**CHAPTER FOUR: PROJECT PREPARATION**

**4.1. Markets and Demand Analysis**

 In most cases, the first step in project analysis is to estimate the potential size of the market for the product proposed to be manufactured( or service planned to be offered) and get an idea about the market share that is likely to be captured.

Put differently, market and demand analysis is concerned with two broad issues:

 -What is the likely aggregate demand for the product /service?

 -What share of the market will be proposed project enjoy?

These are very important, yet difficult, questions in project analysis. Intelligent and meaningful answers to them call for an in-depth study and assessment of various factors like patterns of consumption growth, income and elasticity of demand, composition of the market, nature of competition, availability of substitutes, reach of distribution channels etc.

* The key steps in such analysis are as follows:

 - Situational analysis and specification of objectives

 - Collection of secondary information

 - Conduct of market survey

 - Characterization of the market

 -Demand forecasting

 -Market planning

**Situation Analysis and Specification of Objectives**

* **Its purpose is**

 to generate enough data about the **key aspects** of the market without formal study

* **The aspects include:**

**Customers**: customer’s preferences & purchasing power **Competitors:** strategies & actions of competitors

**Middlemen:** practices of middlemen (Retailers, Wholesalers, Brokers and Commission men…)

* To carry out such a study it is necessary to **specify the objectives as clearly** and as **comprehensive** as possible.

If such situational analysis generates enough data to measure the market and get a reliable handle over projected demand and revenues, a formal study need not to be carried out, particularly when cost and time considerations so suggest.

In most cases, of course, a formal study of market and demand is warranted. To carry out such a study, it is necessary to spell out its objectives clearly and comprehensively. A helpful approach to spell out objectives is to structure them in the form of questions. Of course, in doing so, always bear in mind how the information generated will be relevant in forecasting the overall market demand and assessing the share of the market the project will capture.

* To illustrate, suppose that a small but technologically competent firm has developed an improved air cooler based on a new principle that appears to offer several advantages over the conventional air cooler.

The chief executive of the firm needs information about where and how to market the new air cooler. The objectives of market and demand analysis in this case may be to answer the following questions:

* Who are the buyers of air coolers?
* What is the total current demand for air coolers?
* How is the demand distributed temporally(pattern of sales over the year) and geographically?
* What is the break-up of demand for air coolers of different sizes?
* What price will the consumer be willing to pay for the improved air cooler?
* How can potential customers be convinced about the superiority of the new cooler?
* What price and warranty will ensure its acceptance?
* What channels of distribution are most suited for the air cooler?
* What are the prospects of immediate sales?

**Collection of Secondary Information**

In order to answer the question listed while delineating the objectives of the market study, information may be obtained from secondary and/ or primary sources.

Secondary information is information that has been gathered in some other context and is already available.

Primary information, on the other hand, represents information that is collected for the first time to meet the specific purpose on hand. Secondary information provides the base and the starting point for market and demand analysis.

It indicates what is known and often provides leads and cues for gathering primary information required for further analysis.

**Evaluation of secondary information**

* While secondary information is available economically and readily(provided the market analyst is able to locate it) its reliability, accuracy, and relevance for the purpose under consideration must be carefully examined. The market analyst should seek to know:
* Who gathered the information? What was the objective?
* When was the information gathered? When was it published?
* How representative was the period for which the information was gathered?
* Have the terms in the study been carefully and unambiguously defined?
* What was the target population?
* How was the sample chosen?
* How representative was the sample?
* How satisfactory was the process of information gathering ?
* What was the degree of sampling bias and non-response bias in the information gathered?
* What was the degree of misrepresentation by respondents?
* How accurately was the information edited, tabulated, and analyzed?
* Was statistical analysis properly analyzed?

**Conduct of Market Survey**

Secondary information, though useful, often does not provide a comprehensive basis for market and demand analysis. It needs to be supplemented with primary information gathered through a market survey, specific to the project being appraised.

The market survey may be a census survey or a sample survey. In a census survey the entire population is covered.

* The word population is used here in a particular sense. It refers to the totality of all units under consideration in a specific study.
* Census surveys are employed principally for intermediate goods and investment goods when such goods are used by a small number of firms.

In other cases, a census survey is prohibitively costly and may also be infeasible. For example, it would be inordinately expensive-nay, impossible- to cover every user of lifebuoy or every person in the income bracket $1000-$1500. Due to the above limitations of the census survey, the market survey, in practice, is typically a sample survey. In such a survey, a sample of the population is contacted/observed and relevant information is gathered.

* On the basis of such information, inferences about the population may be drawn.
* The information sought in a market survey may relate to one or more of the following:
* -Total demand and rate of growth of demand
* -Demand in different segments of the market
* -Income and price elasticity of demand
* -Motives of buying
* -Purchasing plans and intentions
* -Satisfaction with existing products
* -Unsatisfied needs
* -Attitudes towards various products

**Steps in sample survey**

Typically, a sample survey consists of the following steps:

1. **Define the target population:** In defining the target population the important terms should be carefully and unambiguously defined.

The target population may be divided in to various segments which may have differing characteristics. For example, all television owners may be divided in to three to four income brackets.

**2. Select the sampling scheme and sample size:** There are several sampling schemes : simple random sampling, cluster sampling, sequential sampling, stratified sampling, systematic sampling, and non-probability sampling.

3. **Develop the questionnaire:** The questionnaire is the principal instrument for eliciting information from the sample of respondents . The effectiveness of the questionnaire as a device for eliciting the desired information depends on its length, the type of questions, and the wording of questions.

4. **Recruit and train field investigators**

Recruiting and training of field investigators must be planned well since it can be time-consuming. Great care must be taken for recruiting the right kind of investigators and imparting the proper kind of training to them.

