GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY, DELHI

BACHELOR OF BUSINESS ADMINISTRATION (BBA)

BBA [(G)-304 & (BI) – 304] PROJECT PLANNING AND EVALUATION

UNIT I **Lectures:-18**

Project Planning Overview: Capital Investments: Importance and Difficulties, Types of Capital Investments, Phases of Capital Budgeting, Levels of Decision Making, Facets of Project Analysis, feasibility Study, Objectives of Capital Budgeting, Techniques of Capital Budgeting.

Financing of Projects: Capital Structure, Mean of Financing, Equity Capital, Preference Capital, Internal Accruals, Term Loans, Debentures, Working Capital Requirement and its Financing, Raising Venture Capital, Raising Capital In International Markets.

Cost of Project, Estimates of Sales and Production, Cost of Production, Profitability Projections, Projected Cash Flow Statement, Projected Balance Sheet

UNIT-II **Lectures:-12**

Market and Demand Analysis: Conduct of Market Survey, Characterization of Market, Demand Forecasting, Uncertainties in Demand Forecasting, Market Planning

Technical Analysis: Manufacturing Process/ Technology, Technical Arrangements, Product Mix, Plant Capacity, Location and Site,

UNIT-III **Lectures:-16**

Project Management: Forms of Project Organization, Project Planning, Project Control, Human Aspects of Project Management

Network Techniques: Development of Project Network, Time Estimation (Simple Practical Problem with EST, EFT, LST, LFT, Total Float), Determination of the Critical Path, Scheduling when Resources are limited, PERT Model, CPM Model (Simple Practical Problem of Crashing), Network Cost System.

Project Review and Administrative Aspects: Control of In- Progress Projects, Post Completion Audits,

Unit IV **Lectures:-6**

Risk and Analysis Uncertainty: Using Sensitivity, Simulation, Decision and Other Techniques.

UNIT – 1

OVERVIEW

MEANING OF CAPITAL BUDGETING

Capital expenditure budget or capital budgeting is a process of making decisions regarding investments in fixed assets which are not meant for sale such as land, building, machinery or furniture.

The word investment refers to the expenditure which is required to be made in connection with the acquisition and the development of long-term facilities including fixed assets. It refers to process by which management selects those investment proposals which are worthwhile for investing available funds. For this purpose, management is to decide whether or not to acquire, or add to or replace fixed assets in the light of overall objectives of the firm.

Normally capital expenditure is one which is intended to benefit future period i.e., in more than one year as opposed to revenue expenditure, the benefit of which is supposed to be exhausted within the year concerned.

NATURE OF CAPITAL BUDGETING

- Capital expenditure plans involve a huge investment in fixed assets.
- Capital expenditure once approved represents long-term investment that cannot be reserved or withdrawn without sustaining a loss.
- Preparation of coital budget plans involve forecasting of several years profits in advance in order to judge the profitability of projects.

It may be asserted here that decision regarding capital investment should be taken very carefully so that the future plans of the company are not affected adversely.

PROCEDURE OF CAPITAL BUDGETING

Capital investment decision of the firm have a pervasive influence on the entire spectrum of entrepreneurial activities so the careful consideration should be regarded to all aspects of financial management.

In capital budgeting process, main points to be borne in mind how much money will be needed of implementing immediate plans, how much money is available for its completion and how are the available funds going to be assigned tote various capital projects under consideration. The financial policy and risk policy of the management should be clear in

mind before proceeding to the capital budgeting process. The following procedure may be adopted in preparing capital budget:-

(1) **Organization of Investment Proposal.** The first step in capital budgeting process is the conception of a profit making idea. The proposals may come from rank and file worker of any department or from any line officer. The department head collects all the investment proposals and reviews them in the light of financial and risk policies of the organization in order to send them to the capital expenditure planning committee for consideration.

(2) **Screening the Proposals.** In large organisations, a capital expenditure planning committee is established for the screening of various proposals received by it from the heads of various departments and the line officers of the company. The committee screens the various proposals within the long-range policy-frame work of the organization. It is to be ascertained by the committee whether the proposals are within the selection criterion of the firm, or they do no lead to department imbalances or they are profitable.

(3) **Evaluation of Projects.** The next step in capital budgeting process is to evaluate the different proposals in term of the cost of capital, the expected returns from alternative investment opportunities and the life of the assets with any of the following evaluation techniques:-

- Degree of Urgency Method (Accounting Rate of return Method)
- Pay-back Method
- Return on investment Method
- Discounted Cash Flow Method.

(4) **Establishing Priorities.** After proper screening of the proposals, uneconomic or unprofitable proposals are dropped. The profitable projects or in other words accepted projects are then put in priority. It facilitates their acquisition or construction according to the sources available and avoids unnecessary and costly delays and serious cot-overruns. Generally, priority is fixed in the following order.

- Current and incomplete projects are given first priority.
- Safety projects ad projects necessary to carry on the legislative requirements.
- Projects of maintaining the present efficiency of the firm.
- Projects for supplementing the income
- Projects for the expansion of new product.

(5) Final Approval. Proposals finally recommended by the committee are sent to the top management along with the detailed report, both o the capital expenditure and of sources of funds to meet them. The management affirms its final seal to proposals taking in view the urgency, profitability of the projects and the available financial resources. Projects are then sent to the budget committee for incorporating them in the capital budget.

(6) Evaluation. Last but not the least important step in the capital budgeting process is an evaluation of the programme after it has been fully implemented. Budget proposals and the net investment in the projects are compared periodically and on the basis of such evaluation, the budget figures may be reviewer and presented in a more realistic way.

IMPORTANCE OF CAPITAL BUDGETING

The key function of the financial management is the selection of the most profitable assortment of capital investment.

The need of capital budgeting can be emphasized taking into consideration the very nature of the capital expenditure such as heavy investment in capital projects, long-term implications for the firm, irreversible decisions and complicates of the decision making.

(1) Indirect Forecast of Sales. The investment in fixed assets is related to future sales of the firm during the life time of the assets purchased. It shows the possibility of expanding the production facilities to cover additional sales. Any failure to make the sales forecast accurately would result in over investment or under investment in fixed assets and any erroneous forecast of asset needs may lead the firm to serious economic results.

(2) Comparative Study of Alternative Projects Capital budgeting makes a comparative study of the alternative projects for the replacement of assets which are wearing out or are in danger of becoming obsolete so as to make the best possible investment in the replacement of assets. For this purpose, the profitability of each project is estimated.

(3) Timing of Assets-Acquisition. Proper capital budgeting leads to proper timing of assets-acquisition and improvement in quality of assets purchased. It is due to nature of demand and supply of capital goods. The demand of capital goods does not arise until sales impinge on productive capacity. On the other hand, supply of capital goods with their availability is one of the functions of capital budgeting.

(4) Cash Forecast. Capital investment requires substantial funds which can only be arranged by making determined efforts to ensure their availability at the right time. Thus it facilitates cash forecast.

(5) Worth-Maximization of Shareholders. The impact of long-term capital investment decisions is far reaching. It protects the interests of the shareholders and of the enterprise because it avoids over-investment and under-investment in fixed assets.

(6) Other Factors. The following other factors can also be considered for its significance:-

- It assists in formulating a sound depreciation and assets replacement policy.
- It may be useful n considering methods of coast reduction. A reduction campaign may necessitate the consideration of purchasing most up-to—date and modern equipment.
- The feasibility of replacing manual work by machinery may be seen from the capital forecast be comparing the manual cost an the capital cost.
- The capital cost of improving working conditions or safety can be obtained through capital expenditure forecasting.
- It facilitates the management in making of the long-term plans an assists in the formulation of general policy.
- It studies the impact of capital investment on the revenue expenditure of the firm such as depreciation, insure and there fixed assets.

WHY CAPITAL EXPENDITURE DECISIONS ARE IMPORTANT?

Capital expenditure decisions represent the most important decision taken by a company. Their importance stem from three inters – related reasons.

1. **Effects in the long Run:** the consequences of capital expenditure decisions extend into the feature. The scope of current manufacture activities of a company governed largely by capital expenditures in the past. Likewise, current capital expenditure decisions provide the frame work for future activities. Capital investment decisions have an enormous bearing on the basic character of a company.
2. **Irreversibility:** The market for used capital equipment in general is ill-organized. Further, for some types of capital equipment, custom-made to meet specific requirement, the market virtually be non-existent. Once such equipment is acquired, reversal of decision may mean scrapping the capital equipment. Thus, a wrong capital investment decision cannot be reversed without incurring a substantial loss.

3. **Substantial outlays:** Capital expenditures usually involve substantial outlays. An integrated steel plant, for example, involves an outlay of several thousand millions. Capital costs tend to increase with advanced technology.

DIFFICULTIES OF CAPITAL BUDGETING

While capital expenditure decisions are extremely important, they also pose difficulties which supported from three principal sources:

(1) Measurement problems: Identifying and measuring the costs and benefits of a capital expenditure proposal tends to be difficult. This is more so when a capital expenditure has a bearing o some other activities of the company like cutting into sales of some existing product or has some intangible consequences like improving the morale of workers.

(2) Uncertainty: A capital expenditure decision involves costs and benefits that extend for into future. It is impossible to predict exactly what will happen in future. Hence, there is usually a great deal of uncertainty characterizing the costs and benefits of a capital expenditure decision.

(3) Temporal Spread: The costs and benefits associated with a capital expenditure decision are spread out over a long period of time, usually 10-20 years for industrial projects and 20-50 years for infrastructural projects. Such a temporal spread creates some problems in estimating discount rates and establishing equivalence.

STEPS IN CAPITAL BUDGETING

1. Estimate the cash flows
2. Assess the riskiness of the cash flows.
3. Determine the appropriate discount rate.
4. Find the PV of the expected cash flows.
5. Accept the project if PV of inflows > costs. IRR > Hurdle Rate and/or payback < policy

Basic Data

	Expected Net Cash Flow	
Year	**Project L**	**Project S**
0	($100)	($100)
1	10	70
2	60	50

3 80 20

TECHNIQUES OF CAPITAL BUDGETING

A. Payback period
B. Net present value (NPV)
C. Internal rate of return (IRR)
D. Modified internal rate of return (MIRR)
E. Profitability index

PAYBACK PERIOD

Payback period = Expected number of years required to recover a project's cost.

Project L

Expected Net Cash Flow

Year	Project L	Project S
0	($100)	($100)
1	10	(90)
2	60	(30)
3	80	50

Payback of Project L = 2 + $30/$80 years

= 2.4 years.

Payback of Project S = 1.6 years.

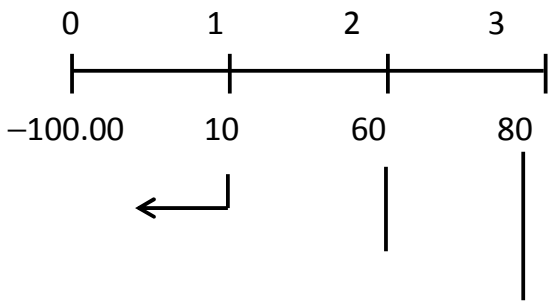
Weaknesses of Payback:

1. Ignores the time value of money
2. Ignores cash flows occurring after the payback period.

NET PRESENT VALUE

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{(1+k)^t}$$

Project L:



9.09

49.59

60.11

NPV_L = $ 18.79

Similarly, NPV_S = $19.98

If the projects are independent, accept both.

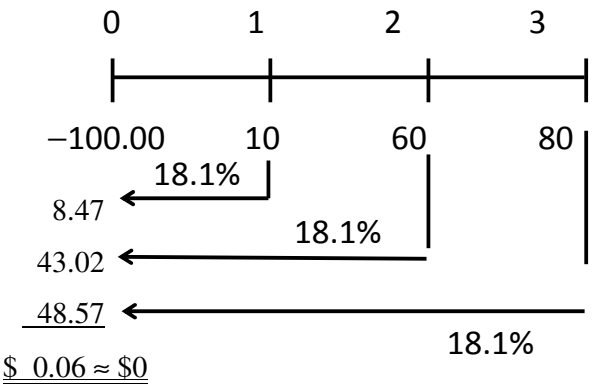
If the projects are mutually exclusive, accept Project S since $NPV_S > NPV_L$.

Note: NPV declines as k increases, and NPV rises as k decreases.

INTERNAL RATE OF RETURN

$$\text{IRR}: \sum_{t=0}^{n} \frac{CF_t}{(1+\text{IRR})^t} = \$0 = \text{NPV}.$$

Project L:



IRR_L = 18.1%

IRR_S = 23.6%

If the projects are independent, accept both because IRR > k.

If the projects are mutually exclusive, accept Project S since $IRR_S > IRR_L$.

Note: IRR is independent of the cost of capital.

PROFITABILITY INDEX (PI)

The **profitability index**, or PI, method compares the present value of future cash inflows with the initial investment on a relative basis. Therefore, the PI is the ratio of the present value of cash flows (PVCF) to the initial investment of the project.

$$PI = \frac{PVCF}{\text{Initial investment}}$$

In this method, a project with a PI greater than 1 is accepted, but a project is rejected when its PI is less than 1. Note that the PI method is closely related to the NPV approach. In fact, if the net present value of a project is positive, the PI will be greater than 1. On the other hand, if the net present value is negative, the project will have a PI of less than 1. The same conclusion is reached, therefore, whether the net present value or the PI is used. In other words, if the present value of cash flows exceeds the initial investment, there is a positive net present value and a PI greater than 1, indicating that the project is acceptable.

PI is also know as a **Benefit/cost** ratio.

As per previous example,

$$\text{PI} = \frac{\text{PV of cash flows}}{\text{Initial cost}}$$

$$= \frac{118.79}{100} = 1.10$$

Accept project if PI > 1.

Reject if PI < 1.0

CAPITAL RATIONING

- Exists whenever enterprises cannot, or choose not to, accept all value-creating investment projects. Possible causes:
  - Banks and investors say "NO"
  - Managerial conservatism
- Analysis is required. One must consider sets of projects, or "bundles", rather than individual projects. The goal should be to identify the value-maximizing bundle of projects.
- The danger is that the capital-rationing constraint heightens the influence of nonfinancial considerations, such as the following:
  - Competition among alternative strategies
  - Corporate politics
  - Bargaining games and psychology

The outcome could be a sub-optimal capital budget, or, worse, one that destroys value!

