2

Project Appraisal

Project appraisal follows the project formulation phase resulting in the preparation of feasibility report (FR). The main objective of project appraisal is to ultimately decide whether the project proposed/sponsored in the FR has to be accepted for Capital Investment, or be rejected. The initial appraisal of the project sponsored also aims at, if need be, recommending the steps or ways in which the project can be redesigned or reformulated with a view to better technical, financial, commercial and economic viabilities; also mitigate or minimize any adverse on negative environmental impact. Thus, project appraisal is an essential tool for judicious investment decision-making, full and complete data and information need to be documented/presented, and analyzed in the FR so as to facilitate the appraisal authorities to carry out:

(i) Demand analysis to establish convincingly the need for the project,
(ii) Check on optimal location,
(iii) Technical analysis to determine whether the specification of technical parameters are sound and realistic,
(iv) Financial analysis to assess whether the project proposal is financially viable,
(v) Commercial analysis to establish the soundness of product or service specifications, marketing plans, organization structure (both project and for operation),
(vi) Socio-economic analysis to determine whether the project is worthwhile to implement from the point of view of the nation that is society at large and the economy as a whole, and
(vii) Environment and physiographical and ecological thresholds analysis which is concerned with the identification of these constraints, and make the evaluation of chances of success (or otherwise) which the project may have to face (these constraints). Internal consistency and external compatibility are two basic attributes of a viable project.

Development oriented administration and forward looking management may have under consideration, at any juncture or time, a number and variety of projects, resources being limited, a choice has to be made. Project appraisal is warranted to assess the material attributes of an investment proposition and to confirm the implications the project will pose for the sponsoring authorities (system) as well as for systems with which it will have to co-exist after its implementation. An

3. APPRAISAL OF PROJECT IMPLEMENTATION PLAN

As indicated earlier, project appraisal is the process of evaluating the salient features of the feasibility study of a project. Project duration or time profile of the project is one of the basic evaluations in comparative appraisal of project ideas. Project Network Analysis (PERT/CPM) is concerned with development of work or implementation plan and establishment of the overall project duration. It will also provide data and information on the quantum and timing of outflow of funds required to implement the project. These data and information are essential for financial/budgetary planning and control and are of vital importance to project authorities for proper and reliable scheduling of the repayment of loans along with interest charges. The point to be assessed in the appraisal process is the authenticity and dependability of the project implementation plan and schedule. It needs to be checked up whether this plan includes all the activities necessary for achieving the project end objectives. After the framework of the implementation plan has been tested, it needs to be ascertained whether the time and resources scheduling has been done on a realistic basis. If time is of essence and happens to be a crucial constraint in the overall scheme of things, it has to be checked up whether the overall project duration will be in accordance with the time requirements (or availability) of the situation. Another aspect to be assessed is whether the project time schedule and the financial outlays envisaged (including their time phasing) are in balance.

4. CONCLUSION

Project appraisal is a multifaceted exercise. The backdrop of the exercise is provided by the value system of the outside agency by or for whom appraisal is undertaken. The appraisal compresses total evaluation of the performance ratings of the project. It covers technological, financial as also socio-economic aspects of the project and presents to the decision-maker(s) not a single figure or numerical value as a measure of the excellence of the project, but a set of valuations embracing the total performance of the project. The project has to be assessed from the point of view of the relationship it will have with other systems (including environmental/ecological) with which it has to co-exist. It needs to be judged on technological soundness. The output of the project has to have a target group. The project has, therefore to be appraised with reference to the marketability of its output (commercial viability). The project needs to generate adequate returns on capital invested. This calls for judgement from the financial point of view. Projects generate certain spill-over effects. They give rise to spin effects, besides providing goods or services; projects also serve as a means of modifying existing income distributions in society. The impact which the project will have on the society at large and various different strata of society (or groups) will also need to be assessed to obtain a total comprehensive picture of the project. Project appraisal should include all the issues which have a bearing on the decision-making process and for giving green signal for the project implementation. Benefit-Cost analysis is one important aspect of the appraisal exercise. The appraisal is the main tool utilized by investment planners to assess the comparative merits of projects for diverse purposes. They have to be compared and ranked because of resource constraints at any given point of time. It enables the decision-maker(s) in applying a uniform set of yardsticks or criteria for measuring the relative performance of various competing projects, and to assign priority to a set of projects for utilization of scarce resources.

