

UNIT – I

PROJECT - INTRODUCTION

Objectives of the Lesson:

After going through this unit, you may be able to

- Define a Project
- Explain in detail the classification of Projects, Sub - projects

Structure of the Lesson:

- 1.0 Introduction
- 1.1 Features of a Project
- 1.2 Operation and Project – Similarities
- 1.3 Operations and Projects – Comparison
- 1.4 Key Considerations in a Project
- 1.5 Classification of Projects, Sub-Projects
 - 1.5.1 Types of Projects
 - 1.5.2 Sub-projects

1.0 Introduction

Organizations perform work continuously. These works include operations or projects though some works may overlap with each other. For the organizations, projects are important elements of change. They are considered to be the leading edge of change in organizations. A project consists of a combination of organizational resources pulled together to create something that did not previously exist and that will provide a performance capability in the design and execution of organizational strategies. Projects are conceptualized, designed, engineered and produced (or constructed); something is created that did not previously exist. An organizational strategy has been executed to facilitate the support of ongoing organizational life. Projects therefore support the ongoing activities of a going concern. For example,

- An R&D project bridges the gap from an existing technology to a future technology.
- A new factory adds to the manufacturing capability.
- A new building contributes to the infrastructure of the city.
- A new highway improves transportation systems.
- A canal provides a waterway over land.
- A pipeline moves oil, gas, or water.
- A new house improves the living standards of a family.

Hence we can define a project as temporary endeavor to create a unique product or service. - Project Management Body of Knowledge (**PMOK**)

Some more definitions are –

Newman et al. defined a project and described its value as simply a cluster of activities that is relatively separate and clear-cut. Building a plant, designing a new package are examples.

It is "any undertaking that has definite, final objectives representing specified values to be used in the satisfaction of some need or desire." **(Ralph Currier Davis)**

1.1 Features of a Project

- A clear termination point (temporary).
- Might be part of a broader program.
- A distinct mission (unique).
- The main virtue of a project involves in identification of a nice, neat work package within a bewildering array of objectives, alternatives, and activities.
- Mostly used as a means of implementing strategy.
- Progressively elaborated i.e. scope and details of the projects evolve as one undertakes the project even though distinguishing features of the project are stated initially.

1.2 Operation and Project - Similarities

- Planned, executed and controlled
- Performed by people
- Limited resources

1.3 Operations and Projects - Comparison

- Operations are repetitive (not unique)
- Operations are ongoing (not temporary)

1.4 Key Considerations in a Project

- a) How much will it **cost**?
- b) What is the **time** required?
- c) What **technical performance** capability will it provide?
- d) To what extent will the project results **fit into the design** and execution of organizational strategies?

1.5 Classification of Projects, Sub-Projects

A detailed study of different types of projects with reference to sequence of stages or processes used in each case would provide us an idea to use project management in a most effective manner. The success of a project-based organization lies in managing a portfolio of projects. In this regard the study of criteria for selection of projects is needed.

1.5.1 Types of Projects

One of the methods to classify projects is:

1. Open project or 'Walking in the fog'
2. Semi-open project or 'Making movies'
3. Closed project or 'Painting by numbers'
4. Semi-closed project or 'Going on a quest'

1. Open Project or "walking in the fog"

Strict control over costs and on time-scale is important. Projects may not achieve anything as in semi-closed project. Neither is it known what to do nor

how to do it. But the project can be altered and act differently. Usually these are reactions to change in certain circumstances like political, competitive).

A lot of quest and speed is required in projects. Not all the projects are closed projects with definite mission. However as the projects passes through phases of a life cycle they usually change from '*Fog*' to '*Paint by Numbers*'. It is up to the leader to decide whether he has to stop at a particular phase for lack of objectives or means; there are no rules to be followed in a project as long as the benefit is achieved.

2. Semi-open Project or "making movies"

In this type, commitment to use of method adopted becomes essential. It can be known *how to* do something but *what is to be* to achieve is unknown. The organization might have expertise and capability but are looking for ways to apply it. It is like we have actors but no script but interested to make movie.

3. Closed Project or "Painting by Numbers"

Traditional projects are suitable example for this type of project. They have clear goals and a well defined set of activities to be carried out. You can know *what* you want to achieve and *how* you will achieve it. It is so clear-cut that you can paint the numbers on it.

4. Semi - closed Project or "Going on a quest"

In this type, strict control over the costs and time-scale at the same time allowing freedom to explore is the main feature. The organization knows *what they* want to achieve but *how to* achieve it is unknown. Hence they send employees on a quest to explore 'out of the box possibilities'. These types of project will lead to overspending, getting delayed, or getting nothing from the project.

Another method to classify the projects is:

1. Simple projects
2. Rapid projects

3. Just-do-it projects or 'Loose Cannons'.

1. "Simple" Projects

A usual project may start off as 'painting by numbers', a fog, a quest, or a movie. The investigative stage are worked out until the organization is confident (say, around 90-95 percent) where at this stage the required benefits can be achieved. At the detailed investigation stage, they will have to narrow the options down and have to proceed for approval and funding to complete the detailed investigation stage. At the development stage, approval to complete the project as a whole is needed. It has become a painting by numbers project.

With a simple project, usually a great deal is known about it even before it starts. By the time the initial investigation stage is completed, fully defined the project is available and this leads to higher confidence level as it is normally for a larger project at the development stage. Thus in a simple project you may bypass certain stages to avoid unnecessary work.

2. "Rapid" Projects

In this case a project is defined with a fixed budget and time-scale but scope is varied to suit a predetermined minimum scope. Usually a prototype or actual operational platform is used in this project to cut down resource requirements and time-scale. Hence some of the stages and processes are merged. But it should be noted that just to save time and cost, phases, and processes of project couldn't be dispensed with.

3. "Just do it" Projects - Loose Cannons

These are undertaken to achieve results irrespective of time and cost. Sometimes these may be a Management's "pet project" with little relevance to strategy. Of course, these start often with optimistic projections and end up bouncing around the organization demanding more and more resources. They tend to very stressful to those associated with these projects. Hence best policy is to avoid them.

Before starting any such project consider the following:

- Why am I doing this?
- Is it really far more important than anything else in the company?
- Am I really sure what I am doing?

There must be very compelling reasons to allow a loose cannon project to start. Responding to a problem by panicking is not usually a good enough reason.