- Some remedies are the following:
  - Relax and eliminate the budget constraint.
  - Manage the process rather than the outcomes.
  - Develop a corporate culture committed to value creation.

Types of Capital Investment Decisions

There are many ways to classify the capital budgeting decision. Generally capital investment decisions are classified in two ways -

(A) On the basis of firm's existence:

The capital budgeting decisions are taken by both newly incorporated firms as well as by existing firms. The new firms may be required to take decision in respect of selection of a plant to be installed. The existing firm may be required to take decisions to meet the decisions to meet the requirement of new environment or to face the challenges of competition. These decisions may be classified into:

Replacement and Modernization decisions: The replacement and modernization decisions aim at to improve operating efficiency and to reduce cost. Generally all types of plant and machinery require replacement either because of the economic life of the plant or machinery is over or because it has become technologically outdated.

Expansion decisions: Existing successful firms may experience growth in demand of their product line. If such firms experience shortage or delay in the delivery of their products due to inadequate production facilities, they may consider proposal to add capacity to existing product line.

Diversification decisions: These decisions require evaluation of proposals to diversify into new product lines, new markets etc. for reducing the risk of failure by dealing in different products or by operating in several markets.

Both expansions and diversification decision are called revenue expansion decisions.

PHASES OF CAPITAL BUDGETING

Capital budgeting is a very complex process which can be divided into five phases:

- **Planning**

The planning phase of a firm's capital budgeting process is concerned with verbalization of its wide investment strategy and the creation and preliminary screening of project proposals. The investment strategies of the firm describe the wide areas or types of investments the firm plants to undertake. These give the framework which shapes, guides, and define the identification of individual project opportunities.

Once a project proposal is recognized, it needs to be examined. To start with, a preliminary project analysis is done. This exercise is meant to judge-

a) whether the project is prima-facie worthwhile to assess a possibility study and
b) what aspect of the project are grave to its visibility and thus warrant an in – depth investigation.

- **Analysis**

If the preliminary screening proposes that the project is prima facie meaningful, a detailed analysis of the marketing, technical, financial, economic, and ecological aspects is undertaken. The questions and issues aroused in a detailed analysis are described in the following section. The center of this phase of capital budgeting is on gathering, preparing and resizing relevant information about various project proposals which are being considered for inclusion in the capital budget. Based on the information developed in this analysis, the flow of costs and benefits with the project can be defined.

- **Selection**

Selection follows, and usually overlaps, analysis. It addresses that -Whether the project worthwhile? A broad range of appraisal criteria have been suggested to evaluate the worthwhileness of a project. They are usually divided into two broad categories, viz, non-discounting standard and discounting standard. The main non-discounting standard is the payback time and the accounting rate of return and the benefit cost ratio. To apply the various appraisals standard cut-off principles have to be specified.

- **Implementation**

The implementation phase for business project that involves setting up of industrial facilities that consists of several stages such as

- project and engineering designs
- negotiations and contracting
- construction
- training, and

- plant commissioning

Translating an investment suggestion into a material is a complex, time- consuming, and risk burdened task. Delays in implementation that are common, can lead to considerable cost overruns. For speedy implementation at a rational cost, the below are helpful.

- **Review**

Once the project is made to order the review phase has to be set in motion. Performance review should be done from time to time to evaluate actual performance with probable performance. A feedback device can be useful in several ways.

- It throws light on how realistic were the suppositions underlying the project;
- It provides a documented record of experience that is extremely valuable in future decision making;
- It proposes corrective action to be taken in the light of actual presentation;
- It helps in finding judgmental biases;
- It encourages a desired warning among project sponsors.

LEVELS OF DECISION MAKING

- STRATEGIC: Long-term objectives; resources; policies
- MANAGEMENT CONTROL: Monitor use of resources; performance
- KNOWLEDGE-BASED: Evaluate potential innovations; knowledge
- OPERATIONAL: How to carry out specific day-to-day tasks

FEASIBILITY STUDY

Definition of Feasibility Studies: A feasibility study looks at the viability of an idea with an emphasis on identifying potential problems and attempts to answer one main question: Will the idea work and should you proceed with it?

Before you begin writing your business plan you need to identify how, where, and to whom you intend to sell a service or product. You also need to assess your competition and figure out how much money you need to start your business and keep it running until it is established.

Feasibility studies address things like where and how the business will operate. They provide in-depth details about the business to determine if and how it can succeed, and serve as a valuable tool for developing a winning business plan.

Why Are Feasibility Studies so Important?

- List in detail all the things you need to make the business work;
- Identify logistical and other business-related problems and solutions;
- Develop marketing strategies to convince a bank or investor that your business is worth considering as an investment; and
- Serve as a solid foundation for developing your business plan.

Even if you have a great business idea you still have to find a cost-effective way to market and sell your products and services. This is especially important for store-front retail businesses where location could make or break your business.

For example, most commercial space leases place restrictions on businesses that can have a dramatic impact on income. A lease may limit business hours/days, parking spaces, restrict the product or service you can offer, and in some cases, even limit the number of customers a business can receive each day.

The Components of a Feasibility Study

- **Description of the Business:** The product or services to be offered and how they will be delivered.
- **Market Feasibility:** Includes a description of the industry, current market, anticipated future market potential, competition, sales projections, potential buyers, etc.
- **Technical Feasibility:** Details how you will deliver a product or service (i.e., materials, labor, transportation, where your business will be located, technology needed, etc.).
- **Financial Feasibility:** Projects how much start-up capital is needed, sources of capital, returns on investment, etc.
- **Organizational Feasibility:** Defines the legal and corporate structure of the business (may also include professional background information about the founders and what skills they can contribute to the business).
- **Conclusions:** Discusses how the business can succeed. Be honest in your assessment because investors won't just look at your conclusions they will also look at the data and will question your conclusions if they are unrealistic.

Feasibility studies contain comprehensive, detailed information about your business structure, your products and services, the market, logistics of how you will actually deliver a product or service, the resources you need to make the business run efficiently, as well as other information about the business.

FINANCING OF A PROJECT

RAISING OF FINANCE

Finance for a Project in India can be raised by way of

(A) Share Capital

(B) Long-term borrowings

(C) Short-term borrowings

Both share capital and long-term borrowings are used to finance fixed assets plus the margin money required to obtain bank borrowings for working capital. Working capital is financed mainly from bank borrowings and from unsecured loans and deposits.

SHARE CAPITAL

Share Capital consists of two broad categories of capital namely equity and preference. **Equity shares** - Equity shares have a fixed par value and can be issued at par or at a premium on the par value. Shares cannot normally be issued at a discount. However, in exceptional circumstances issue of shares at a discount is permitted provided (a) the shares are of a class already existing, (b) the discount is authorised by the shareholders, and (c) the issue .is sanctioned by the Central Government. Normally the Central Government will not sanction a discount exceeding 10%.

The corporate are now allowed raising resources for expansion plans by issuing equity shares with differential voting rights. The main **advantages** of such category of shares are:

1. Equity can be raised without diluting stake of the promoters.
2. Companies can reduce gearing ratios.
3. The risk of hostile takeovers is reduced to a considerable extent.
4. The passing of yield in the form of high dividends to the investors can be ensured

The following are the general **disadvantages:**

1. The cost of servicing equity capital will increase.
2. Poor corporate governance may be encouraged.
3. If issued at discount, they may raise the equity burden.

Preference shares - Preference shares carry a fixed rate of dividend (which can be cumulative). These shares carry a preferential right to be paid on winding up of the company.

Preference shares can be made convertible into equity shares. Issue of preference is not a popular form of capital issue.

The issue of capital by companies is governed by guidelines issued by the Securities and Exchange Board of India (SEBI) and the listing requirements of the stock exchanges.

Apart, from equity, there can also be various forms of pseudo equity. The most common forms are fully or partly convertible debentures and debentures issued with warrants entitling the holder to subscribe for equity. There can also be an issue of non - convertible debentures.

TERM LENDING INSTITUTIONS

Term lending institutions may be categorised on the basis of their area of operations as under:

All India financial institutions consisting of -

- Industrial Development Bank of India (IDB1) (proposed to be converted into a Commercial Bank).
- Industrial Finance Corporation of India (IFCI).
- EXIM Bank
- National Bank for Agriculture and Rural Development (NABARD).
- Industrial Investment Bank of India (HBI).
- Tourism Finance Corporation of India (TFCI).
- Indian Railway Finance Corporation (IRFC).
- Commercial Banks.
- Risk Capital & Technology Finance Corporation Ltd.
- Small Industries Development Bank of India (SIDBI).
- Life Insurance Corporation (LIC)
- General Insurance Corporation of India (GIC) and its four subsidiaries
- Unit Trust of India
- Power Finance Corporation Ltd.
- National Housing Bank
- Rural Electrification Corporation Ltd.
- Infrastructure Development Finance Corporation
- Housing and Urban Development Corporation Ltd. (HUDC0)
- Indian Renewable Energy Development Agency Ltd. (IREDA).

The institutions like LIC & GIC may not be very much associated with the project appraisal but lend their funds in consortium with other all India financial institutions.

State level financial institutions consisting of :

- State Financial Corporation's (SFCs).
- State Industrial Development Corporations (SIDCs).
- Regional Rural Banks & Co-operative Banks.

State level institutions confine their activities within the concerned States and generally extend financial accommodation to small and medium scale sectors.

Term finance is mainly provided by the various All India Development Banks (IDBI, IFCI, SIDBI, IIBI etc.), specialised financial institutions (RCTC, TDICI, TFCI) and investment institutions (LIC, UTI and GIC). In addition, term finance is also provided by the State financial corporations, the State industrial development corporations and commercial banks. Debt instruments issued by companies are also subscribed for by mutual funds and financing activities are also done by finance companies.

Non Fund Facilities

The role of the financial and banking institutions is not merely confined to lending of funds. They render non fund based facilities as well like opening of letters of credit, issue of bank guarantees, etc. Besides, there are private investment companies involved in direct and indirect financing of the projects and also extending lease financing.

PROJECT FINANCING

Before implementing a new project or undertaking expansion, diversification, modernisation or rehabilitation scheme ascertaining the cost of project and the means of finance is one of the most important considerations. For this purpose the Company has to prepare a feasibility study covering various aspects of a project including its cost and means of finance. It enables the Company to anticipate the problems likely to be encountered in the execution of the project and places it in a better position to respond to all the queries that may be raised by the financial institutions and others concerned with the project.

COST OF PROJECT

It constitutes a crucial step in project planning. The aggregate cost indicates the quantum of funds needed for bringing the project into existence. Therefore, cost of project should be fixed with great care and caution. It forms the basis on which the 'Means of Finance' is worked out. The calculation of the promoter's contribution is also done on the basis of the cost of project. Hence, all items which are necessary for the project should be included at this stage itself. The omission ' if subsequently detected, would have to be financed by the promoters themselves. Besides, it would also affect the credibility of the promoters.

The cost of project will usually comprise of the following items:

1) Land and site development
2) Factory building
3) Plant and machinery.
4) Escalation and contingencies
5) Other fixed assets or miscellaneous fixed assets.
6) Technical know-how
7) Interest during construction.
8) Preliminary and pre-operative expenses.
9) Margin money for working capital.

The evaluation of **plant and machinery** should also be made with extreme care and caution as there is a possibility of some items of plant and machinery being not included and it is at

the time of implementation of the project that the lapse is detected and the promoter is forced to finance the omitted items from his own resources.

Practically speaking, there is always a difference between the actual cost and original estimated cost. Leaving aside exceptional cases, the difference in the actual cost and the original assessed cost may be +5 per cent. In a small project, say of the order of Rs. 1 crore or so, this difference can be adjusted by deferring certain expenses of the project which are not necessary prior to the commencement of commercial production. Yet in the larger sized projects say of Rs. 10 crores or more, a difference of 5-10 per cent becomes significant so far as the absolute quantum of funds ' is concerned. This necessarily leads to the possibility of overruns in the project right from the beginning. Therefore it is, imperative to arrive at realistic figure of the cost of project.

Time schedule for implementation & the project is equally important as h has direct bearing on the cost of project. Longer the time schedule higher will be the cost. Hence, every effort should be made to reduce the period of implementation to the maximum possible extent. In this direction use m be made of control charts like bar charts, PERT and CPM techniques. It should be remembered every delay has a cog and this will result in increase in the cost of project, which in turn will affect the profitability of the project.

It is also important to quote realistic price of different **fixed/movable assets**. The financial institutions are very well versed in assessing the cost of any project. Hence, promoters should avoid over quoting or under quoting while, fixing the, cost of project.

MEANS OF FINANCING

Having established the total cost of project, promoters should work out the means of finance which will enable timely implementation of the project. Finance will ' be available from several sources and it is for the promoters to select the most suitable sources after taking into account all the relevant factors.

FINANCIAL STRUCTURE

The financial structure refers to the sources from which .the funds for meeting the project cost can be obtained, as also the quantum which each source will contribute towards the project cost. For this purpose it would be advisable to keep in view the following aspects.

a) The structure should be simple to operate in practice.
b) The plan should have a practical bias and should serve as a working guideline for all project forecasts.
c) While deciding the structure, the environmental constraints should be kept in view. For example, the conditions prevailing in the capital market, future prospects for earnings, term-lending institutional rules and policies in operation, government guidelines, etc.
d) The financial structure should have an in-built flexibility which can take care of circumstances not envisaged initially. This is because, howsoever well devised a plan way be, the overruns, changes in the project cost and term lending institutions suggestions way necessitate a change in the financial plan originally envisaged. The promoters should ' therefore, prepare a number of alternative models on the basis of different presumptions.
e) The financial structure should be such as to make optimum use of all available resources. As use of every resource involves costs, it is imperative that the resources are put to me in the most efficient manner.
f) The availability of funds and the period, required for raising them are important while determining the financial structure.