**5. Obtain information as per the questionnaire from the sample of respondents:**

Respondents may be interviewed personally, telephonically, or by mail for obtaining information. Personal interview ensures a high rate of response. They are, however, expensive and likely to result in biased responses because of the presence of the interviewer. Mail surveys are economical and evoke fairly candid responses. The response rate, however, is often low.

**6. Scrutinize the information gathered**

Information gathered should be thoroughly scrutinized to eliminate data which is internally inconsistent and which is of dubious validity. For example, a respondent with a high income and large family may say that he lives in one room tenement. Such information, probably inaccurate, should be deleted.

**7. Analyze and interpret the information**

Information gathered in the survey needs to be analyzed and interpreted with care and imagination. After tabulating it as per a plan of analysis, suitable statistical investigation may be conducted, wherever possible and necessary.

For the purpose of statistical analysis, a variety of methods are available. They may be divided in to two broad categories: Parametric and nonparametric methods.

Parametric methods assume that the variable or attribute under study conforms to some known distribution.

Nonparametric methods do not presuppose any particular distribution.

* It may be emphasized that the results of the market survey can be vitiated by:
* - Non representativeness of the sample
* -Imprecision and inadequacies of the questions
* -Deliberate distortion in the answers given by the respondents
* -Incorrect and inappropriate analysis and interpretation of data etc.

**Characteristics of the Market**

Based on the information gathered from secondary sources and through the market survey, the market for the product**/** service may be described in terms of the following.

* -Effective demand in the past and present
* -Breakdown of demand
* -Price
* -Methods of distribution and sales promotion
* -Consumers
* -Government policy

**Effective demand in the past and present**: To gauge the effective demand in the past and present, the starting point typically is apparent consumption which is defined as:

 Production+ imports-Exports- changes in stock level

The figure of apparent consumption has to be adjusted for consumption of the product by the producers and the effect of abnormal factors.

In a competitive market, effective demand and apparent consumption are equal. However, in most of the developing countries, where competitive markets do not exist for a variety of products due to exchange restrictions and controls on production and distribution, the figure of apparent consumption may have to be adjusted for market imperfections.

**Breakdown of demand**: To get a deeper insight in to the nature of demand, the aggregate(total) market demand may be broken in to demand for different segments of the market. Market segments may be defined by (i) nature of product, (ii) consumergroup, and (iii) geographical division.

* Nature of product: One generic name often subsumes many different products: steel cover sections, rolled products, and various semi-finished products; commercial vehicle cover trucks and buses of various capacities etc.
* Consumer groups: Consumers of a product may be divided in to industrial consumers and domestic consumers. Industrial consumers may be subdivided industry wise. Domestic consumers may be further divided in to different income groups.
* Geographical division: A geographical breakdown of consumers, particularly for products which have a small value-to-weight relationship and products which require regular, efficient after-sales service is helpful.

Why is segmental analysis required?

* Segmental information is helpful because the nature of demand tends to vary from one segment to another( the demand from consumers in high income brackets may not be sensitive to price variations whereas the demand from consumers in low income brackets may be very sensitive to price variations) and different marketing strategies may be appropriate to different market segments.

**Price**: Price statistics must be gathered along with statistics pertaining to physical quantities. It may be helpful to distinguish the following types of prices: (i) manufacturer’s price quoted as FOB(free on board) price or CIF(cost, insurance, and freight) price, (ii) landed price for imported goods, (iii) average wholesale price, and (iv)average retail price.

**Methods of distribution and sales promotion:** The method of distribution may vary with the nature of product. Capital goods, industrial raw materials or intermediates, and consumer products and tend to have differing distribution channels.

* Further, for a given product, distribution methods may vary. Likewise, methods used for sales promotion(advertising, discounts, gift schemes, etc) may vary from product to product.

**Consumers**: consumers may be categorized along two dimensions as follows:

**Demographical and sociological** **Attitudinal**

* - Age - Preferences
* -Sex - Intentions
* -Income -Habits
* -Profession - Attitudes
* -Residence - Responses
* -social background

**Supply and Competition**: It is necessary to know the existing sources of supply and whether they are foreign or domestic. For domestic sources of supply, information along the following lines may be gathered: location, present production capacity, planned expansion, capacity utilization, and cost structure.

* Competition from substitutes and near substitutes should also be specified.

**Government policy**: The role of government in influencing the demand and market for a product may be significant. Governmental plans, policies, and legislations which have a bearing on the market and demand of the product under examination should be spelt out. These are reflected in import and export trade controls, import duties, export incentives, sales tax, industrial licensing, and financial regulations.

**Demand Forecasting**

After gathering information about various aspects of the market and demand from primary and secondary sources, an attempt may be made to estimate future demand.

A wide range of forecasting methods is available to the market analyst. These may be divided in to three categories: Qualitative methods, time series projection methods, and causal methods.

* **Qualitative methods**: These methods rely essentially on the judgment of experts to translate qualitative information in to quantitative estimates. Qualitative forecasting methods include jury of executive, Delphi method etc.
* **Time series projection methods**: These methods generate forecasts on the basis of the historical time series. The important time series methods include trend projection method, exponential smoothing method, and moving average method.
* **Causal method**: More analytical than the preceding methods, causal methods seek to develop forecasts on the basis of cause-effect relationships specified in an explicit, quantitative manner.

**Market Planning**

* To enable the product to reach a desired level of market penetration, a suitable marketing plan should be developed. Broadly it should cover pricing, distribution, promotion, and service.
* Pricing: ex-factory price, taxes and duties applicable for the domestic price, trade margins/discounts, final price to the domestic customer, export price.
* Distribution: packaging, transportation arrangements, channel of distribution, role of distributors, wholesalers, and retailers
* Promotion: Branding, advertising, personal selling, promotional efforts
* Service: Installation, user education, warranties, after-sale service.