1.5.2 Sub-projects

Sub-projects are tightly coupled and tightly aligned parts of a project without any independent business case or benefit. The conditions under which you would choose to set up sub-projects depend on the degree of delegation you want to effect - it is akin to subcontracting the work.

This type of structure happens as a result of systems and process limitations or reporting requirements. It may be more convenient to represent and report a completely delegated piece of work as a subproject as it may relate to work, which has been let externally, under a contract or internally. Sub-projects may lead to timing mismatch and complexity. Hence greater coordination is required.

Questions for Self-Study

1. Define a Project
2. List out the Similarities and comparing between operation and project
3. What are the key Considerations in a Project?
4. Discuss in detail the different types of projects.
5. What do you mean by Sub – projects?
6. What is the sequence of phases undertaken in each of the four types of projects closed, semi-closed, semi-open, and open?

References

1. Robert Buttrick - "**The Project Workout**" - Pitman Publishers

2. David I. Cleland - "Project Management-Strategic Design and Implementation" - McGraw-Hill International Ed.
3. The Institute of Chartered Accountants of India - "Project Finance, Background Material"
4. Prasanna Chandra - "Projects, Planning, Analysis, Selection, Implementation & Review" - Tata McGraw Hill

LESSON - II

THE PROJECT LIFE CYCLE

Objectives of the Lesson:

After going through this unit, you may be able to

- Know the meaning of Project Life Cycle and its phases
- Analyze the various Phases involved in the Project Life Cycle
- Critically examine the various issues in managing the Project Life Cycle

Structure of the Lesson:

- 2.1** Introduction
- 2.2 Project Phases Analysis
- 2.3 Project Life Cycle Phases
- 2.4 Issues in Managing Project Life Cycle

2.1 Introduction

Projects have a distinct life cycle, starting with an idea and progressing through design, engineering and manufacturing or construction, through use by a project owner. Project life cycle is a collection of generally sequential project phases, whose name and number are determined by the control needs of organization or organizations involved in the project. A project phase is collection of logically related project activities usually culminating in the completion of major deliverable i.e. any

measurable, tangible, verifiable outcome, result or item that must be produced to complete a project or part of project.

2.2 Project Phases Analysis

The project originates as an idea in someone's mind, takes a conceptual form and eventually has enough substance that key decision-makers in the organization select the project as a means of executing elements of strategy in the organization. In practice, the project manager must learn to deal with a wide range of problems and opportunities, each in a different stage of evolution, and each having different relationships with the evolving project. Thus a project manager can effectively and efficiently plan and execute his decisions if he were able to identify these stages in the evolution of a project which is called life cycle of a project.

2.3 Project Life Cycle Phases

A product grows through several phases in its life cycle, starting with an idea, progressing throughout production or construction and passing on to sales and distribution and through to after-sales logistic support. In the same way a project passes through the following stages:

- **Develop an idea something** which is something new.
- **Do Research** by enquiring or examining into the field of knowledge with the objective to convert idea into a practical plan.
- **Design-idea and** get it converted into practical plan.
- **Convert Design by developing** into actual product, service, or process.
- Take the product, service, or process **through Marketing** to customers. It may precede the design phase.
- Convert the resources into product, service, or process through Production.
- **Provide Post Sales service and support** to customers during the use of product or service.

These can be expressed in simple terms as follows:

- a) Have an idea
- b) Have a quick look
- c) Have a closer look
- d) Do it
- e) Try it

f) Use it
g) Post implementation review
Different yet similar phases have been described in managing the life of a project. The managerial action in these phases typically includes:

1. Conceptual Phase

Bases are established and the management approach is formulated in this phase. The decision that a project is needed is made. Goals are established, resources are estimated, and key personnel are appointed.

2. Planning Phase

In this phase, major program characteristics are validated and refined and program risks and costs are assessed, resolved, or minimized. The project organization is defined, targets are set, schedule of execution is drawn, tasks, and resources are defined and allocated and project teams are built.

3. Execution Phase

This phase consist of full scale development phase and production phase, in full-scale development phase, design, fabrication and testing are completed. Costs are assessed to ensure that the program is ready for the production phase. In the production phase the system is produced and delivered as an effective, economical, and supportable system. During this period, responsibility for program management is transferred.

4. Termination Phase

In this phase, the system is actually transferred to organization. Commitments are completed, personnel are rewarded, resources are released, and team members are reassigned.

2.4 Issues in Managing Project Life Cycle

a) Number and Names of Phases

It should be noted that these phases or stages are as per user requirements. Further the names of phases are different in different organizations but the meaning remains the same. Hence a project leader, rather than trying to educate

people as to use pf his name for a particular phase can better exploit the names already familiar to people in the organization to avoid confusion and resentment in use of a particular name.

b) Assessing the Requirements of Resources

One of the first undertakings in planning for a project is to develop a rough estimate of the major tasks or work packages to be done in each phase. There are many ways of looking at a project life cycle. Adams and Brandt suggest two ways of looking at the managerial actions by project phase and the tasks accomplished by project phase.

Once established, the life cycle model should be updated as more is learned about the project. As the project progresses through its life cycle, the project exhibits ever-changing levels of cost, time, and performance. The project manager must make correspondingly dynamic responses by changing the mix of resources assigned to the project as a whole and to its various work packages. Thus budgets will fluctuate substantially in total and in terms of the allocation to the various project work packages. The need for resources and various kinds of expertise will similarly fluctuate, as will virtually everything else.

This constantly changing picture of the life cycle is an underlying structural rationale for project management. The traditional hierarchical organization is not fully designed to cope with managing such an always-changing mix of resources. Rather, it is designed to control and monitor a much more static entity that, day today involves stable levels of expenditures, numbers of people etc.

c) Managing Uncertainty in Project Life Cycles

As the project life cycle progresses, the cost, time and performance parameters must be "managed". This involves continuous re-planning of the as yet undone phases in the light of emerging data on what has actually been accomplished. The Project team must rethink much during the project life cycle to modify and fine-tune the work packages for each phase.

d) Combining the Effect of Stream of Projects

A “stream of projects” that place demands on its resources can characterize many organizations at any time. The combined effect of all the projects facing an organization at any given time determines the overall product, service, and process status of the organization at that time and gives insight into the organization's future.

