from inflation as well as the uncertainty that is implicit in any consideration of the “future”. What is the method by which the problem of time can be resolved?

The method of dealing with the flows of costs and benefits over time in project analysis is called time-discounting. This is a method of reducing to a comparable base the costs and benefits of a project that accrue at different intervals. The underlying thesis in this concept is that the value of money is different at different points of time; for instance Rs.1,000 received today is not of equal worth to a similar amount ten years from now. In other words, costs which have to be paid in the distant future have, at present, a lower significance or value than those to be paid now. Similarly, the benefits which accrue from a project now are of a greater value than those accruing later. Calculation of the present value of costs and benefits involves the use of a discount factor, which is nothing but a rate at which the future is to be discounted. Discount rate represents the present value of the future.
To repeat: the crux of time-discounting is that the value of money is different at different points in time. One thousand rupees received today cannot be equal in worth to Rs.1,000 received in one year’s time. Inflation and uncertainty reduce the value of money over time.

How can the time-discounting method be applied to projects?

In order to explain the application of the time-discounting method, it is useful to briefly recall the manner in which compound interests are calculated. Assume that there is an amount of Rs.100 that is expected to earn interest at 8 percent per annum. In one year, the amount of Rs.100 will increase at this rate to Rs.108.00 \[=100(1+(8/100)]; \] and in two years, this amount will be Rs.116.00 \[=100(1+8/100)]; \] and in three years the amount will increase to Rs.125.90 \[=100((1+8/100)]; \]. The formula that is used is conveniently written as:

\[
F = P(1+r)^n
\]

Where  
F = future worth  
P = present worth  
R= rate of interest  
\(n\) = number of years

or

\[
\text{Future worth (F)} = P \times \frac{(1+r)^n}{1}
\]

Compounding is nothing other than finding out the future worth of the present at a given rate of interest. Discounting is just reverse of compounding. In discounting, the expected future values are given and their present values have to be determined at a given discount rate. This involves using the inverse of the compounding formula:

\[
P = F \times \frac{1}{(1+r)^n}
\]

Present worth (P) = \[F \times \frac{1}{(1+r)}\] Year (1)

\[= F \times \frac{1}{(1+r)^2}\] Year (2)

\[= F \times \frac{1}{(1+r)^3}\] Year (3)

\[= F \times \frac{1}{(1+r)^n}\] Year (n)

Time-discounting is used for calculating the profitability of the project when cash flows spread over a medium to long term with differing costs and incomes. It is thus
important for practitioners to be acquainted not only with the mechanics of discounting, but when, and under what conditions, they should use higher or lower discount rates. When the future carries greater risk and uncertainty, and the fear of inflation or deteriorating economic situations, a higher discount rate is generally used. Conversely, a lower discount rate would suffice when the economic and social situations are stable, and no dramatic changes are expected to take place in the future.

Three methods are discussed here. These are (1) net present value, (2) benefit cost ratio, and (3) internal rate of return.

**Net Present Value Method**

The net present value method can be used by taking the following steps

1. Estimate the cash inflows and outflows on a year-to-year basis.
2. Work out the net cash flows for individual years.
3. Find out for individual years the discount value of 1 at the given discount rate.
4. Multiply the net cash flows for each year by the corresponding discount factor.
5. Add up the present values

It can be seen from the example in Table 2 below that at a 12 percent rate of discount the net present values of the project are negative (-15.1). The project, therefore, cannot be accepted. If, however, a lower discount rate is used, say 8 percent, the net values of the project would turn positive, and the project may gain acceptability. The net values at 8 percent discount rate are shown in Table 3.