**4.2. Raw Materials and Supplies Study**

The different materials and inputs required for the operation of the plant are identified and described in this chapter, and their availability and supply, as well as the method of estimating the resulting operating costs, are analyzed and described.

There is a close relationship between the definition of input requirements and other aspects of project formulation, such as the definition of plant capacity, location and selection of technology and equipment, as these inevitably interact with one another.

* The selection of raw materials and supplies depends primarily on the technical requirements of the project and the analysis of supply markets.
* Important determinants for the selection of raw materials and factory supplies are environmental factors such as resource depletion and pollution concerns, as well as criteria related to project strategies, for example, the minimization of supply risks and of the cost of material inputs.

**A. Classification of raw materials and supplies**

**Raw materials(*unprocessed and semi-processed)***

* *Agricultural products:* If the basic material is an agricultural product, first the quality of the product must be identified.

If the project involves large quantities, the production of the agricultural input may have to be increased. This may require the extension of the area under cultivation and often the introduction of another crop.

* In the case of sugar cane, for example, it would be necessary to increase the area under cane cultivation within the same region, since cane cannot be transported over long distances without involving prohibitive transport costs, loss of sucrose content or both.

In order to estimate the supplies and availability of agricultural products, it may be necessary to collect data on past crops and their distribution by market segment, that is, by geographical area or end-use. Projects based on agricultural produce to be grown in the future may call for actual cultivation on experimental farms under varied conditions. The produce has then to be tested in laboratories and, if necessary, in pilot plants.

The laboratory facilities for pilot plants may not be available within developing countries. The samples, scientifically selected, may have to be sent to other countries where such facilities exist.

* *Livestock and forest products:* In most cases of livestock produce and forest resources, specific surveys are called for to establish the viability of an industrial project.

The general data may be obtained from official sources and from local authorities, but these are sufficient only for opportunity studies.

* *Marine products:* With regard to marine-based raw materials, the major problem is to assess the potential of availability, the yields and the cost of collection. The facilities required for marine operations have often to be provided for in the industrial project.

Availability of marine products may not only depend on ecological factors, but also on national policies and bilateral or multilateral agreements.

* *Mineral products:* For minerals(metallic and non-metallic including clays), detailed information on the proposed exploitable deposits is essential, and an industrial feasibility study of a project can only be legitimately based on proven reserves.

The study should give details of the viability of opencast or underground mining, the location, size, depth and quality of deposits, and the composition of the ore with other elements, that is, the impurities and the need for beneficiation.

***Processed industrial materials and components***

Processed industrial materials and goods constitute an expanding category of basic inputs for various industries in developing countries.

Such inputs can be generally classified under base metals, semi-processed materials relating to a wide variety of industries in different sectors, and manufactured parts, components and subassemblies for assembly-type industries, including a number of durable consumer goods and the engineering goods industry.

In all these cases, it is necessary to define requirements, availability and costs in some detail, to ensure that the specifications in the case of the two latter categories suit the production program envisaged for the project.

**Factory Supplies**

* *Auxiliary materials and utilities:* Apart from basic raw materials and processed industrial materials and components, all manufacturing projects require various auxiliary materials and utilities, usually subsumed as factory supplies.

It is not always easy to distinguish between auxiliary materials, such as chemicals, additives, packaging materials, paints and varnishes, and factory supplies, such as maintenance materials, oils, grease and cleaning materials, since these terms are often used interchangeably.

* However, the requirements of such auxiliary materials and supplies should be accounted for in the feasibility study.
* A detailed assessment of the utilities required (electricity, water, steam, compressed air, fuel, effluent disposal) can only be made after analysis and selection of location, technology and plant capacity, but a general assessment of these is a necessary part of the input study.

An estimate of utilities consumption is essential for identifying the existing sources of supply and any bottlenecks and shortages that exist or are likely to develop, so that appropriate measures can be taken to provide for either internal or external additional supplies in good time.

Such identification is particularly important since it may materially affect the investments to be made in the form of buildings, machinery and equipment and other installations, if such major utilities are in short supply in the plant and need to be provided internally.

**B. Specification of requirements**

In order to estimate the requirements of materials and supplies during the future operation of the plant, such requirements should be identified, analyzed and specified in the feasibility study, both quantitatively and qualitatively.

*Project characteristics and material inputs*

* For a given type of industry the envisaged technology can be capital- or labor-intensive, computerized or mechanized, complex or fairly simple.
* Machinery and equipment can likewise be of different types and sizes, manually or automatically operated and controlled, mechanized or electronic, driven by electricity or steam.

*Requirements of raw materials and factory supplies*

* The requirements of raw materials and factory supplies can be expressed in different ways that supplement each other. The overall objective should be to describe and analyze features and characteristics in such a way that a good understanding of what the project requires, is developed.
* This will form the basis for the supply program and the subsequent cost estimates. The specification of requirements described below might form a useful check-list.
* *User demands:* Users of the produced finished goods have expectations and demands that will have consequences not only for the choice of technology, machinery and equipment, but also for the materials and inputs used.
* It is therefore helpful to identify and describe such demands and try to analyze the effects on input requirements.
* *Quantities required:* In order to allow greater flexibility in the conduct of the study(for example, sensitivity analysis of variations in assumptions and input data), the quantities required can be expressed in many ways.
* *Qualitative properties:* The type of analysis required to identify thecharacteristics of materials and inputs depends on the nature of the inputs and their usage in the particular project.