The projects facing a given organization at a given time typically are diverse - some products are in various stages of their life cycles and embody different technologies; other products are in various stages of development. Management subsystems are undergoing development. Organizational units are in transition. And major decision problems, such as merger and plant location decisions, are usually studied as projects.

Moreover, at any given time, each of these projects usually will be in a different phase of its life cycle. For instance, one product may be in the conceptual phase undergoing feasibility study; another may be in the definition phase. Some might be in production. Other is being phased out in favor of upcoming models. The challenges associated with the overall management of an organization that is involved in a stream of projects are influenced by life cycle, just as are the challenges associated with managing individual projects. In project-driven organizations whose main business is management of the stream of projects passing throughout the organization, the mix of projects in their various phases is most challenging, particularly in allocating work force, funding resources, scheduling work loads, etc. to maintain a stable organizational effort.

Questions for Self-Study

1. What are the issues in managing a project life cycle?
2. How do the three parameters of a project-cost, time and technical performance-interact?

3. Which of the management function is more important in conceptual phase of project life cycle?
4. Whether a rapid project can be undertaken without some stages or processes?
5. What are the advantages of having a stream of projects?

References

1. Prasanna Chandra - "**Projects, Planning, Analysis, Selection, Implementation & Review**" - Tata Mcgraw Hill
2. Robert Buttrick - "**The Project Workout**" - Pitman Publishers
3. David I. Cleland -"**Project Management-Strategic Design and Implementation**" - Mcgraw -Hill International Ed.

LESSON - III

STRATEGIC ISSUES IN PROJECT MANAGEMENT

Objectives of the lesson:

After going through this unit, you may be able to

- Explain the nature and scope of strategic issues
- Know the strategic uses of project management
- Manage the strategic issues in a project
- Understand the project failure and success involved in the strategic issues

Structure of the lesson:

- 3.1 Introduction
- 3.2 Strategic Issues - Nature and Scope
- 3.3 Strategic Issues - Features
- 3.4 Project Management - Strategic Uses
- 3.5 Managing Project Strategic Issues
- 3.6 Strategic Issues - Project Failure and Success

3.1 Introduction

An issue is something that has happened and either threatens or enhances the success of a project. Issue management is the process for recording and

handling any event or problem. Some of the issues can be dealt within the project. However strategic issues may require a change in order to keep the project viable. Hence a study of nature and management of these strategic issues is required.

3.2 Strategic Issues - Nature and Scope

The concept of "strategic issues" has emerged as a way to identify and manage factors and forces that can significantly affect an organization's future strategies and tactics.

Project owners need to be aware of the possible and probable impacts of strategic issues. The project team leader has the primary responsibility to focus the owner's resources to deal with project strategic issues.

In a project, a strategic issue is a condition of pressure, either internal or external, that will have a significant effect on one or more factors of the project, such as its financing, design, engineering, construction, and operation.

3.3 Strategic Issues - Features

- Sometimes a strategic issue arises from the attitudes of employees.
- Strategic issues can emerge at any time during a project's life cycle.
- The successful completion of any project is dependent upon the recognition and management of strategic issues surrounding the social, political, legal, and economic aspects of the project as well as the cost, schedule and technical performance aspects.
- Strategic issues vary depending on the industry and the circumstances of particular project. E. g. in the case of nuclear construction industry the strategic issues may be
 - Licensability
 - Passive safety
 - Power costs
 - Reliability of generating systems
 - Nuclear fuel reprocessing
 - Waste management
 - Capital investment
 - Public perception
 - Environment and
 - Safeguards.

3.4 Project Management - Strategic Uses

One of the basic steps in deciding about a project is to confirm that it is driven by benefits, which support strategy. Strategic fit should be assessable from the beginning. The less clear the strategy, the more likely projects are to pass the initial screening; so there will be more projects competing for scarce resources resulting in the company losing focus and harming overall performance. In this regard the types of strategies that are implemented through project management are required to be understood.

3.5 Managing Project Strategic Issues

Project strategic issues often are nebulous, defying management in the literal sense of the word. It is important that the project teams identify the strategic issues the project faces and deal with them in terms of how they may affect the outcome of the project. In the assessment of the issues, some may be set aside as not having a significant impact on the project. These would not be reacted to but would be monitored to see if any changes occur that could affect the project. Of course, some significant issues may not be subject to the influence of the project team. The Project team requires a philosophy on how to manage strategic issues.

- Identification of an Issue**

Identifying some of the issues often can come about during the selection of the project to support the organizational strategy. During the selection process the following criteria can be addressed to determine if the project truly supports organizational strategy:

1. Does the project support a strength that the enterprise holds?
2. Does it avoid a dependence on something that is a weakness of the enterprise?
3. Does the project support an organizational need?
4. Is there a customer who is willing to pay for the project?

5. Can the project owner assume the risk that is involved in the project?
6. Are the resources and management *skills available* to bring the project to completion on time and within budget?

- **Assessment of an Issue**

The act of assessing an issue entails judging its importance in terms of its impact on the project. One author has suggested four criteria for first assessing an issue as strategic and then moving to subsequent states of management of the issue.

- Strategic relevance
- Action ability
- Criticality
- Urgency
- **Strategic relevance**

The strategic relevance of an issue relates to whether it will have a long-term impact (more than one year) on the project. Strategic relevance addresses the question:

- Will this strategic issue influence the project strategy? Or
- The likely consequences of the strategies that are being followed in the project?

If an issue is strategy-relevant, then the project manager has two basic courses of action:

- Try to live with the issue's impact or
- Do something about the issue.

But some strategic issues will be beyond the authority and resources of the project manager to resolve. In such situations a third course is open to the project manager. Elevate the issue to senior managers for their analysis and possible evaluation. Even though senior managers are aware of the issue, the project manager retains residual responsibility to see that the issue is "tracked" and given due attention.

- **Ability to take Action**

The ability of a project issue deals with the capability of the project team and the enterprise to take suitable action about the issue. For example, the issue of licensability of a new nuclear power plant is critical to the decision of whether to fund such a plant.

A project may face strategic issues about which little can be done. Keeping track of the issue and considering its potential impact on project decisions may be the only realistic action the team can take. Key project managers should always be aware that there are issues that may be beyond their influence.

- **Criticality**

The criticality of an issue is the determined impact that the issue can have on the project's outcome. The issue of growing congressional disenchantment with the U. S. Supersonic Transport Program arose from the concern of the environmentalists over the sonic boom problem.