The various investment appraisal techniques may be considered optional. These serve as aids to management decision-making and sharpen management judgement/intuition/gut sense. Ultimate management decision to accord green-signal/approval for project implementation rests with Corporate management supported by these methods.

Thus, different techniques of project investment appraisal provide us a sound basis to make a comparison of the relative returns of projects, and to decide on the ranking of competing projects vying for allocation of scarce resources.

ANNEXURE I

Feasibilty Study: Check List

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1. Has an examination been made of policy with respect to proposed project/sector of economy?
2. Location studies—What are the options explored? What considerations are taken into account in its choice?
3. Demand—Supply analysis/marketing/trading—has this been systematically and thoroughly done?
4. Technology—What are the alternatives?
   —Analysis
   (a) Implementation/Construction
   (b) Production-Process know how and choice/raw materials choice/ investigation, source of raw material, etc.
   – Plant size, number etc.
   – Product mix/Product Pattern
5. Estimate of costs
   – Capital/Revenue expenditure (operating costs)
   – Breakdown of capital cost (on basis of project Work Breakdown Structure
   – Breakeven point
   – Foreign exchange requirements
6. Sources of financing
   – Project implementation
   – Operation and maintenance
7. Organisation Set-up
   – Project implementation
   – Operation and maintenance
   – Training of personnel
8. Land acquisition
   – Compensation and Rehabilitation

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9. Infrastructure (project services and facilities)
   - Internal Roads/Transportation
   - Water
   - Power
   - Buildings (Office, residential, lab, etc.)
10. Security-Boundary wall, etc.
11. Project implementation/Construction
    - Master Control Network (PERT/CPM) Plan
      - Has it been prepared and included in the Feasibility Study?
      - How long will the project implementation and commissioning take to complete?
    - What is the gestation period for the project to go into 100% benefit achievements
      - Like plant (production) operating at full capacity
      - Like 100% utilization of the irrigation potential of a new Irrigation Project?
12. What ancillary facilities and interrelated projects are required? Like
    - Coal development project for a thermal power project
    - Commanded area development project (agriculture etc.) for an irrigation project
    - Iron ore export programme (project)
      (a) New iron ore mining project
      (b) New road and/or railway development project (to transport processed/treated iron ore to port(s)
      (c) Port development project (expansion or new)
      (d) Strengthening trading facilities (Minerals and Metal Trading Corporation), etc.
13. Socio-Economic analysis – national/regional/local
    - Increase in availability of project output
    - Product and/or services
    - Additional employment opportunities
    - Upgrading of skills
    - Additional export opportunities
    - Reduction in imports (savings in foreign exchange, etc.)
14. Economic analysis

    Have the following studies and analysis been made and included in the feasibility report?
    - Net income and profit – year-wise
    - Accounting rate of return (ARR)
      (a) On initial capital outlay
      (b) On average capital
    - Cash flows (outflow and inflow) and profit

Ref Page

- Payback period
- Discounted cash flow (DCF)
  - (a) Net present value (NPV) – year-wise
  - (b) Internal rate of return (IRR) – year-wise
  - (c) Benefit-cost ratio/ profitability index – year-wise
- Social benefit-cost analysis