**C. Availability and supply**

A feasibility study must show how the materials and inputs required will be provided. General availability, data about materials, potential users and supply sources and programs will have to be analyzed and described.

The interdependencies between project design, material and input requirements and supply of these items should be considered. This means that machinery, equipment, production process, capacity etc. may have to be revised if inputs with the specified characteristics and quantities cannot be provided as required.

* At the initial stage of the study the quantities of basic material inputs that may be required should be assessed principally for the purpose of determining availability and sources for immediate and long-term needs.
* A final assessment of input requirements can be made only after the plant capacity as well as the technology and equipment to be used are defined.

If a basic input is available within a country, its location and the area of supplies, whether concentrated or dispersed, should be determined.

 The alternative uses likely to be made of such materials, and the consequent impact on availability, should be assessed for the project in question.

* For example, natural gas may be available in a remote area where it is economic to use it for the generation of electricity in the absence of other demands.
* The question of transportability and transport costs should be carefully analyzed.
* The distance over which basic material inputs have to be transported and the available and potential means of transport should be defined together with possible bottlenecks.
* When the basic material has to be imported, either in whole or in part, the implications of such imports should be fully assessed. First, the sources of imported inputs have to be determined.
* Secondly, the uncertainty that may relate to imported inputs should be stated. There have been cases where projects have been set up in developing countries based on imported raw materials from particular sources that have then ceased to produce the material in question.
* Thirdly, the implications of domestic production of a basic material that was being imported should be analyzed.
* In most developing countries, such production is accompanied by import control and user industries have to adjust to domestic supplies of basic materials. This may involve adjustments to the quality, specifications and price of such materials.

**D. Supply marketing and supply program**

* An enterprise acts as a buyer on supply markets when purchasing required raw materials and factory supplies.
* Here, relations with the suppliers will have to be established and developed, with bargaining power playing a possible key role, especially when capital goods are purchased or in the case of long term supply contracts.
* Supply marketing must be planned for the initial purchases for a plant erection but also for the continuous operation of a plant.
* ***Supply marketing****:* The objectives of supply marketing are basically cost minimization, risk minimization(reliability of supplies) and the cultivation of relations with supplier.
* *Supply program:* The overall purpose of the outline of a supply program in the feasibility study is to show how supplies of materials and inputs will be secured.
* Cost estimates should be based on the supply program presented.

A supply program should deal with the following:

 - Identification of supplying sources and suppliers

 - Agreements and regulations

 -Quantities and qualities

 -Consignments

 -Means of transport

 -Storage

 - Risk assessment

* In the identification of a particular key supplier, consideration should be given to its geographic location, ownership, main activities, financial strength and profitability, production capacity, output over the last years, key customers and business experience with the type of products and the country concerned.

**E. Costs of raw materials and supplies**

* **Unit costs**
* Not only the availability but also the unit cost of basic materials and factory supplies have to be analyzed in detail, as this is a critical factor for determining project economies.
* In the case of domestic materials, current prices have to be viewed in the context of past trends and future projections of the elasticity of supply.
* For domestic inputs the costs of alternative means of transport should also be considered.
* For imported material inputs, c.i.f. prices (including costs, insurance and freight) should invariably be adopted together with clearing charges (including loading and unloading), port charges, tariffs, local insurance and taxes, and costs of internal transport to the plant.
* **Annual costs**
* Estimates of annual operating costs for materials and supplies should be made. Cost estimates are to be divided into foreign and local currency components. The currencies most likely to be used and the exchange rates applied for the cost estimates should be identified.
* It should be made clear whether the cost estimates refer to a hypothetical level of production at full capacity utilization during the operation phase, or to the first year (or some other year) of operation according to the time schedule for project implementation.
* Some costs vary with the production level of the plant in question, while others are more or less fixed. For example, the normal tariff for electricity is divided into an annual fixed fee and a consumption fee per kilowatt-hour.
* Taking into account expected variations in the production level of the proposed plant, it is advisable to divide cost items into variable and fixed costs.
* **Overhead costs of supplies:**
* When estimating material and input requirements by project components, the project planner has to plan not only at the level of production cost centres, but also at the level of service, administration and sales cost centres.

**4.5 Location, Site and Environmental Impact Assessment**

4.5.1. **Location**

* Location analysis has to identify locations suitable for the industrial project under consideration.
* Traditional approach to industrial location focused, on the proximity of raw materials and market place, mainly with the intention of minimizing transport costs. However, the modern view requires consideration of not only commercial, technical and financial factors, but also of the social and environmental impact a project might have.
* A project potentially located in a number of alternative regions (several alternative locations may have to be considered).
* The choice of location is influenced by a variety of considerations:
	+ Proximity to raw materials and markets
	+ Availability of infrastructure
	+ Availability of labor (especially for labor-intensive projects)
	+ Technological and process characteristics
	+ Government policies, and
	+ Other factors like climatic conditions, ease in coping with pollution, general living conditions, etc.
* In terms of a basic location model, the ***optimum*** ***location*** is one where the total cost viz., transportation cost, production cost and distribution costs is minimized. This generally implies that:

 (i) Projects based largely on imported material may need to be located at ports or near terminals.

 (ii) A project producing ***perishable products*** or ***agro-processing industries*** are market oriented and it is advantageous to locate such production near the major consumption centers.

 (iii) A resource-based projects like ***a cement plant*** or ***a steel mill*** should be located close to the source of basic material.

 (iv) Petroleum products and pharmaceutical can be located at source or near consumption centers or even at some intermediation point.