If a preliminary analysis of an issue indicates it is non-critical, then the issue should be monitored and periodically evaluated to see if its status has changed.

- **Considering Urgent Issues Emerging during the Project Planning**

The urgency of an issue has to do with the time period in which something needs to be done. Or else being equal, if an issue should be dealt with immediately, it must take precedence over other issues. Urgent issues emerging during the project planning should be considered as a "work package" in the management of the project. Someone should be designated as the 'issue work package manager' to look after the issue, particularly during its urgency status.

- **Analysis of an Action**

Identification and assessment of an issue are not enough: The issue has to be managed so that its adverse effect on the project is minimized and its potential benefit is maximized. The issue work package manager is in charge of collecting information, tracking the project and ensuring that the issue remains

visible to the project team. That manager should also coordinate decisions made and implemented regarding the issue.

In the analysis of action required to deal with an issue, seeking answers to a series of questions like the following can be helpful:

1. What will be the probable effect of the issue in terms of impact on the projects schedule, cost and technical performance and the owner's strategy?
2. Who are the principal stakeholders who have an interest in the project? What will be the impact on their probable strategy?
3. How influential are these stakeholders?
4. What strategy should the project team develop to deal with these issues?
5. What might be the real cost in relation to the apparent cost to the project owner and will other projects being funded by the project owner be affected?
6. What specific action will be required and what will it cost the project owner?

The action developed to deal with the issue may, at the minimum, consist of simply monitoring the issue and giving status reports to the project team. Some issues, however, may require a more aggressive approach. The 'issue work package manager may find it useful to think of the issue as having a life cycle, with such phases as conception, definition, production, operations and termination, and to identify the key actions to be considered and accomplished during each phase. The manager should be specific and should stipulate what will be done, when it will be done, how to do it, where, and who will be in charge of implementing the action leading to resolution of the issue.

• **Implementation**

However it is dealt with, the resolution of an issue or the mitigation of its effects requires that a project plan of action be developed and implemented. Indeed, the resolution of a strategic issue can be dealt with as a mini-project requiring the execution of the management functions - planning, organizing, direction and control - and all these functions entail some degree of work-breakdown

analysis, scheduling, cost estimating, matrix-responsibility, information systems, design of monitoring and control and so on. What resources are to be used to resolve the issue? and who should take the leadership role in resolving that issue is the crucial questions to be answered.

3.6 Strategic Issues - Project Failure and Success

A project's success or failure depends upon strategic issue management. Why do projects fail? Many project management theorists and practitioners have considered this question. One study detailed the following reasons for failure:

1. Lack of understanding of the project complexity
2. Lack of access and internal communication
3. Failure to integrate the key elements
4. Inadequate control
5. Subtle change in requirement
6. Ineffective execution strategy
7. Too much dependence on software
8. Contractor/customer with different expectations
9. No shared "win-win" attitudes
10. Inadequate education/training
11. Lack of leadership commitment and sponsorship
12. Not viewed as a start-up business

Similarly success of project also depended on several factors. According to one study they are described as follows:

1. Management commitment
2. A realistic and firm schedule
3. Clear decision-making and authority
4. Flexible project control tools
5. Team work
6. Maintaining engineering ahead of construction
7. Early start-up involvement
8. Organizational flexibility
9. Ongoing critique of the project
10. Close coordination

How the Board can be involved in a Project?

1. Regular and rigorous review of the status of major projects is the best way for directors to be kept informed of how corporate strategy is evolving - and how well the enterprise is preparing for its future.

2. Project performance audits can be a powerful tool to use in gaining an independent assessment of a project's status.
3. In the selection of directors, consideration should be given to the individual's competency in project management.

Questions for Self-Study

1. Critically evaluate the Strategic Issues involved in the project
2. What methods might project manager's employ to identify the strategic issues in a project?
3. What is meant by strategic relevance of an issue?
4. How managers ensure that project team members are aware of and understand the project strategic issues?

References

1. Robert Buttrick - "**The Project Workout**" - Pitman Publishers
2. Prasanna Chandra - "**Projects, Planning, Analysis, Selection, Implementation & Review**" - Tata Mcgraw Hill
3. David I. Cleland -"**Project Management-Strategic Design and Implementation**" - Mcgraw -Hill International Ed.

LESSON – IV

PROJECT FINANCING

Objectives of the Lesson:

From this lesson, you will be able to

- Explain the rational behind project financing
- Know project financing participant and agreements
- List out the principal advantages and disadvantages
- Explain the financial planning and control involved in the projects
- Explain financial reporting

Structure of the Lesson

4.1 Introduction

4.2 Rational

4.3 Project Financing Participants and Agreements

 4.3.1 First Step in a Project Financing: The Feasibility Study

4.4 Principal Advantages and Disadvantages

4.5 Financial Plan and Control in Projects

 4.5.1 Financial plan

 4.5.2 Project Cash Flows

 4.5.3 Measuring Project Cash Flows: Basic Principles

 4.5.4 Principle of Incremental Cash Flows

 4.5.5 Principle of Long Term Funds

 4.5.6 Principle of Financing Costs Exclusion

 4.5.7 Principle of Post-tax

 4.5.8 Cash Flow Stream Components

 4.5.9 Operating Cash Inflows

 4.5.10 Terminal Cash Flow

 4.5.11 Issues as to Cash Flow Analysis/Estimation

4.6 Errors in Cash Flow Estimation

4.7 Overstatement of Profitability

 4.7.1 under Statement of Profitability

4.8 Time Value of Money

 4.8.1 Cost of Capital

4.9 Financial Management Controls

4.10 Authorizing Spending of Funds

4.11 Recording of Actual Costs and Committed Costs

4.12 Financial Reporting

4.1 Introduction

Project financing involves non-recourse financing of the development and construction of a particular project in which the lender looks principally to the revenues expected to be generated by the project for the repayment of its loan and to the assets of the Project as collateral for its loan rather than to the general credit of the project sponsor.

4.2 Rational

Project financing is commonly used as a financing method in capital-intensive industries for projects requiring large investments of funds, such as the construction of power plants, pipelines, transportation systems, mining facilities, industrial facilities, and heavy manufacturing plants. The sponsors of such projects frequently are not sufficiently creditworthy to obtain traditional financing or are unwilling to take the risks and assume the debt obligations associated with traditional financings. Project financing permits the risks associated with such projects to be allocated among a number of parties at levels acceptable to each party.