**Table 2: Computing the Net Present Values (1) (in ₹ 1,000)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Costs (outflows)</th>
<th>Benefits (inflow)</th>
<th>Benefits-costs (Net Cash Flows)</th>
<th>Values of 1 at 12% Discount Rate</th>
<th>Discounted Net Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>250</td>
<td>0</td>
<td>-250</td>
<td>1.00</td>
<td>-250</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>290</td>
<td>40</td>
<td>0.892</td>
<td>35.7</td>
</tr>
<tr>
<td>2</td>
<td>250</td>
<td>290</td>
<td>40</td>
<td>0.797</td>
<td>31.9</td>
</tr>
<tr>
<td>3</td>
<td>255</td>
<td>300</td>
<td>55</td>
<td>0.712</td>
<td>39.2</td>
</tr>
<tr>
<td>4</td>
<td>260</td>
<td>335</td>
<td>75</td>
<td>0.635</td>
<td>47.6</td>
</tr>
<tr>
<td>5</td>
<td>260</td>
<td>335</td>
<td>75</td>
<td>0.567</td>
<td>42.5</td>
</tr>
<tr>
<td>6</td>
<td>260</td>
<td>335</td>
<td>75</td>
<td>0.507</td>
<td>38.0</td>
</tr>
<tr>
<td></td>
<td>1,185</td>
<td>1,295</td>
<td></td>
<td></td>
<td>-15.1 Step 5</td>
</tr>
</tbody>
</table>
### Table 3: Computing the Net Present Values (2) (in ₹ 1000)

<table>
<thead>
<tr>
<th>Year</th>
<th>Benefits-Costs (Net Cash Flows)</th>
<th>Values of 1 at 8% Discount Rate</th>
<th>Discounted Net Cash Flows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Step 2</td>
<td>Step 3</td>
<td>Step 4</td>
</tr>
<tr>
<td>0</td>
<td>-250</td>
<td>1.00</td>
<td>-250</td>
</tr>
<tr>
<td>1</td>
<td>40</td>
<td>0.92</td>
<td>37.2</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>0.86</td>
<td>34.4</td>
</tr>
<tr>
<td>3</td>
<td>55</td>
<td>0.79</td>
<td>43.5</td>
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<tr>
<td>4</td>
<td>75</td>
<td>0.74</td>
<td>54.8</td>
</tr>
<tr>
<td>5</td>
<td>75</td>
<td>0.68</td>
<td>51.0</td>
</tr>
<tr>
<td>6</td>
<td>75</td>
<td>0.63</td>
<td>47.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>18.1</strong></td>
</tr>
</tbody>
</table>

### Benefit-Cost Ratio

The benefit-cost ratio is a ratio calculated by dividing the sum of discounted benefits by discounted costs. Steps for calculating the benefit-cost ratio are:

\[
\text{Benefit – Cost Ratio} = \frac{\text{Sum of Discounted Benefits}}{\text{Sum of Discounted Costs}}
\]

- **Step 1.** Estimate the cash inflows and outflows on a year-to-year basis.
- **Step 2.** Find out for individual years the discount value of 1 at the given discount rate.
- **Step 3.** Multiply the cash inflows and cash outflows for each year by the corresponding discount factor.
- **Step 4.** Add up the discounted values of cash inflows and outflows separately.
- **Step 5.** Divide the discounted values of cash inflows by cash outflows to obtain the benefit-cost ratio.
The computation of benefit-cost ratio is shown in Table 4.

Table 4: Computing the benefit-cost ratio

<table>
<thead>
<tr>
<th>Year</th>
<th>Costs (outflows)</th>
<th>Benefits (inflows)</th>
<th>Discount Factor at 8%</th>
<th>Discounted Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Costs</td>
</tr>
<tr>
<td>0</td>
<td>250</td>
<td>0</td>
<td>1</td>
<td>250</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>290</td>
<td>0.93</td>
<td>232.5</td>
</tr>
<tr>
<td>2</td>
<td>250</td>
<td>290</td>
<td>0.86</td>
<td>215</td>
</tr>
<tr>
<td>3</td>
<td>255</td>
<td>300</td>
<td>0.76</td>
<td>193.8</td>
</tr>
<tr>
<td>4</td>
<td>260</td>
<td>335</td>
<td>0.73</td>
<td>189.8</td>
</tr>
<tr>
<td>5</td>
<td>260</td>
<td>335</td>
<td>0.68</td>
<td>176.8</td>
</tr>
<tr>
<td>6</td>
<td>260</td>
<td>335</td>
<td>0.63</td>
<td>163.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1421.7</td>
</tr>
</tbody>
</table>

Step 5: Benefit Cost Ratio = \frac{1430.5}{1421.7} = 1.00619

The benefit-cost ratio in the above example is greater than 1, indicating that the sum of the discounted benefits is greater than the sum of the discounted costs. If the ratio has been less than 1, as indeed it is at 12 percent discount rate, it would not be advisable to accept the project. Also, as in the case of the NPV, the higher the benefit-cost ratio of a project, the better it is in terms of profitability.