* As far as financial feasibility of alternative locations is concerned, the following data-as well as related financial risks, should be assessed.
	+ Production costs (including environmental protection costs)
	+ Marketing costs
	+ Investment costs
	+ Revenues
	+ Taxes, subsidies, grant and allowance
	+ Net cash flows

**4. 5.2 Site Selection**

Once the location is decided upon, a specific project site alternative should be defined in the feasibility study. This will require evaluation of the characteristics of each site.

* When selecting sites within the selected location, the following requirements and conditions are to be assessed:-
	+ Ecological conditions on site (soil, site hazards, climate etc)
	+ Environment impact (restrictions, standards, guidelines)
	+ Socio-economic conditions (restrictions, incentives, requirements)
	+ Local infrastructure at site location (existing industrial infrastructure, economic and social infrastructure, availability of critical project inputs such as labor and factory supplies)
	+ Strategic aspects (corporate strategies regarding possible future extension, supply and marketing polices
	+ Cost of land
	+ Site preparation and development requirements and costs.
* Topography, altitude and climate may be important for a project as well as access to water, electric power, roads and railways transport.
* Recruitment of managerial staff and labor may be a critical factor for the viability of the project. Development of housing, schools, medical and social center is necessary to attract the required staff and labor force.

**NB:** Plant location and site selection can be undertaken simultaneously.

**4.5.3 Environmental Impact Assessment**

Is designed to develop an understanding of the environmental consequences of newly planned or existing projects and of any project related activities.

EIA is part of project planning process. Environmental benefits or costs are usually externalities or side effects that affect the society in whole or in part.

**4.6 .Production Program and Plant Capacity**

The production program, range and volume of products to be produced depend on the market requirements, proposed marketing strategy and the availability of resources. A production program should define the levels of output to be achieved during specified periods related to the sales forecast.

* Full production level may not be possible during initial production operation owing to various technological, production and commercial difficulties in addition to marketing bottlenecks. Normally a production and sales target of 40-50 percent of the capacity for the first year is considered reasonable. Picking up gradually, towards third or fourth year full production level can be achieved.
* With regards to plant capacity, generally two capacity terms used in relation to level of operation.
1. **A feasible normal capacity (FNC)** – refers to the capacity achievable under normal working conditions considering the technical conditions of the plant, normal stoppages, downtime for maintenance & tool changes, holiday’s, shift pattern and management system applied.
2. **A nominal maximum capacity(NMC)**– is the technically feasible capacity that corresponds to the installed capacity as guaranteed by the supplier of the plant.

**4.7 Technology Selection**

* Appropriate technology selection should be made.
* The advocates of appropriate technology urge that the technology should be evaluated in terms of the following questions:
	+ - Whether the technology utilizes local raw materials?
		- Whether the technology utilizes local manpower?
		- Whether the technology protects ecological balance?
		- Whether the goods and services produced satisfy to the basic needs?
* While selecting the best technologies for the proposed project, the following factors must also be given due attention:
	+ Technological impact on the environment: The technology that we are going to select should not only the one that *minimizes pollution*, but should also *preserve the natural resources* and *saves renewable resources*.
	+ Careful evaluation and assessment of hazardous technologies and the use of toxic materials at different stages of production should be made.
	+ Introduction of obsolete technologies must also be carefully considered. Acquisition of previously discarded and disassembled production plants should be rechecked carefully.

**4.8 Organization and Human Resource**

* A division of the Company into organizational units, in line with the marketing, supply, production and administrative functions is necessary for efficient management of operations and designing a proper organizational structure in accordance with the corporate strategies and policies.
* The recommended organization will depend on the social environment as well as techno-economic necessities. The organizational set-up depends to a large extent on the industrial, enterprise, strategies, polices and values of those in power in the organization.
* A design of the organization usually includes the following steps:
	+ Goals and objectives of the business are stated
	+ Then functions are identified
	+ Functions are grouped or related
	+ Organizations structure or framework designed
	+ All key jobs are analyzed, designed, and described
	+ A recruitment and training program prepared.
* The two reasons for preparing an organization:-
	1. To achieve optimal coordination and control on all project inputs.
	2. To structure the investment and production costs and to determine the costs linked with corresponding organizational units.

**4. 8.1 Organizational Structure**

* Usually the organization structure is designed primarily in line with the different functions. Such as finance, marketing, production and purchasing. However, there is no unique organizational pattern.

**4.8.2 Human Resource**

The successful implementation and operation of industrial projects need different categories of human resources. Example, management, supervisory staff and workers- with sufficient skill and experience.

* The following factors should be given due consideration when the availability and employment of human resources are analyzed:-
	+ The general availability of relevant human resource categories in the country and the project region.
	+ The supply and demand situation in the project region
	+ Recruitment policy and methods
	+ Training policy and program

**NB.** Difficulties in the recruitment of key personnel (such as Managers, supervisors and skilled labor) can be dealt with, in different ways:-

* 1. Recruitment is combined with intensive training of key personnel in order to meet quality requirements.
	2. Foreign expertise is recruited.

**4.9 Financial and Economic Analysis:**

Since reliable cost estimates are fundamental to the appraisal of an investment project it is necessary to check carefully all cost items that could have a significant impact on financial feasibility.

From a financial and economic point of view, investment can be defined as a long-term commitment of economic resources made with the objective of producing and obtaining net gains (exceeding the total initial investment) in the future.

The main aspect of this commitment is the transformation of financial resources(that is, the investor's own and borrowed funds) into productive assets, represented by fixed investment and net working capital.

**4.9.1 Scope and objectives of financial analysis**

A feasibility study, as mentioned earlier, is a tool for providing potential investors, promoters and financiers with the information required to decide whether to undertake an investment, and whether and how to finance such a project.

* The scope and objectives of financial analysis are determined to a great extent by the definition of what investment is.