4.3 Project Financing Participants and Agreements

1. Sponsor/Developer

The sponsor(s) or developer(s) of a project financing is the party that organizes all of the other parties and typically controls, and makes an equity investment in, the company or other entity that owns the project. If there is more than one sponsor, the sponsors typically will form a corporation or enter into a partnership or other arrangement pursuant to which the sponsors will form a "project company" to own the project and establish their respective rights and responsibilities regarding the project.

2. Additional Equity Investors

In addition to the sponsor(s), there frequently are additional equity investors in the project company. These additional investors may include one or more of the other project participants.

3. Construction Contractor

The construction contractor enters into a contract with the project company for the design, engineering, and construction of the project.

4. Operator

The project operator enters into a long-term agreement with the project company for the day-to-day operation and maintenance of the project.

5. Feedstock Supplier

The feedstock supplier(s) enters into a long-term agreement with the project company for the supply of feedstock (i.e., energy, raw materials or other resources) to the project (e.g., for a power plant, the feedstock supplier will supply fuel; for a paper mill, the feedstock supplier will supply wood pulp).

6. Product Off taker

The product off taker(s) enters into a long-term agreement with the project company for the purchase of all of the energy, goods or other product produced at the project.

7. Lender

The lender in a project financing is a financial institution or group of financial institutions that provide a loan to the project company to develop and construct the project and that take a security interest in all of the project assets.

4.3.1 First Step in a Project Financing: The Feasibility Study

As one of the first steps in a project financing the sponsor or a technical consultant hired by the sponsor will prepare a feasibility study showing the financial viability of the project. Frequently, a prospective lender will hire its own independent consultants to prepare an independent feasibility study before the lender will commit to lend funds for the project.

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The feasibility study should analyze every technical, financial and other aspect of the project, including the time-frame for completion of the various phases of the project development, and should clearly set forth all of the financial and

other assumptions upon which the conclusions of the study are based. Among the more important items contained in a feasibility study are:

- Description of project.
- Description of sponsor(s).
- Sponsors' Agreements.
- Project site.
- Governmental arrangements.
- Source of funds.
- Feedstock Agreements.
- Off take Agreements.
- Construction Contract.
- Management of project.
- Capital costs.
- Working capital.
- Equity sourcing.
- Debt sourcing.
- Financial projections.
- Market study.
- Assumptions.

4.4 Principal Advantages and Disadvantages

1. Non-recourse

The typical project financing involves a loan to enable the sponsor to construct a project where the loan is completely "non-recourse" to the sponsor, i.e., the sponsor has no obligation to make payments on the project loan if revenues generated by the project are insufficient to cover the principal and interest payments on the loan. In order to minimize the risks associated with a non-recourse loan, a lender typically will require indirect credit supports in the form of guarantees, warranties and other covenants from the sponsor, its affiliates and other third parties involved with the project.

2. off-Balance-Sheet Treatment

Depending upon the structure of a project financing, the project sponsor may not be required to report any of the project debt on its balance sheet because such debt is non-recourse or of limited recourse to the sponsor. Off-balance-sheet treatment can have the added practical benefit of helping the sponsor comply with covenants and restrictions

relating to borrowing funds contained in other indentures and credit agreements to which the sponsor is a party.

3. Maximize Leverage

In a project financing, the sponsor typically seeks to finance the costs of development and construction of the project on a highly leveraged basis. Frequently, such costs are financed using 80 to 100 percent debt. High leverage in a non-recourse project financing permits a sponsor to put less in funds at risk, permits a sponsor to finance the project without diluting its equity investment in the project and, in certain circumstances, also may permit reductions in the cost of capital by substituting lower-cost, tax-deductible interest for higher-cost, taxable returns on equity.

4. Maximize Tax Benefits

Project financings should be structured to maximize tax benefits and to assure that all available tax benefits are used by the sponsor or transferred, to the extent permissible, to another party through a partnership, lease or other vehicle.

Disadvantages

Project financings are extremely complex. It may take a much longer period of time to structure, negotiate, and document a project financing than a traditional financing, and the legal fees and related costs associated with a project financing can be very high. Because the risks assumed by lenders may be greater in a non-recourse project financing than in a more traditional financing, the cost of capital may be greater than with a traditional financing.

4.5 Financial Plan and Control in Projects

We have seen that cost and time are the important elements in a project. We have seen how project scheduling keeps control on time and to some extent on cost also. Schedule plan is fundamental to cost. But a financial plan is equally important in a project planning. Financial management controls are also important part of monitoring and control of a project.

4.5.1 Financial Plan

It tells you:

- What each phase and work package in the project costs?
- Who is accountable to these costs?
- Whether the financial benefits derived from the project.
- Whether financial commitments made.
- Whether cash flows forecasted.
- Whether financial authorization given.
- What is the net effect of the project on company's Balance Sheet and Profit and Loss Account?

The elements of financial plan or analysis are

1. Cost of the Project

It is dependent upon

- The scope of the project
- The approach to the project
- The time-scale to complete the project
- The risks associated with the project

Conceptually the cost of the project represents the total of all items of outlay associated with a project, which are represented by long-term funds.

E.g.

- Fixed Assets like Land & building, machinery
- Technical Know-how costs, engineering fees
- Preliminary and capital issue expenses
- Margin money for working capital
- Contingency provisions
- Pre-operative expenses

2. Means of Finance

They are to meet the cost of the project and include

- Share capital
- Term loans
- Debentures
- Deferred credits
- Incentives like subsidy
- Miscellaneous sources

Factors influencing the planning of Means of Finance

1. Norms of Regulatory Bodies and Financial Institutions

2. Key Business Considerations like cost of funds, risk, control, and flexibility

3. Estimates of Sales and Production

Some considerations in this regard are-

1. It is not advisable to assume a high capacity utilization level in the first year of operation.
 2. It is not necessary to make adjustments for stocks of finished goods. For practical purposes, it may be assumed that production would be equal to sales.
 3. The selling price considered should be the price realizable by the company net of excise duty. It shall, however, include dealers' commission, which is shown as an item of expense [as part of sales expenses].
 4. The selling price used may be the present selling price - it is generally assumed that changes in selling price will be matched by proportionate changes in cost of production.