**Internal Rate of Return**

The internal rate of return is a rate of discount at which the net present values of a project are zero. Or, expressed differently, it is a rate at which the discounted costs and discounted benefits become equal. The rate represents the “effective interest earned on the investment in the project.” In the words of Gittinger, it is the maximum interest that a project could pay for the resources used if the project is to recover its investment and operating costs and still breakeven.

**Internal Rate of Return** = A rate at which the discounted costs are equal to discounted benefits

Unlike the two other methods discussed earlier where the present values or the benefit-cost ratios are calculated on the basis of the given discount rates, in the case of the internal rate of return, a rate at which the discounted costs would become equal to discounted benefits has to be found out. The higher the IRR, the stronger is the project.
The calculation of the internal rate of return involves the following steps.

Step 1. Estimate the cash inflows and cash outflows on a year-to-year basis.
Step 2. Work out the net cash flows for individual years.
Step 3. Select any random discount rate and compute the net present values.
Step 4. If the NPV thus arrived at is positive, then select a higher discount rate at which the NPV may come close to zero. If, however, the NPV is negative, then select a lower discount rate at which the NPV may come close to zero.

Step 5. Repeat the exercise until a discount rate that reduces the net present values to zero is found.

An example using the figures given in Table 5 may once again be taken to illustrate the computation of the internal rate of return.

**Table 5: Computing the Internal Rate of Return (1)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Costs (Cash outflows)</th>
<th>Benefits (Cash inflows)</th>
<th>Net Cash Flows</th>
<th>Net Present Values Discounted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Step 1</td>
<td>Step 2</td>
<td>Step 3 8%</td>
<td>Step 4 12%</td>
</tr>
<tr>
<td>0</td>
<td>250</td>
<td>0</td>
<td>-250</td>
<td>-250</td>
</tr>
<tr>
<td>1</td>
<td>250</td>
<td>290</td>
<td>40</td>
<td>37.2</td>
</tr>
<tr>
<td>2</td>
<td>250</td>
<td>290</td>
<td>40</td>
<td>34.4</td>
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<tr>
<td>3</td>
<td>255</td>
<td>300</td>
<td>55</td>
<td>43.5</td>
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<tr>
<td>4</td>
<td>260</td>
<td>335</td>
<td>75</td>
<td>54.8</td>
</tr>
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<td>5</td>
<td>260</td>
<td>335</td>
<td>75</td>
<td>51.0</td>
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<td>6</td>
<td>260</td>
<td>335</td>
<td>75</td>
<td>47.2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td><strong>18.1</strong></td>
<td><strong>-15.1</strong></td>
</tr>
</tbody>
</table>

In this example, the initial discounting of the net cash flows (Step 3) has been done at 8 percent, which gives a positive net present value of 18.1. Step 4, that is, discounting at 12 percent, turns the net values to a negative figure of 15.1, suggesting that the rate at which the discounted net values would turn zero must lie somewhere between 8 and 12 percent.

It would thus be noted that the calculation of the internal rate of return requires repetitive computations and is often taxing. An alternative to the use of repetitive computations is “interpolation”, which is a technique of finding the intermediate values between any two
The equation for interpolation is as follows:

\[
\text{Internal rate of return} = \text{Lower discount rate} + \frac{\text{Net present value at lower discount rate}}{\text{Sum of the net present values at the two discount rates (ignore sign)}} \times \left( \text{Difference between the discount rates} \right)
\]

Or

\[
\text{Internal rate of return} = 8 + (12 - 8) \frac{18.1}{(18.1) - (-15.1)} \quad \text{.........(1)}
\]

\[
= 8 + (4) \times \frac{18.1}{33.2} \quad \text{................. (2)}
\]

\[
= 8 + (4) \times 0.54 \quad \text{.................. (3)}
\]

\[
= 8 + 2.1
\]

\[
= 10.1 \text{ rate of discount}
\]

This is the way in which the internal rate of return is calculated. As mentioned earlier, projects with higher IRRs are considered financially safer and stronger. Evidently, it would be inadvisable to accept projects whose IRRs are lower than the prevailing lending or borrowing interest rates in the capital market of the country.