**Investment** may be defined as a long-term commitment of economic resources made with the objective of producing and obtaining net gains in the future.

* The main aspect of this commitment is the transformation of liquidity-the investor's own and borrowed funds-into productive assets, represented by fixed investment and net working capital, as well as the generation of liquidity again during the use of these assets.

Financial analysis and final project appraisal involves the assessment, analysis and evaluation of the required project inputs, the outputs to be produced and the future net benefits, expressed in financial terms.

Project financing includes the design of a proper financial structure, considering the conditions under which funds would be available, and the optimization of project financing from the point of view of the enterprise and the investors..

**4.9.2 Initial investment cost**

* Initial investment costs are defined as the sum of fixed assets (fixed investment costs plus pre-production expenditures) and net working capital, with fixed assets constituting the resources required for constructing and equipping an investment project, and net working capital corresponding to the resources needed to operate the project totally or partially.
* It is the amount required to start a business or a project. It is also called initial investment outlay or simply initial outlay.
* At the pre-investment stage, two mistakes are frequently made. Most commonly, working capital is included either not at all or in insufficient amounts, thus causing serious liquidity problems for the nascent project.

The amount of total investment costs is, in fact, smaller than total assets, since it is composed of fixed assets and net working capital, the latter being the difference between current assets and current liabilities.

**4.9.3. Production costs**

It is essential to make realistic forecasts of production or manufacturing costs for a project proposal in order to determine the future viability of the project. One of the major deficiencies encountered in pre-investment studies is the inaccuracy of production cost estimates.

This frequently leads to unexpected losses which, if reinforced by low capacity utilization caused by wrong sales forecasts, may quickly push a nascent establishment out of operation.

The analysis of cost structures and identification of critical cost items, as well as critical comparisons with similar projects, are proper means of improving the reliability and accuracy of cost projections and predictions of the financial feasibility of an investment.

Production costs should be calculated as total annual costs and preferably also as cost per unit produced(unit costs). Often pre-investment studies deal only with overall production costs, which should then be broken down at least into the main cost items(raw materials, factory supplies, personnel, overheads etc.).

* Given the estimated production, the cost of production may be worked out. The major components of cost of production are:

 - Material cost

 -Utilities cost

 - Labor cost

 - Factory overhead cost

**A. Material cost**

The most important element of cost, the material cost comprises the cost of raw materials, chemicals, components, and consumable stores required for production.

It is a function of the quantities in which these materials are required and the prices payable for them.

* Utilities
* Utilities consists of power, water, and fuel. The requirements of power, water, and fuel may be determined on the basis of norms specified by the collaborators, consultants, etc. or the consumption standards in the industry, whichever is higher.

**B. Labor cost**

Labor cost is the cost of all manpower employed in the factory. Labor cost naturally is a function of the number of employees and the rate of remuneration. The requirement of workers depends on the number of operators/helpers required for operating various machines and manning various services.

In estimating remuneration rates, the prevailing rates in the industry /area should be taken in to account.

* The remuneration should include, besides basic salary, dearness allowance, house rent allowance, conveyance allowance, medical reimbursement, leave travel concession, provident fund contribution, and bonus payments.
* In addition, account should be taken of vacations, overtime work, night work, work on holidays etc.

**C. Factory Overheads**

The expenses on repairs and maintenance, rent, taxes, insurance, on factory assests, and so on are collectively referred to as factory overheads. Repairs and maintenance expenses depends on the state of the machinery–this expense tend to be lower in the initial years and higher in the later years.

* A provision should be made for meeting miscellaneous factory expenses. In addition, a contingency margin may be provided on the items of factory overheads.

**4.9.4. Marketing costs**

Marketing costs comprise the costs for all marketing activities and may be divided into direct marketing costs for each product or product group, such as packaging and storage (if not included in the production costs), sales costs (salespersons, commissions, discounts, returned products, royalties, product advertisements etc.), transport, interim storage(if required) and distribution costs, indirect marketing costs, such as overhead costs of the marketing department(personnel, materials and communications, market research, public relations and promotional activities not directly related to a product or product group etc.).

* The analysis of these costs involves their assignment to various costing groups such as territories, certain classes of customers (wholesalers, retailers, governmental institutions etc.), and products or product groups.
* The analysis of marketing costs together with direct costing can be a very useful instrument for evaluating a marketing mix and for determining an optimal production program and product mix.

**4.9.5 Projected cash flow statement**

The cash flow statement shows the movement of cash in to and out of the firm and its net impact on the cash balance with the firm.

Investment has been defined as a long-term commitment of economic resources made with the objective of producing and obtaining net gains in the future.

The conventional methods of investment appraisal, which will be discussed later, basically evaluate the expected net profit (sales income less costs and income taxes) against the capital invested.

* For the purpose of investment appraisal it is, however, necessary to assess and evaluate over a certain period all inputs required and all outputs produced by the project.
* Balance sheets is, however, not sufficient for this purpose, and therefore the discounted cash-flow concept has become the generally accepted method for investment appraisal.
* Similarly, the cash-flow concept is needed for planning of the flow of financial means, in other words, of the sources and application of funds.
* Cash flows are basically either receipts of cash (cash inflows) or payments (cash outflows).
* For the purpose of financial planning and the determination of the net cash returns of an investment, it is necessary to distinguish between financial flows, which are related to the financing of an investment, and cash flows (expenditures and revenues) representing the performance or operation of the project (operational cash flows).

**4.9.6 Project Selection**

The selection of the right project for future investment is a crucial decision for the long term survival of your company. The selection of the wrong project may well precipitate project failure leading to the company liquidation.

Project selection is making a commitment for the future. The execution of a project will tie up company resources, and as an opportunity cost the selection of one project may preclude your company from pursuing another project.