15. Environment
  - (a) Has environment impact assessment been made and report prepared?
  - (b) Does the feasibility report present the data and information specified below:
  - (i) Existing environment in the project neighborhood/vicinity
    - Population: concentration of population – cities/towns/villages major human activities
    - Water: nature of existing water bodies –rivers, lakes, ground water, estuaries, coastal waters, etc.
      - Utilization of these water bodies : drinking, irrigation, fishing, industrial, etc.
      - Capacity of water bodies for handling wastes
    - Land: Land characteristics – terrain, shape, soils, etc.
      - Land use patterns – agriculture, industrial, residential, grazing, greenery, etc.,
    - Air: present air quality, meteorological conditions
      - wind direction and speed, temperature profiles, inversion frequencies, etc.
    - Flora: natural vegetation – Forest, scrub, grassland, etc.,
      - Crops, species of trees and plants
    - Fauna: important/significant wildlife
      - large mammals, small mammals, birds, reptiles, etc.,
      - Domesticated animals: cattle, goat, sheep, etc.
      - Fish species
    - Aesthetics and cultural heritage
      - Unique land shapes, scenery, historical monuments
  - (ii) Effects arising from the project
    - Pollution: Air pollution – particulates, SO_2, NO_x, HC, CO, etc.
      - Water pollution – chemicals, thermal, suspended solids, etc.
      - Solid wastes – quantity, composition, disposal, etc.
    - Other environmental disruption: construction, open cast mining, road and transportation networks, aesthetic blight etc.
    - Land transformation

- Resource extraction
- Human settlements
  - townships, squatter settlements, etc.

16. Project completion
    - Planning for project completion report
    - End of project evaluation
      - To assess/analyze whether project objectives being achieved/ realized (after commissioning and made operational).

ANNEXURE II

1. Project Investment Appraisal

Let us consider an illustration to demonstrate the application and use of project investment appraisal methods/techniques currently popular. A comparative picture among them may also be obtained with the help of this illustration. Table in Appendix 1 portrays estimated net income (inflow) and profit (before tax) in respect of four competing potential projects in view for capital investment, namely, (i) Power (P), (ii) Infrastructure (I), (iii) Fertilizer (F), and (iv) Steel (S). Project 'I', 'F' and 'S' involve an initial capital investment of Rs. 10 lakh each in year 0 when the projects are expected to be commissioned, becomes operational and start yielding revenue from year 1; similarly, project P with an initial capital of Rs. 1 lakh. Four (4) years is assumed to be the life of each of these 4 projects.

2. Accounting Rate of Return

The salient features of this method (ARR) are broughtout in Appendix 2. The table in this appendix indicates how to work out ARR for the 4 projects 'I', 'F', 'S' and 'P'. It is assumed that the average capital gets steadily liquidated over the project life (4 years) and hence the midpoint becomes the basis.

3. Cash Flow

The project appraisal method needs to relate future revenues from the project to the capital cost invested. Depending upon the type of the project, the cash receipts (inflow) may vary from year to year or be a fixed amount each year. The cash flow may be worked out as the difference between the cash inflow with the new project capital investment, and the cash inflow without it, as in the case of an expansion project. Let us consider project 'F' involving an initial capital of Rs. 10 lakh, as an example. How to arrive at the Net Cash Flow (i.e., Profit) is shown in the table in Appendix 3.

4. Payback Method

How long will the project take to repay the full capital cost to be invested in the project? The payback method provides answer to this query. The period (years/months) taken for the project Net Cash Flows (i.e., cumulative net income) to become equal to the initial capital outlay is worked out in this method. The mechanics of this method as applied to the 4 projects under discussion, and the results flowing therefrom are displayed in the Table in Appendix 4.

5. Discounted Cash Flow (DCF) Technique

This concept is reverse of 'Compound' interest approach (CIA). In CIA, a sum (principal) of Rs. 100/- invested (principal) (P) today at 10% interest per annum will become Rs. 110/- after one year (i.e., including interest (I) of Rs. 10 and so on, year after year if you continue to re-invest without withdrawing the principal sum and accumulated interest. The cumulative amount (A) (P+I) at the end of the n^{th} year from initial investment is given by the well-known compound interest formula.

$$A = P (1 + r)^n$$

where r = interest rate (per annum) on cost of capital
P = principal
A = principal + actual amount of interest
n = number of years for which the principal is invested

The discounted cash flow (DCF) technique is just the reverse of the compound interest method. The amount of Rs. 110/- (mentioned in the preceding paragraph) to be received after 1year is worth Rs. 100/- today. In other words, the Present Value (PV) of Rs. 110/- to be received after 1 year is Rs. 100/-. Similarly, an amount of Rs. 99 (Future Value) to be received after 1year is worth Rs 90 today. (at 10% interest rate per annum); that is, the present value (PV) of Rs. 99 to be received after one year is Rs. 90. Thus, the DCF formula emerges as:

$$PV = \frac{P}{(1+r)^n}$$

where PV = Present Value.