SOURCES OF FINANCE

For every category, of capital there is a distinct source of supply in the market. Therefore, it is necessary for the promoters to identify these sources so that they can be approached for finance at the appropriate time. A project will require two types of funds: -

1. To finance purchase of immovable assets such as land, buildings, plant & machinery, etc.,
2. For carrying on day-to-day operations i.e. working capital funds.

SOURCES OF WORKING CAPITAL FINANCE

- Bank Finance
- Commercial Paper
- Fixed Deposits
- Inter-corporate Deposits

The level and terms of bank finance and commercial papers are governed by the current directives of the Reserve Bank of India (RBI).

The terms on which a company can collect fixed deposits from the public are governed in the case of finance companies by RBI and in case of non-finance companies by Companies Act.

Inter-corporate deposits are outside the purview of the regulations governing acceptance of deposits. As per new Section 372A, inserted vide Companies (Amendment) Ordinance, 1999 w.e.f 31st Oct. 1998, the depositing company is subject to the limit that the aggregate value of its loan, guarantee security and investment with other bodies corporate cannot exceed 60% of its paid-up capital and free reserves or 100% of its free reserves whichever is more. Further, in respect of rate of interest, no loan shall be made at a rate of interest lower than the prevailing bank rate of interest.

SOURCES FOR FINANCING FIXED ASSETS

The type of funds required for acquiring fixed assets have to be of longer duration and these would normally comprise of borrowed funds and own funds. There are several types of long-term loans and credit facilities available which a company may utilise to acquire the desired fixed assets.

BORROWED FUNDS

Term Loan

(1) Rupee loan - Rupee loan is available from financial institutions and banks for setting up new projects as, well as for expansion, modernisation or rehabilitation of existing units. The

rupee term loan can be utilised for incurring expenditure in rupees for purchase of land, building, plant and machinery, electric fittings, etc.

The duration of such loan varies from 5 to 10 years including a moratorium of up to a period of 3 years. Projects costing up to Rs. 500 lakhs are eligible for refinance from all India financial institutions and are financed by the State level financial institutions in participation with commercial banks.

Projects with a cost of over Rs. 500 lakhs are considered for financing by all India financial institutions. They entertain applications for foreign currency loan assistance for smaller amounts also irrespective of whether the machinery to be financed is being procured by way of balancing equipment, modernisation or as a composite part of a new project.

For the convenience of entrepreneurs, the financial institutions have devised a standard application form. All projects whether in the nature of new, expansion, diversification, modernisation or rehabilitation with a capital cost upto 5 crores can be financed by the financial institution either on its own or with State level financial institutions and banks.

(b) Foreign Currency term loan - Assistance in the nature of foreign currency loan is available for incurring foreign currency expenditure towards import of plant and machinery, for payment of remuneration and expenses in foreign currency to foreign technicians for obtaining technical know-how.

Foreign currency loans are sanctioned by term lending institutions and commercial banks under the various lines of credits already procured by them from the international markets. The liability of the borrower under the foreign currency loan remains in the foreign currency in which the borrowing has been made. The currency allocation is made by the lending financial institution on the basis *of* the available lines of credit and the time duration within which the entire line of credit has to be, fully utilised.

Deferred payment guarantee (DPG)

Assistance in the nature of Deferred Payment Guarantee is available for purchase of indigenous as well as imported plant and, machinery. Under this scheme guarantee is given by concerned bank/financial institutions about repayment of the principal along with interest and deferred instalments. This is a very important type of assistance particularly useful for existing profit-making companies who can acquire additional plant and machinery without

much loss *of* time. Even the banks and financial institutions grant assistance under Deferred Payment Guarantee more easily than term loan as there is no immediate outflow of cash.

Soft loan

This is available under special scheme operated through all-India financial institutions. Under this scheme assistance is granted for modernisation and rehabilitation of industrial units. The loans are extended at a lower rate of interest and assistance is also provided in respect of promoters contribution, debt-equity ratio, repayment period as well as initial moratorium.

Supplier's line of credit

Under this scheme non-revolving line of credit is extended to the seller to be utilised within a stipulated period. Assistance is provided to manufacturers for promoting sale of their industrial equipments on deferred payment basis. While on the other hand this credit facility can be availed of by actual users for purchase of plant/equipment for replacement or modernisation schemes only.

Debentures

Long-term funds can also be raised through debenture with the objective of financing new undertakings, expansion, diversification and also for augmenting the long-term resources of the company for working capital requirements.

Leasing

Leasing is a general contract between the owner and user of the assets over a specified period of time. The asset is purchased initially by the lessor (leasing company) and thereafter leased to the user (lessee company) which pays a specified rent at periodical intervals. The ownership of the asset lies with the lessor while the lessee only acquires possession and right to use the assets subject to the agreement. Thus, leasing is an alternative to the purchase of an asset out of own or borrowed funds. Moreover, lease finance can be arranged much faster as compared to term loans from financial institutions.

Public deposits

Deposits from public are a valuable source of finance particularly for well established large companies with a huge capital base. As the amount of deposits that can he accepted by a company is restricted to 25 per cent of the paid up share capital and free reserves, smaller companies find this source less attractive. Moreover, the period of deposits is restricted to a maximum of 3 years at a time. Consequently, this source can provide finance only for short to medium term, which could be more useful for meeting working capital requirements. In other words, public deposits as a source of finance cannot be utilised for project financing or for buying capital goods unless the pay back period is very short or the company uses it as a means of bridge finance to be replaced by a regular term loan.

Before accepting deposits a company has to comply with the requirements of section 58A of the Companies Act, 1956 and Companies (Acceptance of Deposits) Rules, 1975 that lay down the various conditions applicable in this regard.

OWN FUNDS

Equity

Promoters of a project have to involve themselves in the financing of the project by providing adequate equity base. From the bankers/financial institutions' point of view the level of equity proposed by the promoters is an important indicator about the seriousness and capacity of the promoters.

The total equity amount may be either contributed by the **promoters** themselves or they may partly raise the equity from the public. So far as the promoters stake in the equity is concerned, it may be raised from the directors, their relatives and friends. Equity may also be raised from associate companies in the group who have surplus funds available with them. Besides, equity participation may be obtained from State financial corporation/industrial development corporations.

Another important source for equity could be the **foreign collaborations**. Of course, the participation of foreign collaborators will depend upon the terms of collaboration agreement and the investment would be subject to approval from Government and Reserve Bank of India. Normally, the Government has been granting approvals for equity investment by foreign collaborators as per the prevailing policy. The equity participation by foreign collaborators may be by way of direct payment in foreign currency or supply of technical know-how/ plant and machinery.

Amongst the various participants in the equity, the most important group would be the **general investing public**. The existence of giant corporations would impossible but for the investment by small shareholders. In fact, it would be mo exaggeration to say that the real foundation of the corporate sector are the small shareholders who contribute the bulk of equity funds. The equity capital raised from the public will depend upon several factors viz. prevailing market conditions, investors' psychology, promoters track record, nature of industry, government policy, listing requirements, etc.

Preference share

Though preference shares constitute an independent source of finance, unfortunately, over the years preference shares have lost the ground to equity and as a result today preference shares enjoy limited patronage. Due to fixed dividend, no voting rights except under certain circumstances and lack of participation in the profitability of the company, fewer shareholders are interested to invest moneys in preference shares. However, section of the investors who prefer low risks, fixed income securities do invest in preference shares.

Retained earnings

Plough back of profits or generated surplus constitutes one of the major sources of finance. However, this source is available only to existing successful companies with good internal generation. The quantum and availability of retained earnings depends upon several factors including the market conditions, dividend distribution policy of the company, profitability, Government policy, etc. Hence, retained earnings as a source plays an important role in expansion, diversification or modernisation of an existing successful company. There are several companies who believe in financing growth through internal generation as this enables them to further consolidate their financial position. In fact, retained earnings play a much greater role in the financing of working capital requirements.

Seed Capital

In consonance with the Government policy which encourages a new class of entrepreneurs and also intends wider dispersal of ownership and control of manufacturing units, a special scheme to supplement the resource & of an entrepreneur has been introduced by the Government. Assistance under this scheme is available in the nature of seed capital which is

normally given by way of long term interest free loan. Seed capital assistance is provided to small as well as medium scale units promoted by eligible entrepreneurs.

Government subsidies

Subsidies extended by the Central as well as State Government form a very important type of funds available to a company for implementing its project. Subsidies may be available in the nature of outright cash grant or long-term interest free loan. In fact, while finalising the mean of finance, Government subsidy forms an important source having a vital bearing on the implementation of many a project.

UNIT - II

MARKET & DEMAND ANALYSIS

KEY STEPS IN MARKETING & DEMAND ANALYSIS

- Situational Analysis
- Collection of Secondary Information
- Conduct of Market Survey
- Characterization of market
- Demand Forecasting
- Market Planning

STEPS IN MARKET SURVEY

- Define the target population
- Select the sampling scheme and sample size
- Develop the questionnaire
- Recruit and train the field investigators
- Obtain information as per questionnaire from sample of respondents
- Analyze and interpret the information

CHARACTERIZATION OF MARKET

- Effective demand in past and present
- Breakdown of demand
- Price
- Methods of distribution and sales promotion
- Consumers
- Suppliers and competition
- Government Policy

DEMAND FORECASTING

These methods rely on the judgment of experts to translate qualitative information into quantitative estimates. Since it's based on the judgment, there is high likelihood that it may go wrong. ***Following are the important methods***:

Qualitative Methods

- Jury of Executive Method
- Delphi Method

Time Series Projection Methods

These methods generate forecasts on the basis of analysis of historical time series..Following are the important methods:

- Trend Projection Method
- Exponential Smoothing Method
- Moving Averages Method

Casual Methods

These methods are more analytical than the above mentioned methods. These methods seek to develop forecast based on cause and effect relationship specified in an explicit, quantitative manner. Following are the important methods:

- Chain Ratio Method
- Consumption Level Method
- End Use Method
- Leading Indicator Method
- Econometric Method

TECHNICAL ANALYSIS

1. Choice of Technology:

Choice of technology is influenced by the following factors:

- Plant Capacity
- Principal Inputs
- Investment Outlay and production costs
- Use by other units

2. Technical Arrangements:

Satisfactory contractual arrangements should be made to obtain the technical knowhow needed for the proposed production process. Following should be worked out in detail:

- Price of the technology & mode of payment
- Process and Performance guarantees

3. Material and Inputs

- Raw Material
- Utilities

4. Product Mix:

Choice of Product Mix is guided by the market requirements. While planning theproduction facilities some flexibility in product mix should be sought

5. Plant Capacity:

Following factors have bearing on the plant capacity decision

- Technological requirement
- Input constraints
- Investment cost
- Product Mix
- Latest Developments
- Ease of absorption

- Auxiliary Materials & Factory Supplies
- Processed Industrial Materials & Components
- Period of collaboration & Assistance provided
- Continuing benefit of R&D work being done
- Market conditions
- Resources of the firm
- Government Policy

6. Location and Site:

- Choice of site location is influenced by following factors:
- Proximity to the source of raw materials
- Proximity to markets
- Availability of infrastructure

7. Machineries and Equipment:

Requirement of machinery and equipment is dependent on the production technology and plant capacity

8. Structure and Civil Works: This may be divided into 3 categories:

- Site preparation and Development
- Buildings and Structure
- Outdoor Works

9. Environmental Aspects: Following key issues should be considered in respect of environment

- What are the types of effluents and emissions generated?
- What needs to be done for proper disposal of effluents and treatment of waste?
- Will the project be able to secure all the environmental clearances?

10. Charts and Layouts:

Charts and layouts define the scope of the project and provide the basis of detailed engineering and estimation of investment and production costs

- Labor Situation
- Government Policies
- Other factors like climatic & living conditions

UNIT – III

PROJECT MANAGEMENT AND ORGANIZATION

INTRODUCTION

Once a project has been established and the goals are set, the project manager/sponsor has to act to achieve these goals; since a manager/sponsor gets things done through others and also since most of the projects are multi disciplinary, a project manager has necessarily to look around for help. This help can be expected both from internal and external and sources; internally, from within the institution which employs the project manager and externally from various institutions and individual so having competence and skill relevant to the establish systematic arrangement of works, activities (or) talks between individuals and group with the necessary allocation of duties and responsibilities among them to achieve project objectives. This process in nothing but a project organization.

DEFINITION

An English author Harrison (1981) defines a project organization as the arrangement and relationships between Client Company, contractor, and sub-contractor organizations and their respective project managers who are all involved in undertaking a project in a particular environment.

Project organization must have specific objectives a formal structure of authority with some persons in leadership roles and others in sub-ordinate roles, division of work which entails specialization by members in various activities or functions, a formal system of communications and generally a set of formal procedures and customs that distinguish them from the social entities.

The prime objective of a project organization it to accomplish the specific project in the most economical, efficient and effective manner within the constraints of time, budget and performance or quality standards.

FORMS OF PROJECT ORGANIZATIONS

The traditional/classical form of organization is not suitable to the projects. This is due to the following inherent features of projects.

- Project is a non-routine, non repetitive

- Work often plagued with uncertainties.
- It involves co-ordination of efforts of persons.
- The relationships in the project setting are dynamic, temporary and flexible.

Beside that, the traditional form of organization has no means of integrating different departments at levels below top management and it does not facilitate effective communication, co-ordination and control.

Hence, there is a need for entrusting an individual or group with the responsibility for integrating the activities and functions or various departments and outside organization involved in the project work. Depending on the authority that is given to the person responsible for the project, the projects organization may take one of the following forms:

A. Line and staff organization
B. Divisional organization
C. Matrix organization
D. Task force organization
E. Totally projectized organization

A. LINE AND STAFF ORGANIZATION

In this form of project organization, a person is appointed with the primary responsibility of coordinating the work of the people in the functional departments. Such a person is commonly called as project coordinator/project manager who acts essentially in a staff position to facilitate the co-ordination of line management in functional departments.