We live in a world of finite resources and therefore can not carry all the projects we may want or need. Therefore, a process is required to select and rank projects on the basis of beneficial change to your company.

**4.9.6. Project Selection Models**

* A numeric model is usually financially focused and quantifies the project in terms of either time to repay the investment(payback) or return on investment .
* While non-numeric models look at a much wider view of the project considering items from market share to environmental issues.

The numeric selection models include:

**4.9.6.1 Net Present Value(NPV)**

Net present value may be defined as the summation of the present value of the cash inflows minus present value of cash outflows.NPV compares the value of money today to the value of that same money in future, taking inflation and returns into account.

* This method uses the discounted cash flows of a project to determine whether the rate of return on that project is equal to, higher than or lower than the desired rate of return.

It is defined as the value obtained by discounting the difference of all annual cash outflows and inflows occurring throughout the life of a project, calculated for each year at a fixed interest rate.



* + - Where; Ct = cash flow at the end of period t
		- *K* = required rate of return
		- *n* = useful life of project
			* *Io* = initial cost of project
* NPV = **PV** of cash flow – **PV** of initial cost
* **NPV = PV inflows - Cost**

**Decision criterion:** The decision rule for a project under NPV is to accept the project if the NPV is positive and reject if it is negative or:

a. Net Present Value > Zero = Accept

b. Net Present Value < Zero = Reject

* In case of ranking mutually exclusive projects the project proposal with highest positive NPV is given the top priority. It may be noted that this method gives valid results only if money can be immediately reinvested at the chosen rate of interest.

**Illustration:**

* A firm is considering investing in a project which costs 6,000 Br and has the following cash flows

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year  | 1  | 2  | 3  | 4  |
| Cash flow  | 1500  | 3000  | 2000  | 2500  |

The cost of capital is 10% and the project has no salvage value. Using the NPV method advise the firm on whether to invest in the project.

|  |  |  |  |
| --- | --- | --- | --- |
| **Year**  | **Cash Flow**  | **PVIF(10%)**  | **PV**  |
| **1**  | **1500**  | **0.9091**  | **1363.65**  |
| **2**  | **3000**  | **0.8264**  | **2479.20**  |
| **3**  | **2000**  | **0.7513**  | **1502.60**  |
| **4**  | **2500**  | **0.6830**  | **1707.50**  |
|  | **Total PV**  | **7053.00**  |
| **Less Project Costs**  | **(6000.00)**  |
| **NPV =**  | **1053.00**  |

**4.9.6.2. Internal Rate Of Return (IRR)**

The rate at which the total of discounted cash inflows equates with the total of discounted cash outflows is known as internal rate of return. IRR is probably the most sophisticated project budgeting technique. This is the rate at which NPV of investment is zero.

* Thus it depends on cash inflows and outflows of the project or it can be said that this rate is not decided by the management (predetermined rate).The IRR analysis is a measure of the return on investment, therefore, select the project with the highest IRR.
* Internal rate of return is used to evaluate the attractiveness of a project or investment.
* This allows the manager to compare IRR with the current interest rates. One of the limitations with IRR is that it uses the same interest rate through out the project, therefore as the project’s duration extends this limitation will become more significant.

 **Where; R = IRR**

**Decision criterion**:

* If IRR > cost of capital, we accept the project.
* If IRR < cost of capital, we reject the project,
* If IRR = cost of capital, indifferent.

*Steps in the IRR trial and error calculation method*

* It should be noted that IRR is computed using a trial and error method.
* However, financial calculators are programmed to compute IRR
* Compute the NPV of the project using an arbitrary selected discount rate.
* If the NPV so computed is positive then try a higher rate and if negative try a lower rate.
* Continue this process until the NPV of the project is equal to zero
* Use linear interpolation to determine the exact rate
* **Illustration:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year**  | **0**  | **1**  | **2**  | **3**  | **4**  |
| CFs  | $(100,000)  | 30,000  | 30,000  | 40,000  | 45,000  |

* The IRR is the value of ***r***which satisfies the following equation:

 30,000 + 30,000 + 40,000 + 45,000

 (1+r)1 (1+r)2 (1+r)3  (1+r)4

* The calculation of ***r*** involves a process of trial and error. We try different values or ***r*** till we find that the right-hand side of the above equation is equal to $100,000. Let us, to begin with, try ***r=15%.*** This makes the right-hand side equal to:

 30,000 + 30,000 + 40,000 + 45,000 = 100,802

 (1.15)1 (1.15)2 (1.15)3 (1.15)4

* + This value is slightly higher than our target value

 $100,000. So we must increase the value of ***r*** from **15% to 16%.** (In general a higher ***r*** lowers and a smaller ***r*** increases the right hand side value).

* + The right hand side becomes:

 30,000 + 30,000 + 40,000 + 45,000 = 98,641

 (1.16)1 (1.16)2 (1.16)3 (1.16)4

* Since this value is now less than $100,000 we conclude that the value of ***r*** **lies between 15% and 16%.** For most of the purposes this indication is sufficient, but if a more refined estimate of ***r*** is needed, use the following procedures.

1. Determine the NPV of the two closest rates of return

 (NPV/15%) = **-** 802

 (NPV/16%) = **+** 1,359

2. Find the sum of the absolute values of the NPVs obtained in step 1

 802 + 1,359 = 2,161

3. Calculate the ratio of the NPV of the smaller discount rate, identified in step 1, to the sum obtained in step 2.

 **802/2,161= 0.37**

 15+0.37 = **15.37 Percent**

* The IRR, calculated in this manner, is a very close approximation to the true internal rate of return.
* The decision rule for IRR is as follows:

 **ACCEPT**: if the IRR is greater than the cost of capital

 **REJECT**: if the IRR is less than the cost of capital

**4.9.6.3 Profitability Index Or Benefit Cost Ratio (BCR)**

Net present value method cannot be used for those project proposals whose amount of investment differs. To overcome this problem, the profitability index is calculated.