Another example is that a sum of Rs. 100.05 received after 1 year at 15% interest rate has a Present Value (PV) of Rs. 87 $\left[-\frac{100}{1.15}\right]$. Similarly, an amount of Rs. 100/- to be received after 1 year at 10% interest rate is worth Rs. 90.90 $\left[=\frac{100}{1.1}\right]$ today.

6. Net Present Value (NPV)

More or less similar in approach as indicated in para (3) above regarding cash flow, the difference between the sum of the Present Value (PV) [vide the formula in the foregoing para 5] of cash inflow and that the PV of all cash outflow gives the Net Present Value (NPV). If two alternative proposed projects are considered for capital investment, the one with a greater NPV will receive higher priority for investment. For the 4 projects 'I', 'F', 'S' and 'P' under discussion, how to arrive at the NPV is shown in Table in the Appendix 5. It will be observed from the result of this analysis that project 'F', with the highest NPV, is the most preferable option for an initial capital investment of Rs. 10 lakh.

7. PV Concept

The PV concept is further illustrated below: Assuming an initial capital outlay of Rs. 5 lakh for interest rate (i.e., cost of capital) of 10% (r):

Year (*n*)	Cash in flow (Rs. '000)	$(1 + r)^n$ or $(1 + 0.1)^n$	Present value (Rs. '000)	
0				
1	200	1.10	200/1.1	= 181.81
2	300	1.21	300/1.21	= 247.93
3	250	1.33	250/1.33	= 187.97
4	250	1.46	250/1.46	= 171.23
Total	1000			788.94

The Net Present Value (NPV) = Rs. 7,88,940 – 5,00,000 = Rs. 2,88,940. Therefore, it will be a worthwhile proposition/investment.

8. Discounting Factors

The discounting Table in Appendix 8 sets out discounting factors for different rates of interest for working out NPV.

9. Internal Rate of Return (IRR)

In this IRR method, the objective is to calculate and find out the discount rate which will provide zero (0) NPV, which rate is styled Internal Rate of Return (IRR). The relationship between NPV and discount rate is illustrated in the Table in Appendix 5. It will be seen from this table that as the discount rate increases, the NPV of a project decreases. IRR is the point where NPV curve crosses the horizontal axis. The process for calculating IRR is iterative. If it is found that for one discount rate, the NPV is positive, and for another, the NPV is negative, the IRR will be in between the two by a process of iteration. We can narrow the gap between the two discount rates (positive and negative) making it reasonably and negligibly small – say, 1% and thus enabling us to arrive at the IRR by interpolation.

The project organization can compare this IRR with its target rate usually set by the Corporate Management to decide whether the proposed project deserves green signal for its implementation. How to work out or identify IRR is shown in the Table in Appendix 6 The highest IRR of 33.3% is claimed by projects 'F' and 'P'.

10. Benefit-Cost Ratio (or Profitability Index)

This method is a combination of Net Present Value (NPV) and Internal Rate of Return. Benefit-Cost ratio (B/C) or Profitability Index (PI) is the ratio of

$$\frac{\text{Output}}{\text{Input}} \text{ or } \frac{PV \text{ of cash inflow}}{PV \text{ of cash outflow}} \text{ of the project}$$

This concept is illustrated for the 4 projects under discussion in the Table below:

Project	Present value of cash flow (Rs. '000)		Benefit Cost ratio (B/C) or Profitability Index (PI)	Ranking (priority)
	Inflow	Outflow		
1	2	3	4 [Col (2) ÷ (3)]	5
I	1148	1000	1.148	IV
F	1335	1000	1.335	II
S	1284	1000	1.284	III
P	134	100	1.340	I

It will be observed from the foregoing table that projects 'F' and 'P' have more or less the same B/C ratio, that is, or more or less equally profitable.

11. Overall Sum up

With a view to obtaining a comparative picture, the results of application of different yardsticks for gauging the financial health of the four projects considered and discussed in the foregoing paragraphs are summarized in Appendix 7.