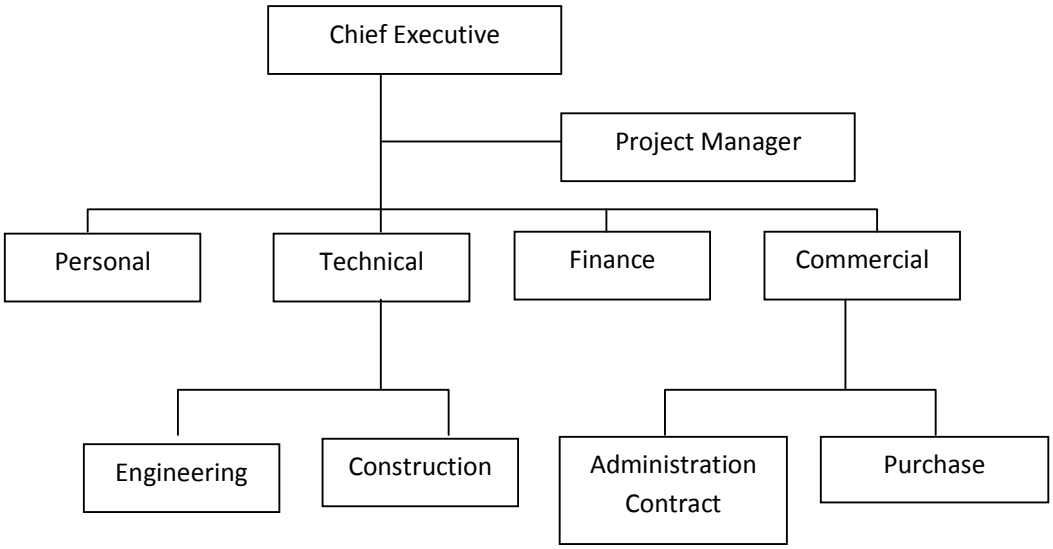
He serves only as the focal point for activity control, that is, a center for information. The project manager does not have authority and direct responsibility of line management. He may gently coax line executive to strive for the fulfillment of project goals.

The project manager in this position, does not make any decision for the project, nor does he provide any staff service top the functional departments who make all the decisions relating to the project. The project manager merely collects information. Collects and communicates the same to the chief executive.

This arrangement may be chosen by a chief executive who wants to directly control the project but cannot devote much time to keep track of details. The chief executive may expect

the project manager to co-ordinate and expedite the project which the latter will find a very trying proposition in view of his not having any authority.

He may influence some decisions taken by the chief executive or by the functional departments, but he cannot himself make any decision which can become binding for others. In other words, he has to rely on personal authority for getting things done and not on positional authority.



Demerits

1. The project manager may find it difficult to exert leadership and feel unsure of his role due to deprival of formal organization authority. He has to influence others only through his professional competence closeness to top management and persuasive abilities.
2. This arrangement may work for every small projects. It cannot works for large projects even if the project manager is provided with supporting staff since the real person, who in this arrangement wields authority and can therefore co-ordinate and expedite the project, is the chief executive who, as stated earlier, may not have much time for the project.

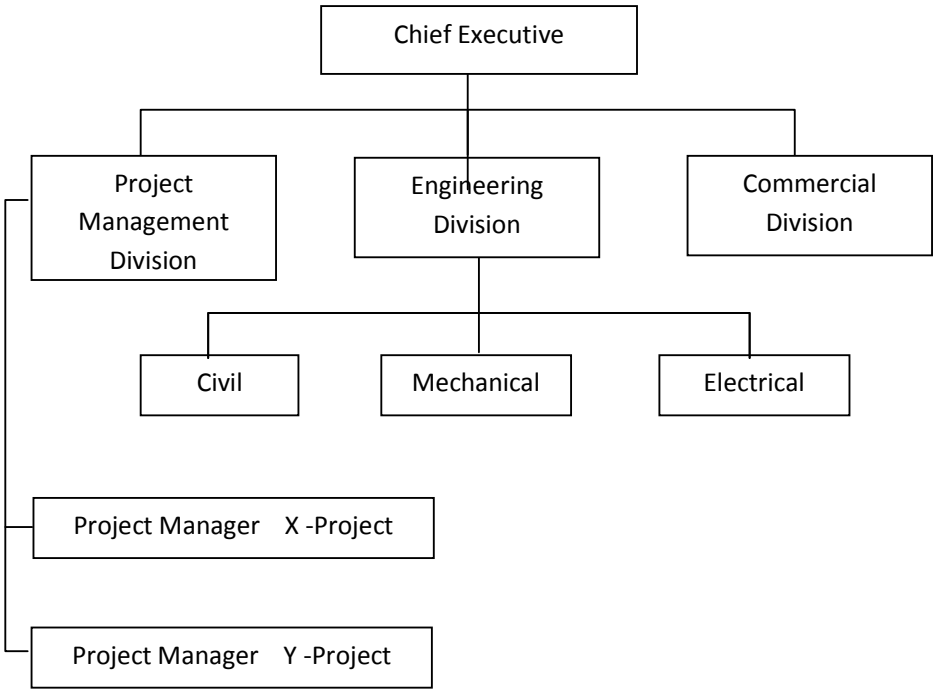
B. DIVISIONAL ORGANIZATIONS

Under this form of project organization, a separate division is set up to implement the project. Headed by the project manager, this division has its complement personnel over whom the project manager has full like authority. In effect, this form of organization implies the

creation of a separate goal oriented division of the company with its own functional departments.

This form of organization facilitates the process of planning and control, brings about better integration of efforts and strengthens the commitment of project-related personnel to the objectives of the project, the project manager in this role provide departments who will executive the project.

The project manager, in this case, will be a specialist in project management toosl and techniques, and in view of his superior knowledge relating to scheduling, budgeting and information systems, he is in the best position to advise other functions. A project manager in this role can also carry out service activities like collection and transmission of data, follow-up one functional group to service another group to service another group, maintain records, measure progress, analyze progress and prepare progress reports. He may also act as a single focal point regarding communication between various participating functions and between his company and other interacting companies.



It is also interesting to note that a project manager in such an arrangement fully identifies himself with the project and considers himself responsible for its successful completion, However, the fact remains that at times of adversely the project manager, in such an

arrangement, is liable to throw up his arms and declare that he could be held least accountable for fulfillment of the project goals as he hardly had any voice in its execution.

Demerits

1. The drawback in this arrangement is that while a great deal could be expected, not much may be delivered. The project manager would expect to be heard, but he might not. The functional managers would expect him to take all the responsibilities without any authority, but he cannot. Yes as has been mentioned before, it will be for the first time that someone other than the chief executive will claim a project as his own and work as best as possible for its success.
2. It is possible in this arrangement to encourage direct communication with the work force, or the source where work is being done, without going through the times of authority. This arrangement, however, would not entitle the project manager to issue instructions to the work force however senior he may be in the organizational hierarchy. Any instruction has strictly to come from the functional base irrespective of whether it relates to schedule, budget, information system or co-ordination with other functional groups or outside agencies.

The direct approach, though devoid of any authority, may not get automatically accepted unless this has the backing of the chief executive and in course of time becomes an organizational practice. Yet if lines of communication are not made direct, there would be inordinate delay and much of the advantage that could be expected from the arrangement would not be there.

C. MATRIX ORGANIZATION

The line and functional forms of organization si conducive to an efficient use of resources but is not suitable for an effective realization of project objectives. The divisional form of organization si suitable for an effective realization of project objectives but not conducive to an efficient use of resources. The matrix form of organization seeks to achieve the twin objectives of efficient use of resources and effective realization of project objectives the cost of greater organizational complexity, of course. A competent project manager will succeed in acquiring some authority because of his sheer identification with the projet and its cause to the extent a project manager is able to acquire the authority, the functional manager will be forced to dispense with the same. When this arrangement of sharing authority between a

project manager and other functional manager it formalized, we have an organizational form, which is known as matrix organization.

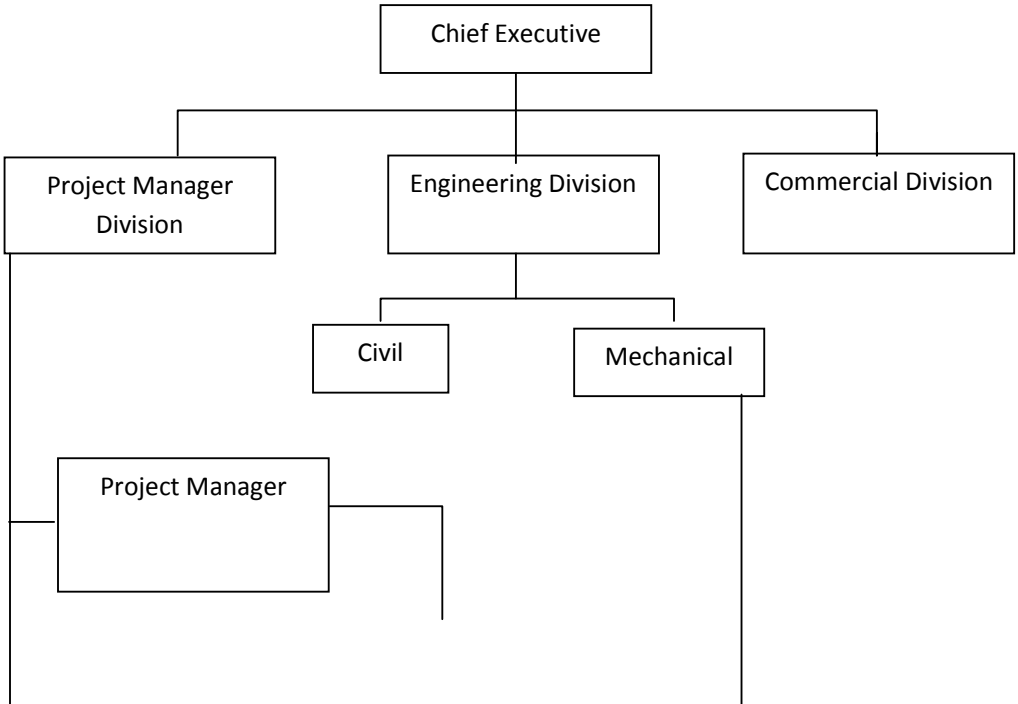
Functional Manager / Project	Functional Manager	Functional Manager	Functional Manager
	A	B	C
Project Manager X	A1	B1	C1
Project Manager Y	A2	B2	C2
Project Manager	A3	B3	C3

Flow of Project activity

Flow of Project Authority

A matrix, as shown in Figure, is a concept borrowed from algebra where an individual will abide by the decisions made by two superiors – one belonging to the project and the other to the specialized function. One will be this direct like boss and the other his project boss. Both are responsible for the successful completion of the project boss. Both are responsible for the successful completion of the project and therefore, both ought to have authority over the working force through whom the project is being executed. The following figure shows the matrix organization.

A mutually supportive relationship should exist between the partners in a matrix set up for the successful execution of a project. Matrix organization is, thus, a deliberate attempt to provide authority, i.e., a chair to those who are asked to assume responsibility, and as long as one does not put one's chair before one in dealing with work, there should not be any problems.



The main feature in the matrix operation is that, the parties involved in the matrix will have a common concern as well as a specialist concern. As long as the parties respect the specialty of the others and look to one another for help and support for the common cause, a matrix will work extremely well. But is one assumes that what should have even a common cause is not common, and also believes that help would not be forthcoming unless the other party is forced, matrix is unlikely to succeed.

Thus, a matrix may be filled either to the project side or to the functional side depending on circumstances. If the project influence is more in decision-making for the project, then the arrangement is considered a strong matrix. On the other hand, if the functional departments are seen to be influencing the decision-making more, the arrangement is considered a weak matrix. While a company may operate on matrix, one may see it operating with different strengths in different projects.

But such problems are very real in the operation of a matrix. It may be weaker than the weakest acceptable or stronger than the strongest desired. A balanced matrix where there is a balance of power between the project manager and functional manager is an ideal but non-exist out situation. Therefore, many people consider a matrix a complex organizational arrangement and would like to avoid it if possible.

D. TASK FORCE ORGANIZATION

An alternative arrangement which clearly accords authority to the project manager and avoids disillusionment of either the project manager or the functional manager due to mal-operation of the matrix is a task force. In this arrangement the project manager is delegated the fall authority to make decisions for the project, but that would be required to operate within the functional organizations' policies and procedures. There is clearly o intervention from the

various functional departments, no duel decision making and no dual reporting relationship for the working force, the project manager makes all the decisions but within the policies and procedures laid down for him.

A task force is created by drawing personnel form various functional departments and putting them under the project manager. The staff so assigned will continue to receive administrative support from their home departments but whey will respond only to the project manager, while they will receive all directions.

The project merely requisitions the expertise and directs its use in the best interest of the project. So the project should decide what is to be done, when it is to be done and at what budget, it should be for the functional departments to decide who should do it, what back-up he should be given, what norms and standards he should follow so that the work is completed as per specifications and within the time the budget.

Trouble normally starts when the functional departments would not take-up the work that is needed first or would not deploy resources to do it within the time and budget. The work may happen when resources to do it within the time and budget. The functional manager may either accord approval or take it up in case, the functional manger and the project manager cannot settle it between there selves. On the other hand, there may not be any reference at all to the functional manger or corporate management, if the project manager sorts it out at his level by taking the functional staff into confidence whenever decisions are made.