It would be mentioned that the internal rate of return is the most widely used method for appraising development projects. Most international and bilateral aid agencies rely on this method as a guide to decisions on projects in question, of course, among several other considerations. The main advantage of the IRR is that it is less subject to maneuvering than either the net present value or the benefit-cost ratio methods. In their cases, almost everything about projects depends on the discount rates: by changing the discount rates, results as desired by the planners or administrators can be obtained. This is not possible to be done in the case of the internal rate of return where, if favorable results were to be sought on a particular project, the entire stream of costs and benefits of the project will need to be changed.

Another example of assessing a water supply project for a town by IRR is illustrated below
Key Questions

a) Will the project have a positive cash flow at any time during the project life?
b) In the case of income – generating projects: what is the projected net profit and when will project break even?

Key Issues

1. To calculate the incremental net benefit because only the net benefits with the project in excess of those which would have accrued without the project should be taken into account. If the project results in cost reductions, they should be considered as incremental net benefits.
2. To determine the project life. It is usually the economic life of the major investment item which is shorter than the technical life due to technological obsolescence.
3. To assess the debt-servicing capacity of the project during the entire project life in order to ensure that the project will be capable of meeting its financial obligations at any time. Cash flow analysis calculates the expected net cash flow as the differences between receipts and expenses for each year over the project life. Receipts and expenses for each year over the project life. Receipts and expenses comprise all monetary transactions (cash inflows and outflows) irrespective of an impact on real income. A continuous project implementation and later operation requires a positive net cash flow at any time.

In case of an income – generating project, the commercial profitability of the project has to be assessed by estimating all revenue and costs. Revenue and costs comprise all transactions that generate or reduce real income irrespective of cash flows. The commercial profitability is only given, if a net profit is likely to be achieved at the end of the project life or, in the case of a continuous operation, after an respected point in time depending on the project type. Funding assistance is usually required to finance the capital investments needed to get project started.

Case Study: APPRAISAL OF A TOWN LEVEL WATER SUPPLY PROJECT

Pricing and cost recovery in water supply projects has become almost unworkable for the small and medium towns due to various reasons. Irregular supply, enormous maintenance and high energy costs, inadequate water treatment, poor recovery, inadequate pricing of water supply to consumers, provision of underground drainage, sewage treatment are some of the intricate reasons for not providing minimum supply of water as per the normative standards. Water Supply project implemented by Tiruppur Area Development Corporation, JUSCO and a few city corporations have become sustainable and income generative. Increased efficiency and full cost recovery by billing, metering, technical designs, automation of metering, etc. would help. Billing system covering variable charges for economically weaker sections, commercial, high income groups etc., need to be adopted suitably. Appropriate service providers like SPV could be used. Therefore, a small example of how a town level water supply project can be remunerative even with minimum pricing is illustrated below;
Minimum Data

1. PROJECT: Supply of Water to 1 residents of a town consisting of 10,000 houses
2. Capital Expenditure : Rs. 7 crores
3. Cost of Capital : 10%
4. Operations and maintenance Rs. 25 lakhs per annum
5. Average revenue from each house hold Rs. 150 per month or Rs1.8 crore/year
6. Life of the project: 10 years

With the above data available with us, we can now work out Net Present Values, Benefit Cost Ratio and IRR based on the incomes and expenditure over the period of 10 years as below