APPENDIX 2

Accounting Rate of Return (ARR)

Project	On initial investment		On average capital investment	
	Actual Return (PA)	Average ROI (%)	Average capital	Average ROI (%)
(1) Infrastructure (I)	$125\left[=\frac{500}{4}\right]$	$12.51\left[=\frac{125}{1000}\times 100\right]$	$500\left[=\frac{1000}{2}\right]$	$25\%\left[=\frac{125}{500}\times 100\right]$
(2) Fertiliser (F)	$200\left[=\frac{800}{4}\right]$	$20\%\left[=\frac{200}{1000}\times 100\right]$	$500\left[=\frac{1000}{2}\right]$	$40\%\left[\frac{200}{500}\times 100\right]$
(3) Steel (S)	$200\left[=\frac{800}{4}\right]$	$20\%\left[=\frac{200}{1000}\times 100\right]$	$500\left[=\frac{1000}{2}\right]$	$40\%\left[\frac{200}{500}\times 100\right]$
(4) Power (P)	$20\left[=\frac{80}{4}\right]$	$20\%\left[=\frac{20}{100}\times 100\right]$	$50\left[=\frac{100}{2}\right]$	$40\%\left[=\frac{20}{50}\times 100\right]$

- Designed to quantify profits estimated from capital investment on a project.
- ARR indicates estimated profit as percentage of capital cost to be expended.
  Two methods are shown in the adove Table, namely,
  (i) On initial investment
    – actual average profit/return
    – average rate of return (ROI or ARR) (%)
  (ii) On Average Capital Investment
    – Average capital is worked on the basis of the initial investment steadily eroding over the project life (4); the midpoint (2 years) is assumed/taken.
    – ROI (or ARR) is ratio of average return or profit and average capital.

Merits

- Generally used and popular
- Enable comparison of percentage return with organisation (any) target return.

Disadvantages

- No allowance for time factor of profit
  – The 4 projects considered are ranked equally through major differences in timing of projects may be there.
- Profit element somewhat subjecting—not as appropriate as cash flow.

APPENDIX 6

Discounted Cash Flow and Internal Rate of Return

Year	Project 'I'			Project 'F'			Project 'S'			Project 'P'		
	CF	DF 24.2%	PV	CF	DF at 33.5%	PV	CF	DF at 28.5%	PV	CF	DF at 33.5%	PV
0	–1000	1.00	–1000	–1000	1.00	–1000	–1000	1.00	–1000	–100	1.00	–100
In flow												
1	750	×0.80	=603	650	0.75	488	450	0.78	350	65	0.75	49
2	250	×0.65	=162	450	0.56	253	450	0.61	273	45	0.56	25
3	250	×0.52	=130	350	0.42	148	450	0.47	212	35	0.42	15
4	250	×0.42	=105	350	0.32	111	450	0.37	165	35	0.32	11
Total	500		1000	800		1000	800		1000	180		100
	(500–1000)			(1800-1000)			(1800–1000)			(80–100)	100	
Net PV =			0.00			0.0			0.0			0.0
			(1600 –1000)									

CF = Cash Flow; PV = Present Value; DF = Discount Factor.

- Discount Factor: Project 'I' – 24.2%, Project 'F' = 33.5%, Project 'S' = 28.5, Project 'F' = 33.5%

APPENDIX 7

Comparative Picture of the Results of the Application of Different Project Appraisal Methods

Project	Initial Capital outlay	Profit (total)	Accounting Rate of Return (ARR)		Pay Back Period (number of years)	Discounted Cash Flow (DCF)		
			Initial capital outlay	On average capital		Net present value (NPV)	Internal rate of return (IRR)	Profit-ability Index (PI)
		Rs. '000	(Per cent)	(Per annum)		(Rs '000)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
I	1000	500 (500 + 0 + 0 +0)	12.5%	25%	2	148	24.2	1.148
F	1000	800 (400 + 200 + 100 + 100)	20%	40%	1.8	335	33.5	1.335
S	1000	800 (200 + 200 + 200 + 200)	20%	40%	2.2	284	28.5	1.284
P	100	80 (40 + 20 + 10 + 10)	20%	40%	1.8	34	33.5	1.340