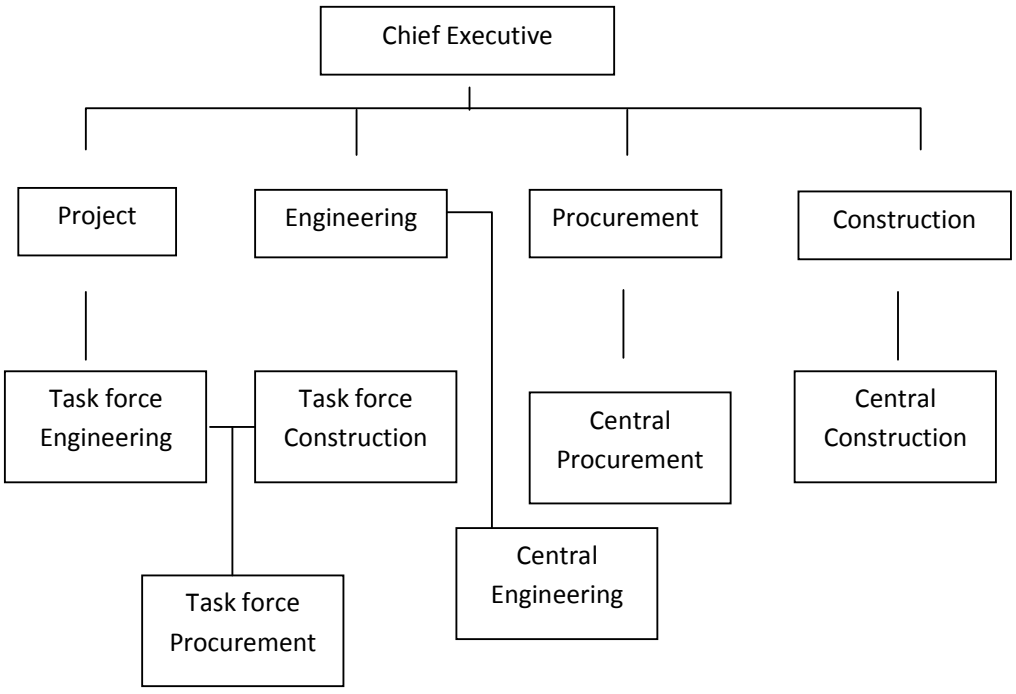


Figure shows the task force arrangement. The project mangers authority is indicate by the lines and dotted lines show the relationship between the functional staff and the functional manager. The relationship shows by the dotted like enables communication of the functions staff with their respective functional departments for obtaining technical support of additional staff support but no decisions relating to the project.

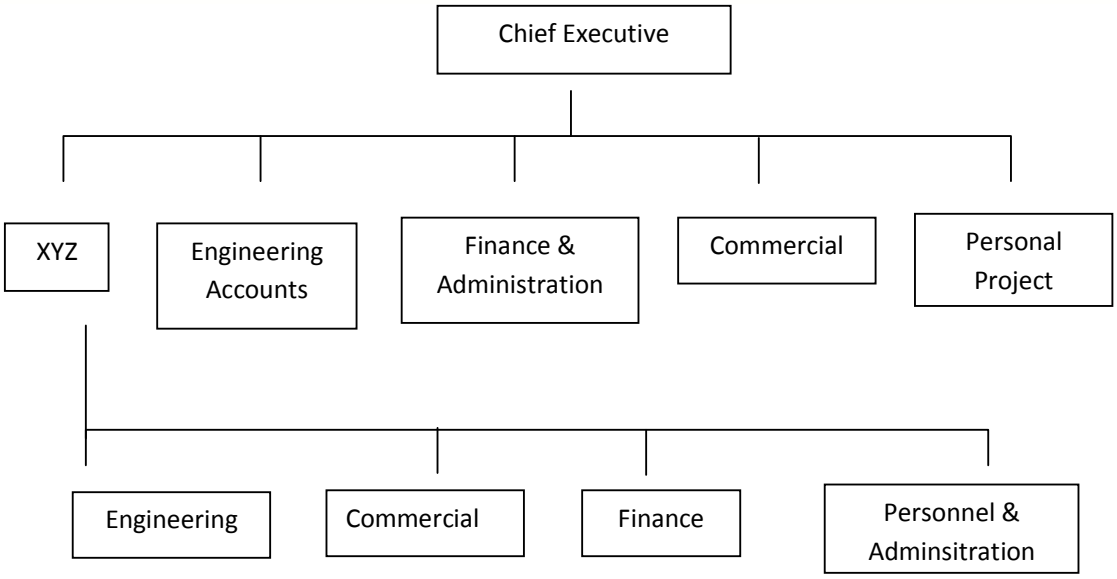
Unlike the matrix the loyalty of the functional staff in this arrangement is clearly with the project. The functional department's influence is virtually non-existent. Therefore unless the functional representative have strong functional commitment, functional excellence is likely to e compromised for expediency. The functions will require strong corporate management support to ensure adherence or policies and procedures laid down by them.

E. TOTALLY PROJECTIZED ORGANIZATION

A totally projectized organization is an arrangement in which the project manager has total authority even regarding functional policies and procedures. There is no constraint whatsoever with respect to any function. The functional specialists have not one to notify. They will be carrying out what the project demands and the project manager instructs.

Many people compare this arrangement to a mini company a totally autonomous organization in which the project manager is the chief executive. It will, necessarily have decisions and departments headed by very senior functional specialists who can function independently without any support whatsoever. They would act on behalf of the project manager for taking decisions in their area of competence.

Such an arrangement is obviously possible when the project is too large and complex or geographically so located that there is no way of managing it without granting autonomy to the term handling the project. The project manager for such a project will obviously be a very senior person to justify delegation of so much authority by the company. The project manager, in such an arrangement, will be required to carry out lot of administrative functions besides his core project business. It would not be surprising to find the project manager spending more time in the administrative matters than on the business of the project in this types of arrangement.



Figures show a totally projectized organization. The difference between this arrangement and the one shown in the figure is not the mere elimination of dotted line relationships but also the inclusion of personnel accounts and many such functions which are not the project manager's immediate concern. Yet this arrangement may be justifies for a project because of its size, complexity, location, importance to the company and also need for special treatment, particularly in case of a jolt or collaborative project or if the financial institutions so desire that it be organized that way.

The totally projectized arrangement may also be desirable if the company is executing only one gigantic project.

Which Organization structure is most suitable?

A matrix is also expected to work for very large and complex projects, but it practices, it adds its own complexing. A matrix is also effective for small but complex projects where many multi disciplinary specialists are required for short durations. However, unless the number of such projects is many, a matrix arrangement would not be justified. So either total projectization or fast force arrangement would appear to be the best arrangement for execution most projects. And in both these arrangements the project manager is delegated authority commensurate with the responsibility he is expected to undertake. Project objectives get primary attention in both these arrangement.

The traditional form of organization is not suitable for project work because it has not means of integrating different departments at levels below the top management and it doesn't facilitate effective communication, coordination and control. Hence, project organization may take one of the following forms – line and staff organization, Divisional organization, Matrix organization, Task force organization and totally projected organization.

Features of Good Project Management Organization

- There should be an effective project head
- Good and experienced Project group
- Separate Project department in case of continuous project activities
- Involving agencies like project, operation, consultant, finance and commercial departments effectively.
- Good System of selection, training, promotion and remuneration of project personnel
- Well equipped computerized information system and impossible with project management softwares.
- Capable to execute the projects along with the operation activities.
- In large project organization own construction facilities may be created.

NETWORK TECHNIQUE IN PROJECT SCHEDULING

Network technique is predominantly used in project scheduling. When will each activity be commenced, when the same has to be completed, which activity can be delayed, when will the project be completed and related questions are answered by PERT and CPM techniques. All these require time estimates and sequential relations between jobs.

Time estimates are made based on past experience, the job nature and availability of resources. In PERT, 3 estimates of time for each activity is made as was already stated and the expected time worked out using a formula already dealt with. This is needed since PERT deals with uncertain business environment, In CPM only one time estimate is made as it assume certainty condition. But estimates may be revise in both the cases as in assurance in past estimates come to light.

Once time estimates and sequential relations are known activities scheduling can be prepared. You have to find out EST, EFT, LST, LFT, total slack and free slack. All these have been already explained. Then activities can be taken up as per their EST or LST or some in between times taking advantage of slack of activities. Of course, for critical activities EST and LST are same, also EFT and LFT are also same. That is, they have no slack.

Under PERT we can find the probability of finishing a project by certain date. For this the standard deviation of activity times for critical activities is to be calculated.

An 'Z' value is calculated as follows:

$$Z = \text{std. normal variate} = \frac{\text{Due date} \;\; \text{Expected date of completion}}{\text{Project std. deviation}}$$

Corresponding to the 'Z' obtained, from the normal distribution table 'area' under normal curve is found. From that figure, the probability of completion by the due date is known.
We may find the probability of completion by 22^{nd} day from commencement for out car project, given the expected completion by 20^{th} day.
We need to know the three time estimate for the critical activities which are as follows:

Activity	Tp	Tm	To	(Tp-To) / 6
B	**10**	**9**	**2**	**(10 – 2) / 6 = 4/3**
H	**9**	**4.5**	**3**	**(9 – 3) / 6 = 1**
J	**5**	**3**	**1**	**(5 – 1) / 6 = 2/3**
L	**5**	**3**	**1**	**(5 – 1) / 6 = 2/3**
M	**5**	**1.5**	**1**	**(5 – 1) / 6 = 2/3**
N	**5**	**1.5**	**1**	**(5 – 1) / 6 = 2/3**

Std. deviation of project = $\sqrt{(4/3)2+(1)2+(2/3)2+(2/3)2+(2/3)2+(2/3)2}$

$$= \frac{16}{9}+1+\frac{4}{9}+\frac{4}{9}+\frac{4}{9}+\frac{4}{9}$$

$$= \frac{41}{9} = \frac{6.4}{3}$$

$$\text{Z Variate} = \frac{\text{Due date} \;\; \text{Expected date}}{\text{Project std. Deviation}}$$

$$= \frac{22-20}{6.4/3} = \frac{2\times 3}{6.4} = \frac{60}{64} = 0.9375$$

Area under normal curve corresponding to Z = 0.9375 is equal to = 0.825. That is, there is a probability of 0.825 or 82.5% that the project would be completed by 22nd day.

The probability computation is helpful in project rescheduling, if need be, where the 'P' is very small, there is need for speeding up the work through commissioning more resources or in postponing the due date. Hence the use of PERT and CPM in project scheduling.

CRITICAL PATH METHOD (CPM)

The critical path analysis is an important tool in production planning and scheduling. Gantt charts are also one of the tools of scheduling but they have one disadvantage for which they are found to be unsuitable. The problem with Gantt chart is that the sequence of operation of a project or the earliest possible date for the completion of the project as a whole cannot be ascertained. This problem is overcome by this method of Critical Path Analysis.

CPM is used for scheduling special projects where the relationship between the different parts of project is more complicated than of a simple chain of task to be completed on after the other. This method (CPM) can be used at one extreme for the very simple job and at other extreme for the most complicated tasks.

A CPM is a route between two or more operations which minimizes (or maximizes) some measures of performance. This can also be defined as the sequence of activities, which will require greatest normal time to accomplish. It means that the sequences of activities, which require longest duration, are singled out. It is called at critical path because longest duration is singled out. It is called as critical path because any delay in performing the activities should be taken should be taken up first.

According to ***John L. Burbidge,*** "One of the purpose of critical path analysis to find the sequence of activities with the largest sum of duration times, and thus find the minimum time necessary to complete the project. This critical series of activities is known as the 'Critical path".

Under CPM, the project is analyzed into different operation or activities and their relationship are determined and shown on the network diagram. So, first of all a network diagram is drawn. After this the required time or some other measure of then combined to develop a schedule which minimizes or maximizes the measure of performance for each operation. Thus CPM marks critical activities in a project and concentrates on them. It is based on the assumption that the expected time is actually the time taken to complete the object.

Main Objectives Of CPM

(i) To find difficulties and obstacles in the course of production process

(ii) To assign time for each operation,

(iii) To ascertain the starting and finishing times of the work

(iv) To find the critical path and the minimum duration time for the project as a whole.

Situations where CPM can be effectively used:

(a) In production planning

(b) Location of and deliveries from a warehouse

(c) Road systems and traffic schedules

(d) Communication network

Advantages of CPM

i. It provides an analytical approach to the achievement of project objective which are defined clearly.
ii. It identifies most critical elements and pays more attention to these activities.
iii. It assists avoiding waste of time, energy and money on unimportant activities.
iv. It provides a standard method for communicating project plains, schedules and cost.

PERT (PROGRAMME EVALUATION AND REVIEW TECHNIQUE)

There are so many modern techniques that have developed recently for the planning and control of large projects in various industries especially in defence, Chemical and construction industries. Perhaps, the PERT is the best known of such techniques.

(i) PERT is a time-event network analysis technique designed to watch how the parts of a programme fit together during passage of time and events. The special project office of the U.S. Navy developed the technique in 1958. individual tasks should be shown in a network. Events are shown by circles. Each circle representation event a subsidiary plans whose completion can be measured at a given time.
(ii) Each arrow represents and activity the time consuming element of a programme, the effort that must be made between events.
(iii) Activity time is the elapsed time required to accomplish element an event. In the original PERT, three-time values are used as follows: Is

t1 (It involves the expected of any operation can never by determined expected time of any operation can never by determined exactly.

Major feature of PERT

(iv) All

(a) Optimistic time) : It is the best estimate of time if everything goes exceptionally well

(b) t2 (Most likely time): It is an estimated time what the project engineer believes necessary to do the job or it is the time which most often is required if the activity is repeated a number of times.

(c) t3 (Pessimistic time) : It is also an activity of under adverse conditions. It is the longest time and rather is more difficult to ascertain.

The experiences have shown that the best estimate of time out of several estimates made by the projects engineer is:

$$t = \frac{t1 + 4t2 + t3}{6}$$

and the variance of t is given by-

$$V(t) = \frac{t3\ \ t1}{6}$$

Here it is assumed that the time estimate follows the Beta distribution.

(v) The next step is the compute the critical path and the slack time. A critical path or critical sequence of activities is one, which takes the longest time to accomplish the work and the least slack time

Advantage of pert

PERT is a very important of managerial planning and control at the top level concerned with overall responsibility of a project. PERT has the following merits.

(i) Pert forces nabagers and subordinate manger's to make a plan for production because time event analysis is quite impossible without planning and seeing how the pieces fit together.

(ii) PERT encourage management control by exception. It concentrates attentions on critical element that may need correction.

(iii) It enables forwards-working control, as a delay will affect the succeeding events and possibly the whole project. The production manager can somehow make up the time by shortening that of some other time.

(iv) The network system with its sub-systems creates a pressure for action at the right spot and level and at the right event.