### ANALYSIS OF NET COST BENEFIT OF THE WATER SUPPLY PROJECT

<table>
<thead>
<tr>
<th>Particulars</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental Revenue (Rs in Crores)</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Incremental cost (Rs in Crores)</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Net cash flow (Rs in Crores)</td>
<td>1.55</td>
<td>1.55</td>
<td>1.55</td>
<td>1.55</td>
<td>1.55</td>
<td>1.55</td>
<td>1.55</td>
<td>1.55</td>
<td>1.55</td>
<td>1.55</td>
<td>1.55</td>
</tr>
<tr>
<td>PVIF at 10%</td>
<td>0.909</td>
<td>0.826</td>
<td>0.751</td>
<td>0.683</td>
<td>0.621</td>
<td>0.564</td>
<td>0.513</td>
<td>0.467</td>
<td>0.424</td>
<td>0.386</td>
<td></td>
</tr>
<tr>
<td>PV of cash flows at 10%</td>
<td>1.41</td>
<td>1.28</td>
<td>1.16</td>
<td>1.06</td>
<td>0.96</td>
<td>0.87</td>
<td>0.80</td>
<td>0.72</td>
<td>0.66</td>
<td>0.60</td>
<td>9.62</td>
</tr>
<tr>
<td>PVIF at 20%</td>
<td>0.833</td>
<td>0.694</td>
<td>0.579</td>
<td>0.482</td>
<td>0.402</td>
<td>0.335</td>
<td>0.279</td>
<td>0.233</td>
<td>0.194</td>
<td>0.162</td>
<td></td>
</tr>
<tr>
<td>PV of cash flows at 20%</td>
<td>1.29</td>
<td>1.08</td>
<td>0.90</td>
<td>0.75</td>
<td>0.62</td>
<td>0.52</td>
<td>0.43</td>
<td>0.36</td>
<td>0.30</td>
<td>0.25</td>
<td>6.5</td>
</tr>
</tbody>
</table>
BCR at 10%=9.62/7=1.37

IRR -10%+(20-10)X(9.62-7)/ (9.62-6.5)

IRR-18.40%

Return on investment=18.4%-10%= 8.4%

**Project Appraisal Report**

The appraisal of a project would provide the project authorities the following information for taking decision;

I. Does it meet the immediate and long-term objectives?
II. How does the project compare with other competing projects?

Project appraisal leads to overall assessment of the project’s chances for success based on the findings of the feasibility analysis. It seeks to establish what will occur, who will gain and lose, when the project’s impacts will occur and the efficiency of the project investments in relation to the benefits derived. The form of the project appraisal process depends on a variety of factors, such as the scale and complexity of the given project, the nature of the organization involved, the availability of professional staff, the importance attached to non-economic factors and so forth. A project appraisal report should cover the following topics.

1. Description of the project proposal and its objectives;
2. Description of the current baseline conditions.
3. Economic and financial appraisal
4. Socio-cultural assessment
5. Environmental assessment
6. Overall assessment of the project proposal (findings of the project appraisal process)
7. Conclusions and recommendations
8. Preliminary framework for project monitoring and evaluation.

**Hassan - A Case Study of Good Appraisal**

Hassan town in Karnataka State is chosen as a model town for taking up such an exercise. This integrated Infrastructure Plan Programming for Hassan, through its local body i.e., the municipality, is a well knit package of many programmes-services and remunerative-integrated into one cohesive unit, instead of disjointed projects planned without any inter relation among them.

The exercise was taken up to find ways and means of increasing the local body’s internal resources while at the same time looking to lending agencies for financial assistance towards schemes for provision of infrastructure facilities and other remunerative schemes designed for resource augmentation and asset creation. It is now proposed to study the existing service levels and finances, identifying the gaps, exploring the possibilities of increasing the revenue and reducing the expenditure to bolster up the savings. The next step would be to estimate the funds
required to take up the service and remunerative projects and assess the capability of the municipality to borrow and finally prioritise the schemes to meet its purpose.

It was followed up with the discussions on the markets, shops, parks and play fields in the town some of which are remunerative. So with the views expressed on service and remunerative projects gathered from the public, discussion with the municipal officials, officials of the other departments, Boards such as Water-Supply and Drainage, Housing, Slum Clearance, were taken up in two or three informal group meetings to arrive at the possible proposals for meeting the problems and the needs of the community. This was followed by the spot visits to the places identified for action.