* Profitability index is the relationship between present value of cash inflows and present value of cash outflows. This ratio is an indicator of the profitability of the project and hence it is known as profitability index. It can be calculated by using the following formula:
* Profitability Index = Present Value of Cash Inflows

 Present Value of Cash Outflows

**Decision Criterion**: Under this method, an investment proposal may be accepted whenthe profitability index exceeds one and rejected of the PI is less than one. In case of ranking of mutually exclusive projects, the project proposal with highest positive profitability index will be given top priority.

* **Illustration: A project has the following cash flows**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year**  | **1**  | **2**  | **3**  | **4**  |
| **Cash Flow**  | **300**  | **400**  | **700**  | **900**  |

* **If the required rate of return is 9% and the project initial cost is 1500 Br, calculate the PI of the project and advice if the project is acceptable**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year**  | **Cash Flow**  | **PVIF (9%)**  | **PV**  |
| **1**  | **300**  | **0.9174**  | **275.52**  |
| **2**  | **400**  | **0.8417**  | **336.68**  |
| **3**  | **700**  | **0.7722**  | **540.54**  |
| **4**  | **900**  | **0.7084**  | **637.46**  |
|  |  | **Total PV =**  | **1790**  |

* **Decision:** The project is acceptable since PI > 0

**Net Present Value Vs Profitability Index**

* Profitability index is similar to Net Present Value approach. Both NPV and PI will give the same decision as regards the accept reject decision (for same initial investment proposals).
* The only difference is that NPV is an absolute measure of a project’s acceptability(discriminate between the projects having large outlays and projects having small outlays) whereas; profitability index is a relative measure. So, a decision may differ in case of evaluation of mutually exclusive proposals.
* For example if the present value of cash inflows Project A Rs. 30,000, Project B Rs. 15,000. Initial investment in Project A Rs. 15,000, in Project B Rs. 6,000, according to net present value method project A will be selected because its NPV is more than the NPV of project B. But, as per PI method project B will be preferred as its profitability index 2.5 is higher than that of project A 2.
* Similarly if the present value of cash inflows of project A and project B are 120,000 and 100,000 respectively. Initial investment in project A and project B are 100,000 and 80,000 respectively.
* According to NPV method both the projects are alike whereas profitability index of project B is more than that of project A.

**4.9.6.4. . Payback Period(PBP)**

The payback period is the time taken to gain a financial return equal to the original investment.

* In other words, the payback period is defined as the number of years required to recover the investment in a project. It recognizes that recovery of the original investment in the shortest period is an important element while appraising capital expenditure decisions.
* The time period is usually expressed in years and months. To calculate the payback period, simply work out how long it will take to recover the initial outlay.
* The payback period is the most widely used project selection calculation, even if this is an initial filter. Its main strength is that it is simple and quick.

**Decision criterion:** A project will be accepted, if the payback period calculated is lessthan its economic life or the maximum period set by the management.

* In case of alternative projects, different projects may be ranked in order of payback period- the shorter the period the higher the ranking. The project with the shortest payback period will be selected in case of two mutually exclusive projects.
* Example 1
* If a project has an investment of Br. 60,000 and annual cash inflow is Br. 15,000 per year for 10 years. Compute the PBP?

PBP = 60,000/15000= 4 years

* Example 2
* If the project cash inflow is not in “annuity form”, cumulative cash inflow method may be used to compute that PBP. Assuming an initial investment of Br. 30,000 for the following stream of cash flows and compute the PBP.

|  |  |  |
| --- | --- | --- |
| **Year**  | **Cash inflows**  | **Cumulative**  |
| 1  | 10,000  | 10,000  |
| 2  | 8,000  | 18,000  |
| 3  | 12,000  | 30,000  |
| 4  | 7,000  | 37,000  |
| 5  | 9,000  | 46,000  |
| 6  | 3,000  | 49,000  |

Hence, PBR, is 3 years

**4.9.6..5. Accounting Rate Of Return (ARR)**

The yearly after tax income as a percentage of investment is known as accounting rate of return. It is based on accounting concept of return on investment. Under this method, average annual profit(after tax) is expressed as percentage of investment to measure the profitability of the investment proposal.

* It is also known as unadjusted rate of return, since it does not take into account the time value of money. There is no unanimity regarding the definition of the rate of return.
* **ARR= Average income x 100 or Average Income**

 **Average investment Total Investment**

**Decision criterion:** A minimum rate of return is pre-determined and the projectsyielding lower returns are rejected. This pre decided rate is known as cut off rate.

* In case of various alternative projects, their ranking is done as per the ARR of each project. The project with the highest ARR will have the top priority while the project with the lowest ARR will be assigned lowest priority.
* Obviously, projects having higher ARR would be preferred to projects which have lower ARR.
* NB: Payback period method and accounting rate of return method are called traditional methods of project appraisal or ‘unadjusted time methods’, because these methods basically ignore the time value of money.

An investment of $600,000 is expected to give returns as follows:

* Year 1 ($50,000),
* Year 2 ($150,000),
* Year 3 ($80,000), and
* Year 4 ($20,000).

Calculate the average rate of return.

Total returns over the four years

 = 50,000 + 150,000 + 80,000 + 20,000 = $300,000

* Average returns per annum =
	+ 300,000 / 4 = $75,000
* ARR = 75,000 / 600,000 = 12.5%