(v) PERT can be effectively used for re-scheduling the activities.

Limitations in using pert

The uses of PERT techniques are subject to the following limitations:

(i) It is a time-consuming and expensive technique.

(ii) It is based on Beta Distribution and the assumption of Beta Distribution may not always be true.

(iii) PERT is not suitable when programme is nebulous and a reasonable estimate of time schedule is not possible.

(iv) It is not useful for routine planning of recurring events such as mass production because once a repetitive sequence is clearly worked out; elaborate and continuing control is not required.

(v) The expected time and the corresponding variance are only estimated values.

Difference in pert and CPM

Although these techniques (PERT and CPM) use the same principles and are based on network analysis yet they in the following respects from each other:

(i) PERT is appropriate where time estimate arte uncertain in the duration of activities as measured by optimistic time, most likely time, and pessimistic time, where as CPM (Critical Path Method) is good when time estimates are found with certainty. CPM assumes that he duration of every is constant and therefore every activity is critical or not.

(ii) PERT is concerned with events, which are the beginning or ending points of operation while CPM is concerned with activities.

(iii) PERT is suitable for non-repetitive projects while CPM is designed for repetitive projects.

(iv) PERT can be analyzed statistically whereas CPM not.

(v) PERT is not concerned with the relationship between time and cost, whereas CPM established a relationship between time and cost is proportionate to time.

Construction of a network

We may take up a project involving manufacture of a new model car. The activities involved are in table-1 with their sequential order indicated. The duration and labour needs are also presented.

Table – 1 : New Model car – Network Activities

Activity Letter	**Activity Description**	**Preceding activities**	**Duration (days)**	**No. of employees needed**
A	Start	Nil	0	---
B	Design	A	8	3
C	Build frame	B	2	5
D	Build doors	B	1	2
E	Fix axles, wheels & fuel tank	C	1	3
F	Build body shell	B	3	7

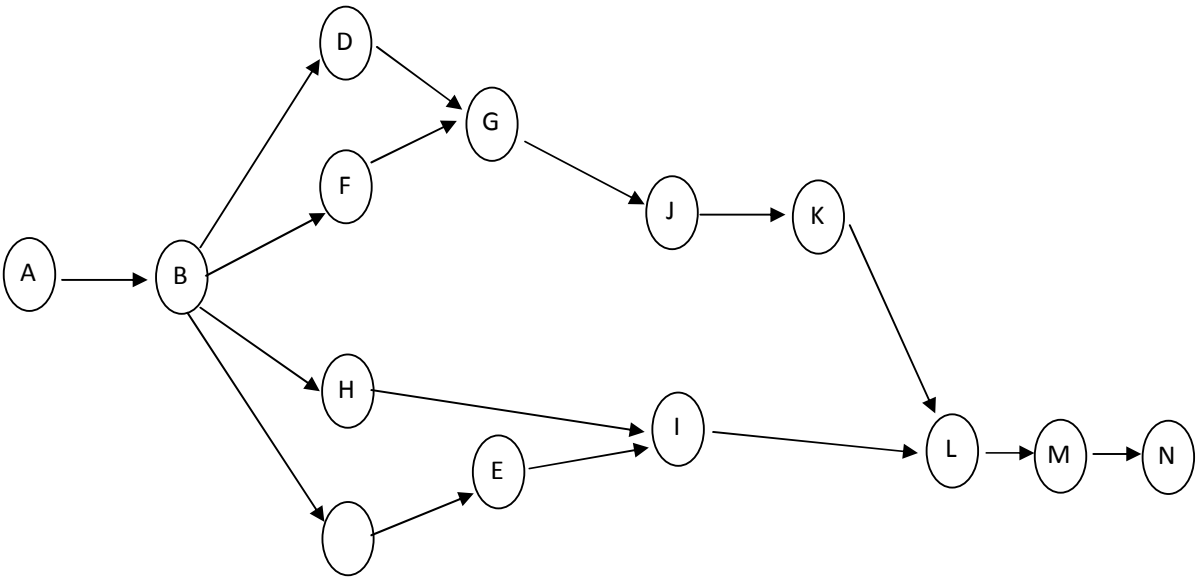
G	Fit doors to body shell	D,F	1	2
H	Build & test engine	B	6	5
I	Assemble and test chassis	E,H	3	3
J	Paint body	G	2	4
K	Interior	J	1	3
L	Mount body to chassis	I,K	1	3
M	Road test the car	L	1	2
N	Finishing touch	M	1	2

For the above project we can construct a network. Before we do it a descriptive of how to construct a network is presented. A network contains connected 'events' and 'activities'. 'Event' refers to the 'starting' or 'completion' of specific jobs. The 'circles' in the network indicate the 'events'.

Otherwise, the circles are known as 'nodes'. 'Activity' refers to progress to work leading from 'one event to other event'. This is indicated by the 'arrows' in the network. When drawing a network physical neatness, avoiding criss-cross, 'loops' must be avoided. A 'loop' results when two activities have the same 'start' and 'end' nodes or events.

In such a case, a 'dummy' activity, with time zero as well as resource needs zero, is introduced to avoid a loop. Now, the network for the car project is attempted.

Network diagram – car project



A brief description is presented on the network in Fig. 1. Node or event A is the starting point. Node B indicates the completion of 'design' work, A – B, therefore indicates the progress of design activity, which needs 8 days for completion.

The numbers above the arrows thus indicate the time required for completion of respective activities. Until design, B, is completed activities C, D, F and H cannot be taken up. Hence, all these activities have common start node, viz B. Activity 'G' cannot be taken up, until activities D and F are over. So activities D & F coverage at 'G', and so on. No dummy activity is needed for the project.

In the network, only one time estimate is given for each activity. As against this, pessimistic (longer), optimistic (shorter) and most likely (via media) time estimates may be given for each activity. These time estimates are notated as tp, to tm. From these estimates, expected time (te) is worked out as follows:

(Tp + 4 Tm To) / 6 = Te

The 'te' is taken as the activity duration and written above the activity arrow in the network. The 'te' computation given above is based on 'beta' distribution which underline very low probability for tp and to and very large probability for tm.

Now, the different routes of the network can be deduced. A route simply means the course of project from the starting point to the ending point of the project accordingly, the routes of the project are:

Route I : A – B – D – G - J – K – L – M – N

Route II : A – B – F – G – J – K – L – M – N

Route III : A – B – H – I – L – M – N

Route IV : A – B – C – E – I – L – M – N

The time duration of the different routes can be worked out by adding together the time duration of individual activities falling in the respective routes, Accordingly.

Route I involves : 8+1+1+2+1+1+1+1 = 8 days

Route II involves : 8+3+1+2+1+1+1+1 = 18 days

Route III involves : 8+6+3+1+1+1+ = 20 days

Route IV involves : 8+2+1+3+1+1+1 = 17 days

The longest route is : A – B – H – I – L – M – N, which takes 20 days. This route is called the critical path. The network diagram represents the critical path by thick arrows or double line arrows, just to indicate the critical path prominently.

The time required for completion of the project is given by the time duration of the critical path. If everything goes well, by end of 20^{th} day the new model car would by ready, for this to happen, each activity in the critical path has to be taken up and completed as per schedule.

That is 'B' must be over by the 8^{th} day, H must be commenced on beginning of 9^{th} day and completed on 14^{th} day. I to begin on 15^{th} day and completed by 17^{th} day, L to begin on 18^{th} day and completed on the same day, M to begin on 19^{th} day and completed on the same day and N to begin on 20^{th} day and completed on the same day.

Now the concepts of earliest start time (EST), earliest finish time (EFT), latest short time (LST), latest finish time (LFT), slack, total slack and free slack may be presented.

EST refers to when a particular activity can be taken up at the earliest. Activity A–B has to begin at day 0 day and will go till the end of day 8. Actually B-D, B-F, B-H and B-C can be taken up immediately after A-B is over, i.e. from end of day 8. (i.e. the beginning of day 9).

So, the EST for B-D, B-F, B-H and B-C is end of day 8. B-D will be over by end of day 9 day and that the EST for D-G is end of day 9 (i.e. the beginning of day 10). The EST for G-J is not however end of day 10, by which time D-G will be over.

Because G-J cannot be commenced until F-G is also completed. F-G will be over by end of day 12. So, for G-J the EST is end of day 12 or beginning of day 13 and so on.

EFT refers to when a particular activity can be completed, assuming it has been commence as per its EST. for A-B it is end of day 8, for B-D it is end of day 9, for B-F it is end of day 11 and so on. For G-J the EFT is end of day 14.

LST and LFT are computed backwards from last activity, viz, M-N in this project. M-N must be over by end of day 20. So, its LFT is end of day 20. Its LST is end of day 19, so that by end of day 20. If you go backward, for activity L-M the LST is end of day 18 and LFT is end of day 19.

Table-2 gives the EST, EFT, LST and LFT for the various activities.

Table – 2 : EST, EFT, LST and LFT

Activity	EST	EFT	LST	LFT	Total (LFT-EFT) or (LST-EST)	Free Stack
A-B	1	8	1	8	0	0
B-D	9	9	12	13	4	0
D-G	10	10	14	14	4	2
B-F	9	11	11	13	2	0
F-G	12	12	14	14	2	0
G-J	13	14	15	16	2	0

J-K	15	15	17	17	2	0
K-L	16	16	18	18	2	2
B-H	9	14	9	14	0	0
H-I	15	17	15	17	0	0
B-C	9	10	12	13	3	0
C-E	11	11	14	14	3	0
E-I	12	14	15	17	3	3
I-L	18	18	18	18	0	0
K-M	9	19	19	19	0	0
M-N	20	20	20	20	0	0

Slack or float refers to be extent an activity can be delayed without affecting completion of the project on time. This is given by LST – EST or LFT – EFT; Table 2 gives this also under total slack column. You will note that activities falling on the critical path have no slack.

Because, none of the activities can be delayed, lest projects duration will increase. There are two concept of slack: total slack and free slack. Total slack is simple LST – EST or LFT – EFT. Free slack refers to slack or spare time available for an activity when all succeeding activities in the network can be started at their respective EST. Only three activities D-G, K-L and E-I have free slack.

Uses of network techniques

PERT and CPM techniques have become useful to management in many ways. These are:

(i) The graphic representation of how each activity is dependent on others helps in better scheduling, monitoring and control of project activities.

(ii) To prepare the network itself considerable planning, analysis and in dept, evaluation of the whole project are needed, which in turn help in better execution of the project.

(iii) Network techniques can serve as indicator of bottle necks and potential trouble spots and this helps in effective preventive handling of pitfalls of that the project progress will as per original plans

(iv) Network diagram illustrates the type and extent of coordination required amount several functionaries of the project team, viz., designers, managers, contractors and others.

(v) Network diagram helps in identifying critical tasks and thereby helps diversion of resources to them so that they are not lagging behind schedule.

(vi) Network diagram helps in identifying critical path, which may be changing a number of times as time estimates prove inaccurate. So the critical path has to be identified every time estimates are changers and this is easily done with the help of the network.

(vii) Network techniques help in resource allocation. Resources such as labour and machine can be better allocated to project activities with the help of a network analysis.

(viii) Network help in resource smoothing. That is, when resources requirements are uneven over time, a sort of smoothening or leveling is required. PERT and CPM are useful in this regard.

(ix) Network techniques help in ascertaining whether or not advisable to crash project time and the impact of crashing on cost of the project. What activities have to be speeded up so as to minimize cost escalation on account of crashing are known with network analysis.

(x) Network techniques help in cost control too. Starting works by their LST could help in lock up of capital for a less period than when works are started by their EST. This is a cost control exercise facilitated by network analysis.

Resource Allocation and leveling through network

ERT and CPM techniques are not simple static involving the computation of times, EST, LST, EFT, LFT and drawing the diagram. It is a dynamic tool. It helps in resource allocation and resources leveling.

Resources allocation means how much resources be diverted to the project concerned day after day as the project progresses.

In table : the number of workers required for each activity is given. With that information we can compute what is the human resource requirement day after day.

The resource requirement depends on when the activities are scheduled to begin, i.e., as per their EST or LST or any intermediary time. Suppose as per EST the activities are scheduled.

Then the human resources needs would be as in table – 3

You know in the first eight days only 'B' will be takent up requiring every day 3 labours. On the 9th day, C, D, F and H can be taken up requiring a total of 19 labours and 'D' is completed that day. On the 10th day C,F & H alone are in progress and 'C' is over gby end of day 10. On the 11th day E, F and H are in progress and both E & F are over by end of the day. On 12th day 'G' is taken up as both the preceding activities D & F are over by now.

And so on as you see in table 3.

Table 3 : Progress of activities and labour needs when activities are scheduled by EST.

Days	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**Total Labour Needs**
1	3													3
2	3													3
3	3													3
4	3													3
5	3													3

6	3													3
7	3													3
8	3													3
9		5	2		7		5							19
10		5			7		5							17
11				3	7		5							15
12						2	5							7
13							5		4					9
14							5		4					9
15								3		3				6
16								3						3
17								3						3
18											3			3
19												2		2
20													2	2
Total Labour days per activity	24	10	2	3	21	2	30	9	8	3	3	2	2	119

From table-3, you know how much labour is required on day to day basis, (see last column) and how much is required activity – wise (see lat row). You can now make allocations of human resources to the project.

In the same way, you can find what would be the day-to-day labour needs when the works are scheduled as per their LSt, table-4 gives the same.

Between 9^{th} and 17^{th} days, there are differences in the daily needs under the two pattern of job scheduling. During the period 1^{st} – 8^{th} day only one critical activity is in operation and

during 18^{th} – 20^{th} days too only critical activities are operated. So, under both scheduling patterns the labour needs are same.

Table 4 : Progress of activities and labour needs when activities are scheduled by LST.