Estimates were then prepared for the identified projects. In the case of remunerative projects they were tested for their financial viability. Along with the projects costs, the operation and maintenance cost, the resulting annuity payments of loan with interest were also worked out. The already existing municipal budget with receipt, expenditure, existing debt service ratio (Ratio of loan repayment to total receipts excluding grant) is projected for the next five years and to these are added new projects, their income, expenditure with new debt service ratio of existing and new projects and the net financial status.

**Alternative Scenarios:**

a) Revenues can be increased through traditional and innovative methods.
b) Expenditure can be reduced.
c) New projects can be undertaken to generate more funds.
d) Cutting down some projects itself or pruning down some items of one project or more, to bring down the capital cost requirements.
e) If grants are available for service projects, to work out some loan grant mix.

So different scenarios were tried with various permutation and combinations of the five principles enunciated above to bring the debt service ratio below 25 percent and at the same time aim at surplus balances.
Checklist: Financial Appraisal of a Infrastructure Development Project-
Corrective Actions-Flow chart

Financial Appraisal

Remunerative Project Component

Total Cost of the Project/Investment

O & M Costs

Cost of Depreciation

Any other Costs

Total Costs

Benefits/Returns from Remunerative

Premiums/ Deposits from renting/leasing of commercial shopping/ centres

Income from sale of Sites and services

Renting or Leasing of New Bus Stand/Park

Any other Incomes from the remunerative project

Incomes over the next 25 years

Cash Flow Analysis for 25 Years

Calculation of NPV/IRR/CBR- Decision to select the project
QUIZ

Chapter 3

1. Project appraisal enables
   a. To know cost benefits
   b. Technical feasibility
   c. Economic & Environmental viability
   d. All of the above

2. As a result of poor project appraisal
   a. We may end up with no demand for the project
   b. We may incur losses
   c. We will save money
   d. a & b

3. Project appraisal gives an indication about the
   a. Total viability of the project
   b. Financial, Economic & Social benefits only
   c. Only technical viability
   d. None of the above

4. The appraisal techniques used are
   a. NPV & IRR
   b. BCR
   c. Sensitivity analysis
   d. All of the above

5. Economic viability of the project is judged normally at discount rate of
   a. 4%
   b. 25%
   c. 12%
   d. 40%

6. Financial analysis takes into account discount rate of
   a. Actual borrowed rate of interest of the capital
   b. 20%
   c. 3%
   d. None of the above
7. In case the project is funded by more than one source, the financial analysis is carried out using
   a. Weighted average cost of capital for each project
   b. More than the weighted average
   c. Less than the weighted average
   d. None of the above

8. Project is acceptable if
   a. NPV is positive
   b. NPV is negative
   c. NPV is Zero
   d. None of the above

9. Project is acceptable if BCR is more than 1
   a. True
   b. False

10. Internal Rate of Return (IRR) indicates
    a. Net return on investment in the project
    b. No return on investment in the project
    c. None of the above
    d. Only b

11. Social cost benefit analysis helps
    a. Selecting financially remunerative project
    b. Selecting socially remunerative project
    c. In knowing whether social benefits exceed its social cost
    d. b & c

12. Time discounting of cash flows means
    a. Calculation of the present value of cost & benefits during the project life
    b. It is the method of reducing to a comparable base the costs & benefits that accrue at different intervals
    c. a & b
    d. None of the above
13. The formula for calculation of present value is
   \[ PV = \frac{FV}{(1+R)^n} \]
   where
   \( PV \) = present value
   \( FV \) = Future value
   \( R \) = Rate of Interest
   \( n \) = Number of years

   a. True
   b. False

14. Benefit cost ratio = \textbf{Sum of the discounted benefits} \\
     \textbf{Sum of the discounted cost}

   a. True
   b. False

15. Internal rate of return
   a. Is the rate of discount at which net present values of a project are zero
   b. Rate at which the discounted costs are equal to discounted benefits
   c. Lower discount rate + \left( \frac{\text{difference between the discount rates}}{\text{Sum of the net present Value of the two Discount rates (Ignore sign)}} \right) \times \frac{\text{net present value of the lower discount rate}}{\text{Sum of the net present value of the two Discount rates (Ignore sign)}}
   d. All of the above