A model estimate is given below

Details of each Product can be furnished

4. Cost of Production

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

1. Material cost
2. Utilities cost
3. Labor cost
4. Factory overhead cost

5. Working Capital Requirement and its Financing

In estimating the working capital requirement and planning for its financing the following points have to be borne in mind:

1. The working capital requirement consists of the following:
 - i] Raw materials and components [indigenous as well as imported]
 - ii] Stocks of goods-in-process [also referred to as work-in-progress]
 - iii] Stocks of finished goods
 - iv] Debtors
 - v] Operating expenses.
2. The principal sources of working capital finance are:
 - i] Working capital advances provided by commercial banks ii] trade credit
 - iii] Accruals and provisions, and iv] long-term sources of financing.
3. There are limits to obtaining working capital advances from commercial banks.

They are in two forms:

- i] The aggregate permissible bank finance is specified as per the norms of lending, (prescribed by the Tandon Committee in India),
 - ii] Against each current asset a certain amount of margin money has to be provided by the firm.
4. The Tandon Committee has suggested three methods for determining the maximum permissible amount of bank finance for working capital. The method that is generally employed now is the second method. According to this method, the maximum permissible bank finance is calculated as follows:

Current assets as per the

- Non-bank current liabilities norms laid down by the like trade credit and provisions.

Tandon Committee.

The implication of this norm is that at least 25% of current assets must be supported by long-term sources of finance.

5. The margin requirement varies with the type of current assets. While there is no fixed formula for determining the margin amount, the ranges within which margin requirements for various current assets lie are as follows.

Current Assets Margin	
Raw materials	10 - 25 per cent
Work-in-process	20 - 40 per cent
Finished goods	30 - 50 per cent
Debtors	30-50 per cent

6. Profitability Projection [or Estimates of Working Results]

Given the estimates of sales revenues and cost of production, the next step is to prepare the profitability projections or estimates of working results [as they're referred to by term-lending financial institutions in India].

7. Break-even Point

The profitability projections or estimates of working results discussed above are based on the assumption that the project would operate at given levels of capacity utilization in future. In addition to knowing what the projected profits would be at certain levels of capacity utilization, it is also helpful to know what the level of operation should be to avoid losses. For this purpose, the breakeven point, which refers to the level of operation at which the project neither makes profit nor incurs loss, is calculated?

8. Projected Cash Flow Statements

The cash flow statement shows the movement of cash into and out of the firm and its net impact on the cash balance with the firm. The format for preparing the cash flow statement, which is really a cash flow budget, as prescribed by the all-India financial institutions is shown here. While this format calls for preparing the cash flow statement on a half-yearly basis for the construction period and an annual basis for the operating period [for ten years] for managerial purposes, it may be helpful to prepare it on a quarterly basis for the construction period and half-yearly basis for the first 2 to 3

operating years for managerial purposes. This would facilitate better financial planning, project evaluation, and fund control.

Cash Flow Statement Sources of funds

1. Share issue
2. Profit before taxation with interest added back
3. Depreciation provision for the year
4. Development rebate reserve
5. Increase in secured medium and long-term borrowings for the project
6. Other medium/long-term loans
7. Increase in unsecured loans and deposits
8. Increase in bank borrowing for working capital
9. Increase in liabilities for deferred payment [including interest] to machinery suppliers
10. Sale of fixed assets
11. Sale of investments
12. Other income [indicate details] Total [A]

Disposition of Funds;

1. Capital expenditure for the project
 2. Other normal capital expenditure
 3. Increase in working capital
 4. Decrease in secured medium and long-term borrowings
 - All India Institutions
 - SFCs
 - Banks
 5. Decrease in unsecured loans and deposits
 6. Decrease in bank borrowings for working capital
 7. Decrease in liabilities for deferred payments [including interest] to machinery suppliers
 8. Increase in investments in other companies
 9. Interest on Term Loans
 10. Interest on bank borrowings for working capital
 11. Taxation
 12. Dividends
 - Equity
 - Preference
 13. Other expenditure [indicate details] Total [B]
- Opening balance of cash in hand and at bank
- Net surplus/deficit [A-B]

- Closing balance of cash in hand and at bank

9. Projected Balance Sheets

The Balance sheet, showing the balances in various asset and liability accounts, reflects the financial condition of the firm at a given point of time. The format of Balance sheet prescribed by the Companies Act is given below

Format of Balance Sheet Prescribed by the Companies Act

Liabilities	Assets
Share capital	Fixed assets
Reserves and surplus	Investments
Secured loans	Current assets loan and advances
Unsecured loans	Miscellaneous expenditures and
Current liabilities	- losses
And provisions	

4.5.2 Project Cash Flows

The three basic steps in determining whether a project is worthwhile or not is:

- a] Estimate project cash flows.
- b] Establish the cost of capital [or hurdle rate], and
- c] Apply a suitable decision or appraisal criterion.

4.5.3 Measuring Project Cash Flows: Basic Principles

For developing the stream of financial costs and benefits, the following principles must be kept in mind:

1. Principle of Incremental Cash Flows
2. Principle of Long Term Funds
3. Principle of Financial Costs Exclusion
4. Principle of Post-tax

4.5.4 Principle of Incremental Cash Flows

The cash flows of a project must be measured in incremental terms. To ascertain a project's incremental cash flows, one has to look at what happens to the cash flows of the firm with the project and without the project. The difference between the two reflects the incremental cash flows attributable to the project.

That is –

Project cash cash flow for the firm Cash flow for the firm

In estimating the incremental cash flows of a project, the following guidelines must be borne in mind:

1. Consider all incidental effects
 2. Ignore sunk costs
 3. Include Opportunity costs
 4. Question the allocation of overhead costs

4.5.5 Principle of Long Term Funds

A project may be evaluated from various points of view: total funds point of view, long-term funds point of view, and equity point of view. The measurement of cash flows as well as the determination of the discount rate for evaluating the cash flows depends on the point of view adopted. It is generally recommended that a project may be evaluated from the point of view of long-term funds [which are provided by equity stockholders, preference stock-holders, debenture holders, and term-lending institutions] because the principal focus of such evaluation is normally on the profitability of long-term funds. This argument, though plausible, cannot be regarded as unassailable. Nonetheless, we subscribed to the position that it is quite reasonable to view a project from the long-term funds point of view. Hence for determining the costs and benefits of an investment project we will raise the questions. What is the sacrifice made by the suppliers of long-term funds? What benefits accrue to the suppliers of long-term funds?