Days	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**Total Labour Needs**
1	3													3
2	3													3
3	3													3
4	3													3
5	3													3
6	3													3
7	3													3
8	3													3
9							5							5
10							5							5
11					7		5							12
12		5			7		5							17
13		5	2		7		5							19
14				3		2	5							10
15								3		4				7
16								3		4				7
17								3		3				6
18											3			3
19												2		2
20													2	2
Total Labour	24	10	2	3	21	2	30	9	8	3	3	2	2	119

days per activity														

Resource leveling means evening out the daily resources needs to the extent possible. You find that under the EST scheduling the labour needs on 9th thorough 17th days are respectively 19, 17, 15, 7,9,9,6 and 3 persons and under the LST scheduling, labour needs are 5,5,12,17,19,10,7,7 and 6 persons per day respectively for the different days.

The daily needs are highly varying. Certain leveling or smoothening or reducing the variations in daily needs can be attempted. That is what is called as resources leveling. Why is leveling needed?

The reasons are:

(i) Resources constraint can be one of the reasons. Say, not more than 12 persons are available on any one day, whereas we need as much as 19 persons on one day. By rescheduling non-critical activities using their slack times, the above purposes can be served.

(ii) Practically speaking, too much needs on some days and too little needs on other days are not signs of good planning.

(iii) Also, disruption in work is more probable when the peaks and through in resource needs are not ironed out.

(iv) Optimum utilization of permanent/owned facilities, avoiding ideal time, is possible with resource leveling exercises.

Say in our case only 12 labours are available on any one day. Is it possible to complete the project on time with only 12 persons? May be some rescheduling can be thought of. The method adopted here is called as 'heuristic programming'. Heuristic mean 'rule of thumb'

that works and a collection of these rules is known as 'heuristic programming'. One approach of heuristic programming is rescheduling activities that have larger slack time.

A resource leveling is suggested here. Let us go by LST scheduling given in table – 4 for all but activities D and F. Let us advance F utilizing the 3 days' slack. That is we take the work on 9^{th} itself and complete by 11^{th}.

In so doing the labour needs on 9^{th} ,10^{th} , and 11^{th} days go up to 12 persons each day and for 12^{th} and 13^{th} days go down to 10 and 12. So, we satisfy the maximum labour availability condition now.

Further a cosmetic improvement is possible, by advancing D by and day to 12^{th} day and by so doing the labour needs for 12^{th} day become 12 and 10 for 13^{th} day. Now the labour requirements from 9^{th} thorough 14^{th} day become 12, 12, 12, 12, 10 and 10 persons. Definitely this is a better arrangement than the one depicate by table – 4 or table – 3 scheduling.

This arrangement also ensures better utilization of permanent employees say 0 persons here. As per LST scheduling on days 9, 10 and 11 there is an avoidable ideal time. Now, after rearrangement, all are fully utilized on these days. Thus, there is a saving in the number of hired nonpermanent labours. The saving is to the extent of 12 days' labour. Hence, the need and score for resource leveling.

PROJECT REVIEW AND ADMINISTRATION

Project review is an important aspect in the process of planning. Every socio-economic programmes needs to be assessed for its results. One can say that the need for and importance of review of planned programmes was realized and stressed along with the initiation of the planning exercise itself.

Review is an important tool to identify the shortcomings during the entire implementation period and to develop or initiate corrective actions to improve the delivery and administrative purposes. Such studies answer question like: whether the project is implemented in the ways specified; whether the methods, process, procedures etc. adopted are appropriate to achieve the set goal; whether the personnel are sufficiently motivated, trained and adequate for the success of the project. Similarly, the project evaluation studies are conducted for assessing the impact of the project and also to examine the project efficiency.

Thus the role, function, objective and purpose and of Project Review is not only to help, guide, direct and aid the planners, project sponsors, policy formulators but also help the administrators, executives, scholars and academicians. In review, the most fundamental task is the formulation of criteria of review and also determination of the time for the study. On the basis of these criteria of Review and also determination of the time for the study. On the basis of these criteria the results or outcome of the projects are assessed.

Review/Evaluation process essentially involves some important steps viz. Data collection, estimation of cost benefits and profitability of the project and comparing it with the required rate of return to decide acceptance or non acceptance of the project. Data collection may be made both from secondary sources or published documents viz. company balance sheets, government publications, publications of independent research bodies or industrial association as well as from primary sources like the industry and market.

Once the data is collected, it is necessary to shift the same for eliminating the irrelevant and retain only the significant information. On the basis of the data collected and collated an estimate may be prepared of the cost of the project starting from cost of the land and building and going through elements like cost of plant going through elements like cost of plant and machinery, duties, and taxes, working capital needs, estimated pre-operative expenses and contingencies to arrive at an estimate of total cost of the project.

Once the cost of the project is estimated, it is necessary to make certain assumption as regards the schedule of implementation, capacity build-up of production, cost of raw

material, other related costs, realizable selling prices etc. in order to arrive at the returns and the profitability of the project.

A comparison of the estimated and required profitability will form the basis of selection or rejection of the project. What constitutes estimate/required profit ability? It really depend on the nature and focus of project evaluation.

Project review is the final phase of Project Management. The various facets of project review are

- Initial review
- Performance evaluation
- Abandonment analysis
- Behavioural issues in project abandonment
- Administrative aspects of capital budgeting
- Evaluating the capital budgeting system of an organization.

Initial review

It is the first stage in the project review process. The initial review of a project is of two types.

- Control of project in progress
- Post audit

Control of Project in Progress

The expenditure authorization for a project generally specifies how much can be spent by whom and when. To ensure that the actual expenditure does nto deviate significantly from the authorized expenditure, periodical control is exercised during project implementation.

Post audit

An audit of a project after it has been commissioned is referred to as post audit or post completion audit. Most firms do a post audit for almost every project above some threshold limit. Such an audit compares actual performance vis-à-vis planned performance when the operations of the project stabilize.

Performance Evaluation

While the post audit is typically a one-time exercise, performance evaluation is done periodically. It seeks to measure the performance of the project on an ongoing basis.

Performance evaluation may be done in terms of economic rate of return or book return on investment.

$$\text{Economic rate of return for a given year} = \frac{\text{Cash flow} + \text{Changes in present value}}{\text{Present value at the beginning of the year}}$$

$$\text{Book return rate of return for a given year} = \frac{\text{Cash flow} + \text{Changes in book value}}{\text{Book value at the beginning of the year}}$$

Abandonment analysis

Ordinarily a project is analyzed on ht assumption that the firm will operate it for a given period. Often, however, it may be possible to abandon the project before this period. This possibility of abandonment, when considered explicitly in project analysis, may change the decision itself. A detailed discussion about this analysis is given in the project control techniques paper. (Please refer)

A basic rule of capital budgeting says that investment decisions should be guided by the net present value criterion. Applied to a project 'continuation versus abandonment' decision, this rule says the project must be abandoned if the net present value associated with abandonment

is greater than the net present value associated with continuation is greater than the net present value associated with abandonment.

Administrative aspects of capital budgeting

The discussion of administrative aspects of capital budgeting has been organized as follows:

- identification of promising investment opportunities
- classification of investments
- submission of proposals
- decision making
- preparation of capital budget and appropriation
- implementation
- performance review

The relationship between the firm and its environment should be regularly analyzed, corporate plans and perspectives must be widely shared, and the creativity and imagination of the employees must be tapped. To generate ideas, suggestion schemes are usually recommended.

Classification

The classification of project proposals refers to the grouping of similar proposals into separate categories. Classification helps in decision making, budgeting, and control.

Submission of proposals

To ensure that all relevant information for proposals is gathered systematically, a standardized proposal form may be used by all the sponsors of investment projects.

The proposal form before it reaches the capital budgeting committed should normally be routed through persons who can comment on the estimates furnished by the sponsor. The routing channel, however, cannot be standardized. It will vary from one organization to another and, perhaps, from one proposal to another.

Routing a proposal through several persons provides a mechanism for obtaining the views and judgments of others. This also facilitates coordination of inter-related activities. Obviously this system would yield benefits only when the persons through whom the proposal is routed give thought to it rather than merely forward it in a routine manner.

Decision Making

The optimal capital budget for the firm as a whole can be drawn up only when capital investment decisions are completely centralized. In most cases, decentralization is required to facilitate quick decisions, develop executives, and conserve top management time for important natters. That is why most of the companies empower executives at different levels to take investment decisions involving outlays up to certain limits.

Preparation of Capital Budget and Appropriation

Smaller projects which can be approved at lower levels may be covered by a blanket appropriation so that they can be undertaken expeditiously. Projects of larger magnitude may be included after approval in the tentative capital budget. The final capital budget, which serves as the basis of budgetary appropriations, should be drawn up after the availability of funds is ensured. Often careful planning of funds is required before budgetary appropriations are made.

Implementation

Delays in implementation and consequent increases in project cost are very common. In many cases over-runs have been between 30 per cent and 100 per cent. These facts emphasize the need for expeditious implementation at a reasonable cost. For this the following points are helpful:

- Adequate formulation of projects
- Use of the principle of responsibility accounting
- Use of network techniques
- Exercise of proper control

Performance Review

Performance review is meant for evaluating actual performance vis-à-vis projected performance. It is concerned with the verification of assumptions regarding both revenues and costs.

Review Process

Project can be reviewed in different dimensions. Essentially it has to be evaluated from the marking technical, financial and commercial (Profitability) dimensions. Let us discuss briefly all these dimensions of project review.

Financial Review

The financial reviews seek to determine the:

1) Reasonableness of the estimate of capital cost.
2) Reasonableness of the estimate of working results
3) Adequacy of the rate of return.
4) Appropriateness of the financing pattern

Reasonableness of the estimate of capital cost.

While assessing the capital cost estimates efforts are made to ensure that:

i) Padding or under-estimation of costs is avoided.
ii) Specification of machinery is proper.
iii) Proper quotations are obtained for potential suppliers
iv) Contingencies are provided and
v) Inflation factors are considered.

Reasonableness of the Estimate of working results: the estimate of working results is sought to be based on:

i) A realistic market demand forecast
ii) Price computations for inputs and outputs that are based on current quotations and inflationary factors.
iii) An appropriate time schedule for capacity utilization and
iv) Cost projections that distinguish between fixed and variable costs.

Adequacy of Rate of Return: The general norms for financial desirability are as follows:

1.	Internal rate of returns	:	15 per cent
2.	Return on investment	:	20-25 per cent
3.	Debt-service coverage ratio	:	1.5 to 2.0

In applying these norms, however a certain degree of flexibility is shown on the basis of the nature of the project, the risks inherent in the project and the status of the promoter.
Appropriateness of the Financing Patterns:-

The institution considers the following in assessing the financial pattern:

A general debt, equity ratio norm of 2:1

A requirement that promoter should contribute 15% to 20% of the project cost.

Stock exchange listing requirements

The means of the promoter and his capacity to contribution reasonable share of the project finance.

Financial review: Two aspects in our discussions of financial review, two questions need to be answered:

1. How financial institutions define the cash flow stream?

2. How financial institutions calculate the debt service coverage ratio?

Cash flow stream

Among the three methods of assessing cash flow stream. The total funds point of view method from which a project may be evaluated and defined the measures of cash flow stream applicable to these points of view.

Financial institutions view a project from the total funds point of view: Let us see how the cash flow stream defined by them compares with the cash flow stream applicable to the total funds points of view.

	Cash flow stream defined	Cash flow stream (total

	by financial institutions	funds of view method)
1. Initial flow	Outlay on fixed asses plus current assets depreciation	Outlay on fixed assets plus current assets
2. Operating flow	Earning before interest and taxes	Profit after tax + Depreciation + interest on short term borrowings (1-tax rate) + interest on term loan (1 – tax rate)
3. Terminal flow	Residual value of assets + realizable value of current assets	Net salvage value of fixed assets + net salvage value of current assets.

Comparing the cash flow streams given above, we find that:

a. The initial flow is defined identically in both the cases
b. The operating flow is defined in pre-tax terms by the financial institutions
c. The terminal flow is defined in both the cases as the sum of
    1. the residual value of fixed assets and
    2. the realizable value of current assets

However the procedures of estimation seem to be different financial institutions, typically define the residual value of fixed assets as equal to 5 percent of the initial cost for non-depreciable assets. Clearly no explicitly effort is made to estimate the likely salvage value at the end of the economic life and the tax liability thereon as part of an exercise to establish the net salvage value. Likewise, the realizable value of current assets is typically put

as equal to its par value. This procedure x is simple and obviates the need to consider the effect of tax factor.

Debt Service Coverage Ratio: The debt service coverage ratio (DSCR) has been defined as

The calculation done by the financial institutions is however slightly different. In their calculation the DSCR of each year is determined separately and then the arithmetic average of these yearly DSCR is taken. In symbols, the overall DSCR as calculated by the financial institutions is as follows:

It may be noted that the DSCR, as calculated by the financial institutions is either to or greater than the DSCR as calculated by Eq. A given above. Refinements in Financial Evaluation:

The financial evaluation that is presently done may be strengthened by a systematic analysis of risk and inflation.

Risk analysis: The ten year projection and subsequent analysis based on them is done under a single set of assumptions. In view of the risks characterizing investment projects it is advisable to look at the possible variations in the key factors and examine their impact on profitability. For this purpose, the techniques of sensitivity analysis and scenario analysis should be employed routinely. In addition, the technique of montre carlo simulation may be employed for projects involving substantial commitments and considerable risks.

Inflation analysis: Typically, financial projections are based are based on current prices/costs. Implicit in this procedure is the assumption to move in random. Where different inflation rates are applicable to various items of revenues and costs, the same should be explicitly incorporated in financial evaluation.

Better monitoring: While Project Monitoring and control is done reasonably during the implementation stage, it is done less effectively during the operational stages. This may be

because of lack of adequate personnel and should monitor the needs of a large number of projection and continuing basis. Given the importance of monitoring and control during the operational stage it may be necessary to

a) augment the manpower engaged in the task
b) computerize the monitoring routines
c) design check lists which focus sharply on critical areas
d) develop sound remedial measures to cope with sickness right in the incipient stage and
e) review the monitoring procedures periodically to strengthen them

Technical Review

The technical review done by the financial institution focuses mainly on the following aspects.