16. What is the Internal Rate of Return (IRR) of a project?
   a. The time period needed to pay back the investment from a project when future income is discounted.
   b. The inherent discount rate or investment yield rate produced by the project over a pre-defined period of time.
   c. The rate of negative risk that can be accepted for a project without turning the Expected net present value negative.
   d. The expected benefit from a project’s deliverable calculated as a percentage of the original investment over a specified time period.
17. Which is not true in regard of RoI (Return on Investment) for a project?
   a. It defines the cumulated net income from an investment at a given point in time or during a defined period.
   b. It includes investment, direct and indirect costs and may include allowances for capital cost, depreciation, risk of loss, and/or inflation.
   c. It is most commonly stated as a percentage of the investment or as a dimensionless index figure.
   d. It is the time when cumulated net income is equal to the investment.

18. A project being evaluated by an agency has a cost of capital of 12%. Initial investment is Rs 1,00,000 benefits as below

<table>
<thead>
<tr>
<th>Year</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>25,000</td>
</tr>
<tr>
<td>Year 2</td>
<td>40,000</td>
</tr>
<tr>
<td>Year 3</td>
<td>40,000</td>
</tr>
<tr>
<td>Year 4</td>
<td>50,000</td>
</tr>
</tbody>
</table>

The value of the BCR is

a. 1.75  
b. 1.145  
c. 2.3  
d. 0.45

19. Rule for BCR for a project is
   a. BCR > 1 accept
   b. BCR = 1 in different
   c. BCR < 1 reject
   d. All of the above

20. Assumed is a discount rate of 5% per year. Looking at the present values of the benefits of these projects in the first 3 years, what is true?
   a. Both projects are equally attractive
   b. The first project is more attractive by app. 7%.
   c. The second project is more attractive by app. 5%.
   d. The first project is more attractive by app. 3%
## TEMPLATE (Indicative)

### Project Appraisal

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Name of the Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Need for the Project</td>
</tr>
</tbody>
</table>
| 2      | project proposal and its objectives;                                                 | Proposal  
|        |                                                                                      | Objectives  
| 3      | Immediate and long-term benefits?                                                   | Immediate objectives  
|        |                                                                                      | Long term objectives  
| 4      | Description of the current baseline conditions.                                      | What would happen in the absence of project?  
|        |                                                                                      | Study Area/Location  
|        |                                                                                      | Environmental Impact  
|        |                                                                                      | Beneficiaries  
|        |                                                                                      | Social costs  
|        |                                                                                      | Legal issues  
|        |                                                                                      | Demand  
|        |                                                                                      | Other Constraints  
|        |                                                                                      | Favourable conditions  
|        |                                                                                      | Etc.  
| 5      | Project comparison with other competing projects?                                    | Eg. Alternative options: based on feasibility analysis  
| 6      | Economic and financial appraisal                                                    | • Total Cost  
|        |                                                                                      | • O&M Expenditure  
|        |                                                                                      | • Opportunity costs  
|        |                                                                                      | • Other costs  
|        |                                                                                      | • Returns on Investment over project life  
|        |                                                                                      | • NPV  
|        |                                                                                      | • CBR  

87
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Institutional Appraisal</td>
<td>Eg. Capability in terms of expertise, personnel, skills, worth, past experience etc.,</td>
</tr>
<tr>
<td>8</td>
<td>Legal Assessment</td>
<td>Eg. Land, title deed, clearances, NOC etc.</td>
</tr>
</tbody>
</table>
| 9 | Technical appraisal | 1. Technology used & Type of equipments & Suitability conditions  
2. Hardware, software, Skills, Knowledge, personnel etc.  
3. How realistic is the implementation schedule  
4. Labour intensive method or others  
5. Cost estimates of Engineering Data  
| 10 | Socio-cultural assessment | Social benefits, community development etc. |
| 11 | Environmental assessment | Environmental impact, benefits, hazards, risks, clearances etc. |
| 12 | Overall assessment of the project proposal (findings of the project appraisal process) |   |
| 13 | Conclusions and recommendations |   |
| 14 | Preliminary framework for project monitoring and evaluation. |   |
| 15 | Remarks if any |   |