The sacrifice made by the suppliers of long-term funds is equal to the outlays on fixed assets and net working capital [it may be recalled that net working capital, which represents the difference between current assets and current liabilities, is supported by long-term funds]. The benefits accruing to the suppliers of long-term funds consist of operational cash inflows after taxes and salvage value of fixed assets and net working capital.

4.5.6 Principle of Financing Costs Exclusion

When cash flows relating to long-term are being defined, financing costs of long-term funds [interest on long-term debt and equity dividend] should be excluded from the

analysis. Why? The weighted average cost of capital used for evaluating the cash flows takes into account the cost of long-term funds. Put differently the interest and dividend payments are reflected in the weighted average cost of capital. Hence, if interest on long-term debt and dividend on equity capital are deducted in defining the cash flows, the cost of long-term funds will be counted twice - an error that should be carefully guarded against.

Operationally, the exclusion of financing costs principle means that

- [I] The interest on long-term debt [referred to hereafter as just interest for the sake of simplicity] is ignored while computing profits and taxes thereon and
- [ii] The expected dividends are deemed irrelevant in cash flow analysis. While dividends pose no difficulty as they come only from profit after taxes, interest needs to be handled properly. Since interest is usually deducted in the process of arriving at profit after tax, an amount equal to interest [1 -tax rate] should be added back to the figure of profit after tax. To understand the nature of this adjustment, it may be noted that:

Profit before interest and tax [1 -tax rate]

= [Profit before tax + interest] [1-tax rate]

= [Profit before tax] [1-tax rate] + [interest] [1-tax rate]

= Profit after tax + interest [1-tax rate]

Thus, whether the tax rate is applied directly to the profit before interest and tax figure or whether the tax adjusted interest, which is simply interest [1-tax rate], is added to profit after tax, we get the same result.

4.5.7 Principle of Post-tax

Tax payments like other payments must be properly deducted in deriving the cash flows. Put differently cash flows must be defined in post-tax terms [It may be noted that the cost of capital employed for evaluating the cash flow stream is also measured in post-tax terms].

4.5.8 Cash Flow Stream Components

The cash flow stream associated with a project may be divided into three basic

Components:

- [i] An initial investment
- [ii] Operating cash inflows and
- [iii] Terminal cash flow.

The initial investment represents the relevant cash outflow when the project is set up.

The operating cash inflows are the cash inflows that arise from the operation of the project during its economic life. The terminal cash flow is the relevant cash flow occurring at the end of the project life on account of liquidation of the project.

Initial Investment

The manner in which the initial investment is defined depends on whether the project is a new project or a replacement project as shown below.

New Project

Cost of capital assets
+ Installation cost
+ Working capital margin
+ Preliminary and pre-operative expenses

Replacement Project

Cost of replacement capital assets
+ Installation cost
- Post-tax proceeds from the sale of old capital assets
+ Change in working capital margin
- Tax shield, if any, on capital assets
+ Preliminary and pre-operative expenses
- Tax shield, if any, on replacement capital assets.

Tax shield is the benefit due to savings in tax.

4.5.9 Operating Cash Inflows

For deriving the operating cash inflows, the projected profitability statements are the starting point. Since there is a difference between the recognition of revenues and expenses in accounting and the incidence of cash flows, a rigorous analysis requires that each item of revenue and expense be examined to find out the cash flows associated with it.

It suffices if depreciation and the other non-cash charges, which are deducted in computing profits from the accounting point of view, are added back because they do not result in cash outflows. This means that the operating cash inflow for a given year is defined as follows.

New Project	Replacement Project
Profit after tax	Change in profit after tax
+ Depreciation	+ Change in depreciation
+ Other non-cash charges	+ Change in other non-cash charges
+ Interest on long-term debt [1 -tax rate]	+ Change in interest on long-term debt [1-tax rate]

4.5.10 Terminal Cash Flow

The cash flow resulting from the termination or liquidation of a project at the end of its economic life is called its terminal cash flow. It is defined as follows:

New Project	Replacement Project
Post-tax proceeds from the Sale of capital assets	Post-tax proceeds from the sale of replacement capital assets
+ Net recovery of working Capital margin .	+ Post-tax proceeds from the sale of present capital assets
	+ Net recovery of working capital

4.5.11 Issues as to Cash Flow Analysis/Estimation

Time Horizon for Analysis of cash flow

What should be the time horizon for cash flow analysis? The time horizon for cash flow analysis is the minimum of the following:

1. Physical life of the Plant
2. Technological life of the Plant
3. Product Market life of the Plant
4. Investment Planning Horizon of the Firm

4.6 Errors in Cash Flow Estimation

As cash flows have to be forecast far into the future, errors in estimation are bound to occur. Yet, given the critical importance of cash flow forecasts in project evaluation, adequate care should be taken to guard against certain biases, which may lead to over-statement or under-statement of true project profitability.

4.7 Overstatement of Profitability

Knowledgeable observers of capital budgeting believe that profitability is often overstated because the initial investment is under-estimated and the operating cash flow exaggerated.

The principal reasons for such optimistic bias appear to be as follows:

1. Intentional overstatement
2. Lack of experience
3. Myopic euphoria
4. Capital rationing

4.7.1 under Statement of Profitability

The problem of optimistic bias may lead to an over-statement of project cash flows and profitability. There can be an opposite kind of bias relating to the terminal benefit, which may depress a project's true profitability.

1. Salvage values are under-estimated
2. Intangible benefits are ignored
3. The value of future options is overlooked.

4.8 Time Value of Money

Cash flows occur in a project at different point of time. Due to inflation the money value erodes over a period of time. But this is not factored in the normal cash flow analysis. Hence different discounting techniques may have to be used to represent correct value of cash flow.

4.8.1 Cost of Capital

A Firm's cost of capital is the rate of return it must earn on its investments for the market value of the firm to remain unaffected. It can also be regarded as the rate of return required by investors on capital provided by them. A central concept in financial management, linking the investment and financing decisions, the cost of capital is important for three reasons:

1. For a proper analysis of capital expenditure decisions, an estimate of the cost of capital is required. The cost of capital is the discount rate used in the net present value calculation (time value as discussed above) and also the financial yardstick against which the internal rate of return is evaluated.

2. Several other decisions - like leasing, long-term financing, and working capital policy - require estimates of cost of capital.
3. In order to maximize the value of the firm, the costs of all inputs [including the capital input] must be minimized and in this context the firm should be able to measure the cost of capital.