1. Project mix
2. Capacity
3. Process of manufacture
4. Engineering know-how and technical collaboration
5. Raw materials and consumables
6. Location and site
7. Building
8. Plant and equipments
9. Break-even point

The technical review is done by qualified and experienced personnel available in the institutions and/or outside experts (particularly where large and technologically sophisticated projects are involved).

Marketing Review

The importance of potential market and the need to develop a suitable marketing strategy cannot be over-emphasized. Hence efforts are made to:

1. Examine the reasonableness of demand projections by utilizing the findings of available surveys, industry association projections, planning commission/DGTD projections and independent market surveys (which may sometimes be commissioned).
2. Assess the adequacy of marketing arrangements in terms of promotional effort, distribution, network, transport, facilities, stock levels etc.
3. Judge the knowledge, experience and competence of key marketing personnel.

Marketing Review: In order to judge the managerial capability of the promoters, the following questions are raised.

1. How resourceful are the promoters?
2. How sound is the understanding of the project by the promoters?
3. How committed are the promoters?

Resourcefulness: This is judged in terms of the prior experience of the promoters the progress achieved in organizing various aspects of the project and the skill with which the project is presented.

Understanding: This is assessed in terms of the credibility of the project plan (this includes, inter alia, the organization structure, the estimated costs, the financing patterns, the assessment of various inputs and the marketing programme) and the details furnished to the financial institutions.

Commitment: This is gauged by the resources (financial, managerial, material and other) applied to the project and zeal with which the objectives of the project. Short-term as well as long-term and pursued.

Managerial review also involves an assessment of the caliber of the key technical and managerial personnel working on the project, the schedule for training them and the remuneration structure for rewarding and motivating them.

Economic Review

The economic review looks at the project from the large social point of view. The methodology adopted by the financial institutions for the purpose of economic evaluation is lebelled as "Partial little Mirrless" approach. In addition to the calculation of economic rate of return as per this approach, they also look into two other economic indicators viz.

Effective rate of protection and Domestic resource cost

The economic review done by the financial institutions is not very rigorous and sophisticated. Also the emphasis place on this review is rather limited. So, it is essential to give increased emphasis and improved methodology for vital aspect of project review.

Project Review by World Bank

The World Bank evaluation of project includes all the above factors. Additional special features which are covered by the World Bank in evaluation of the project are given below.

1. World Bank places considerable emphasis, particularly in the world countries, about the availability of infrastructure in the supporting facilities. While evaluating the projects they generally insist on complete arrangement of infrastructure facilities and commitments in this regard from the concerned.
2. Project management capabilities of the team in charge of the project are also one of the important considerations reviewed by the appraisal terms. They in fact go into the bio-data and the other details of the key persons and sometimes put conditions for a suitable persons to look after the aspects of the project where they feel that the management aspect is weak

3. Besides the technical feasibility of the project, the World Bank put some emphasis of the marketing arrangement and the marketing feasibility of the project. This is a fact that normally the project which is technically feasible would come up and start function ship but the marketing arrangements are major cause of failure of the projection case either there is no demand or the project is unable to compare with its competitors in market. The World Bank reviews the production capacities available in the marketing area. The marketing network proposed by the projects as well as marketing set-up is thoroughly reviews to ascertain the adequacy of marketing arrangements even at the stage of project appraisal.
4. The World Bank also reviews the working capital arrangement of the project in detail to ensure that the project has adequate arrangement of working capital for operation and does not lack working capital.
5. Other important aspects which the World Bank reviews are the economic analysis of the project. The project is not supported by the World Bank, if it does not have a proper economic rate of return, The economic analysis considers the benefits of the project not to the project corporation but to the nation as a whole. The project taken up by the World Bank for financing only in case the economic rate of return is favourable.

Requirements of Proper Review:

There are varied opinions about the requirements for adequate evaluation. So, the project can be evaluated under the following conditions. :

1. Clear statement of the goals and objectives
2. Agreed upon criteria for assessing objectives
3. Project targets are explicit and measurable
4. Intervention or treatment is explicit

Evaluating the project management of an organization

The soundness of the project management system of an organization may be evaluated in terms of the following criteria:

Results	Are the results of the capital budgeting system consistent with the goals of the organization?
Techniques	Are efficient techniques being employed for purposes of capital expenditure planning, decision making and control?
Communication	Are the premises underlying capital budgeting communicated to those who participate in this process?
Decentralization	Is there meaningful delegation and decentralization which permits decision making at appropriate levels?
Intelligibility	Are the policies, methods of analysis, and procedures understood by different segments of the orginisation which are involved in capital budgeting?
Flexibility	Does the system have sufficient flexibility respond to the dynamic changes in the environment and to permit variations in approaches for projects with differing characteristics?
Control	Are adequate control being exercised in the simple mentation phases to ensure that slippages are mitigated?
Review	Is there a systematic review of capital investments which permits meaningful feedback for improving the

system and its effectiveness?

UNIT – IV

RISK ANALYSIS

Risk may be defined as the variability which may likely to accrue in future between the estimated project returns and actual returns.

In investment appraisal, managers are concerned with evaluating the riskiness of a project's future cash flows. Here, they evaluate the chance that the cash flows will differ from expected cash flows, NPV will be negative or the IRR will be less than the cost of capital.

In the context of risk assessment, the decision-maker does not know exactly what the outcome will be but it is possible to assign probability weightage to the various potential outcomes. There are three different types of project risk to be considered:

1. Stand-alone risk: This is the risk of the project itself as measured in isolation from any effect it may have on the firm's overall corporate risk.

2. Corporate or within-firm risk: This is the total or overall risk of the firm when it is viewed as a collection or portfolio of investment projects.

3. Market or systematic risk: This defines the view taken from a well-diversified shareholders and investors. Market risk is essentially the stock market's assessment of a firm's risk, its beta, and this will affect its share price.

Due to practical difficulties of measuring corporate and market risk, the stand-alone risk has been accepted as a suitable substitute for corporate and market risk. There are following techniques one can use to deal with risk in investment appraisal.

STATISTICAL TECHNIQUES FOR RISK ANALYSIS:

(a) Probability Assignment

(b) Expected Net Present Value

(c) Standard Deviation

(d) Coefficient of Variation

(e) Probability Distribution Approach

(a) Probability Assignment: The concept of probability is fundamental to the use of the risk analysis techniques. It may be defined as the likelihood of occurrence of an event. If an event

is certain to occur, the probability of its occurrence is one but if an event is certain not to occur, the probability of its occurrence is zero. Thus, probability of all events to occur lies between zero and one.

Such probability assignments that reflect the state of belief of a person rather than the objective evidence of a large number of trials are called personal or subjective probabilities'.

(b) Expected Net Present Value: Once the probability assignments have been made to the future cash flows, the next step is to find out the expected net present value. It can be found out by multiplying the monetary values of the possible events by their probabilities. The following equation describes the expected net present value.

$$ENPV = \sum_{t=0}^{n} \frac{ENCF_t}{(1+k)^t}$$

Where, ENPV is the expected net present value, ENCFt expected net cash flows in period t and k is the discount rate. The expected net cash flow can be calculated as follows:

$$ENCFt = NCFjt \times Pjt$$

Where, NCFjt is net cash flow for jth event in period t and Pjt probability of net cash flow for jth event in period t.

(c) Standard Deviation: The assignment of probabilities and the calculation of the expected net present value include risk into the investment decision, but a better insight into the risk analysis of capital budgeting decision is possible by calculating standard deviation and coefficient of variation.

Standard deviation (σ) is an absolute measure of risk analysis and it can be used when projects under consideration are having same cash outlay. Statically, standard deviation is the square root of variance and variance measures the deviation about expected cash flow of each of the possible cash flows.

(d) Coefficient of Variation: If the projects to be compared involve different outlays/different expected value, the coefficient of variation is the correct choice, being a relative measure. It can be calculated using following formula:

$$CV = \frac{\text{Standard deviation}}{\text{Expected Value}} \quad \text{or} \quad \frac{\sigma}{CF}$$

(e) Probability Distribution Approach: The researcher has discussed the concept of probability for incorporating risk in capital budgeting proposals. The probability distribution of cash flows over time provides valuable information about the expected value of return and the dispersion of the probability distribution of possible returns which helps in taking accept-reject decision of the investment decision.

OTHER TECHNIQUES:

(a) Sensitivity Analysis

(b) Scenario Analysis

(c) Break Even Analysis

(d) Simulation Analysis

(e) Decision Tree Approach

(a) Sensitivity Analysis: While evaluating any capital budgeting project, there is a need to forecast cash flows. The forecasting of cash flows depends on sales forecast and costs. The sales revenue is a function of sales volume and unit selling price. Sales volume will depend on the market size and the firm's market share. The NPV and IRR of a project are determined by analyzing the after-tax cash flows arrived at by combining various variables of project cash flows, project life and discount rate.

The behavior of all these variables is very much uncertain. The sensitivity analysis helps in identifying how sensitive are the various estimated variables of the project. It shows how sensitive is project's NPV or IRR for a given change in particular variables. The more sensitive the NPV, the more critical is the variables.

Steps:

1. Identify the variables which can influence the project's NPV or IRR.
2. Define the underlying relationship between the variables.
3. Analyze the impact of the change in each of the variables on the project's NPV or IRR.

The Project's NPV or IRR can be computed under following three assumptions in sensitivity analysis -

- Pessimistic (i.e. the worst),
- Expected (i.e. the most likely)
- Optimistic (i.e. the best)

(b) Scenario Analysis: In sensitivity analysis, typically one variable is varied at a time. If variables are interrelated, as they are most likely to be, it is helpful to look at some plausible scenarios, each scenario representing a consistent combination of variables.

Procedure:

1. Select the factor around which scenarios will be built. The factor chosen must be the largest source of uncertainty for the success of the project. It may be the state of the economy or interest rate or technological development or response of the market.
2. Estimate the values of each of the variables in investment analysis (investment outlay, revenues, costs, project life, and so on) for each scenario.
3. Calculate the net present value and/or internal rate of return under each scenario.

Evaluation:

- Scenario analysis may be regarded as an improvement over sensitively analysis because it considers variations in several variables together.
- It is based on the assumption that there are few well-delineated scenarios. This may not be true in many cases. For example, the economy does not necessarily lie in three discrete states, viz., recession, stability, and boom. It can in fact be anywhere on the continuum between the extremes.
- Scenario analysis expands the concept of estimating the expected values. Thus in a case where there are 10 inputs the analyst has to estimate 30 expected values (3 x 10) to do the scenario analysis.

(c) Break-even Analysis: In sensitivity analysis one may ask what will happen to the project if sales decline or costs increase or something else happens. A financial manager will also be interested in knowing how much should be produced and sold at a minimum to ensure that the project does not 'lose money'. Such an exercise is called break even analysis and the

minimum quantity at which loss is avoided is called the break-even point. The breakeven point may be defined in accounting terms or financial terms.

(d) Simulation analysis:

Sensitivity analysis and Scenario analysis are quite useful to understand the uncertainty of the investment projects. But both the methods do not consider the interactions between variables. It differs from sensitivity analysis in the sense that instead of estimating a specific value for a key variable, a distribution of possible values for each variable is used.

The simulation model building process begins with the computer calculating a random value simultaneously for each variable identified for the model like market size, market growth rate, sales price, sales volume, variable costs, residual asset values, project life etc. From this set of random values a new series of cash flows is created and a new NPV is calculated. This process is repeated numerous times, perhaps as many as 1000 times or even more for very large projects, allowing a decision-maker to develop a probability distribution of project NPVs. From the distribution model, a mean (expected) NPV will be calculated and its associated standard deviation will be used to guage the project's level of risk. The distribution of possible outcome enables the decision-maker to view a continuum of possible outcomes rather than a single estimate.

Merits:

- It facilitates the analysis and appraisal of highly complex, multivariate investment proposals with the help of sophisticated computer packages.
- It can cope up with both independence and dependence amongst variables. It forces decision-makers to examine the relationship between variables.

Demerits:

- Simulation is not always appropriate or feasible for risk evaluation.
- The model requires accurate probability assessments of the key variables. E.g., it may be known that there is a correlation between sales price and volume sold, but specifying with mathematical accuracy the nature of relationship for model purposes may be difficult.
- Constructing simulated financial models can be time-consuming, costly and requires specialized skills.

- It focuses on a project's standalone risk. It ignores the impact of diversification, i.e., how a project's stand-alone risk will correlate with that of other projects.
- Simulation is inherently imprecise. It provides a rough approximation of the probability distribution of net present value.

(e) Decision-tree Approach: Sometimes cash flow is estimated under different managerial options with the help of decision-tree approach. A decision tree is a graphic presentation of the present decision with future events and decisions. The sequence of events is shown in a format that resembles the branches of a tree.

Steps in constructing decision tree:

1. The first step in constructing a decision tree is to define a proposal. It may be concerning either a new product or an old product entering a new market. It may also be an abandonment option or a continuation option, expansion option or no-expansion option, etc.
2. Second step is identifying various alternatives. For example, if a firm is launching a new product, it must chalk out the demand possibilities and on that basis it identifies different alternatives-whether to have a large factory or a medium-size or only a small plant. Each of the alternatives will have varying consequences on the cash flow.
3. The third step is to lay out the decision tree showing the different alternatives through different branches. And finally, the estimates of cash flow with probabilities in each branch are made. The results of the different branches are calculated that show desirability of a particular alternative over the others.

For example, a company is considering a new machine having estimated cash flows as follows. The machine is having a life of 2 years. The cost of machine is Rs. 60,000 and a company's required rate of return is 12%. If a company wants to use decision tree approach, recommend whether the machine should be bought or not.

Merits:

- Decision tree analysis gives the clarity of sequential investment decisions.
- It gives a decision maker to visualize assumptions and alternatives in graphic form which is easier to understand than the analytical form. It helps in eliminating the unprofitable branches and determines optimum decision at various decision points.

Demerits:

- The decision tree becomes more and more complicated if he includes more and more alternatives. It becomes more complicated if the analysis includes interdependent variables which are dependent on one another.
- It becomes very difficult to construct decision tree if the number of years expected life of the project and the number of possible outcomes for each year are large.

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