Some Misconceptions about cost of capital are

1. The concept of cost of capital is too academic or impractical.
2. The cost of equity is equal to the dividend rate or return on equity.
3. Retained earnings are either cost free or cost significantly less than external equity.
4. Depreciation has no cost
5. The cost of capital can be defined in terms of an accounting-based measure.
6. If a project is heavily financed by debt, its weighted average cost of capital [WACC] is low.

4.9 Financial Management Controls

They comprise

- Estimating the costs and benefits
- Obtaining authorization to spend funds
- Recording actual costs committed costs
- Forecasting future costs and cash flow
- Reporting

Of these we have already studied about estimating the costs and forecasting the costs and cash flows, as a part of Financial Plan.

4.10 Authorizing Spending of Funds

In case of process of authorization to spend funds the following criteria are to be looked into

- It should be consistent with the project framework
- It should concentrate only on substantive issues
- It should not be too lengthy
- There should not be redundancy

4.11 Recording of Actual Costs and Committed Costs

As far as the recording of actual costs and committed costs are concerned it should be noted that it has nothing to do with normal bookkeeping, which is of no relevance to project management. A system of capturing costs and commitments wherever they

originate in your company and allocating them to project is to be established. It is also necessary that this done in for each stage to have control.

4.12 Financial Reporting

Financial reporting is converting accounting and operational data into meaningful information to promote action.

Reports should be

- Timely
- Accurate
- Forward looking

Usually a financial report tells you what has been spent to date

- The expected outcome of the project
- The impact on the current financial year
- The cost of work yet to be done
- List of transactions, purchases made on the project
- Details of time booked to the project.

Questions for Self-Study

1. What is Cash Flow Stream Components?
2. Explain Authorizing Spending of Funds
3. What do you mean by Recording of Actual Costs and Committed Costs?
4. Explain Financial Reporting?
5. What are the components of project cost? Discuss them in detail.
6. What consideration should be borne in mind while estimating sales revenue?
7. What are the items found in cash flow statement?

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LESSON – V

PROJECT FORMULATION CHECKLIST

Objectives of the Lesson:

From this lesson, you will be able to

- Explain the Steps in Preparation of Project Report
- List out the Contents of a Detailed Project Report
- Explain the appraisal of project by lenders
- Know the financial working in the project report

Structure of the Lesson

- 5.1 Introduction
- 5.2 Steps in Preparation of Project Report
- 5.3 Contents of a Detailed Project Report
- 5.4 Appraisal of Project by Lenders
 - 5.4.1 Economic Feasibility
 - 5.4.2 Technical Feasibility
 - 5.4.3 Managerial Feasibility
 - 5.4.4 Organizational Feasibility
 - 5.4.5 Commercial Feasibility
 - 5.4.6 Financial Feasibility
- 5.5 Hints for Financial Working in the Project Report
 - 5.5.1 Project Equity - Various options for Financing
 - 5.5.2 Debt
- 5.3 Post-project Reviews

5.1 Introduction

A project report is the study of the project carried out in a particular manner and presented in a systematic way. A perfect project report is one, which answers all the important questions normally asked by the main promoter, lenders and investors.

From the point of a management student it would be very useful to learn the drafting of a project report. Hence contents of a model project report with hints and how the lenders appraise the project is given in this lesson.

5.2 Steps in Preparation of Project Report

- **Data Collection**

This is invariably the first step for preparation of a project report. The data collection has to be made in terms of industry processes players, technology, market (domestic & international) etc.

- **Drafting the report**

Such collected data helps in finding out basic viability of a given project. Once this is completed, the next step is to collect the data in respect of the following items and assimilate in right format to complete the project report:

- | | |
|--------------------------|--------------------------------|
| 1. Capacity | 9. Utilities |
| 2. Process | 10. Effluents |
| 3. Technical arrangement | 11. Labour |
| 4. Management | 12. Schedule of Implementation |
| 5. Location | 13. Other projects of the |
| 6. Building Company | 14. Means of Finance |
| 7. Plant and Machinery | 15. Profitability |
| 8. Raw Material | |

5.3 Contents of a Detailed Project Report

It should contain the following details:

- **Capacity**

Under this head, the capacity in respect of each of the proposed products in the format is required to be given, which includes:

- Installed capacity
- Maximum production achieved
- Proposed installed capacity and
- Maximum production envisaged
- Number of shifts
- Details of prototype development and testing/approval
- ISI or other relevant specifications.

- **Promoter/Management**

Under the captioned heading, maximum information on the promoters including details like:

- Educational qualification and the experience in the industry or business etc.

- If the promoters are first generation entrepreneurs, one should explain the rationale for starting the venture. This justification should be supported with relevant experience of promoters in the proposed business field.
- Existing Company, annual accounts, and other details
- Small write-up on other ventures
- Style of management
- **Location and its Advantages**

While selecting a site for the project, advantages and disadvantages of the site should be taken into consideration. Enumerate in detail the advantages and disadvantages which were weighed before selecting the site and also highlight each of the factors which were considered most advantageous for the project, such as

- Good transport facilities,
- Nearness to market,
- Availability of raw materials, water, power, labour etc.
- Reference to rainfall, floods, cyclones, earthquakes etc.
- The topography of
- Factory building,
- Ancillary buildings,
- Open storage space,
- Housing colony,
- Area required for future expansion.
- **Land**

The following information may be furnished under each head:

- Total area and cost thereof; including conveyance charges.
- When the land is acquired/proposed to be acquired.
- The cost of land payable in deferred installments or in kind, such as by issue of shares. The land taken on lease basis, separately mention the amount of initial premium and the annual lease rent.
- If the land is acquired / proposed to be acquired from promoters/directors, give full particulars, such as the relationship.
- If the land for the project has been earlier used for agricultural purposes, it may be necessary to obtain the permission of the State Government for converting it into non-agricultural land.

- **Buildings**

The mode of construction of the buildings may be explained in detail i.e.,

- Whether through a contractor,
- By the unit's own organization etc.
- In case the buildings are to be constructed through contractors, describe the process of selection of the contractor(s) and the reasons for selecting the contractor(s).
- Copies of master plan
- Equipment layout or plan of buildings
- Particulars of architect.

- **Raw Materials**

The detailed specification preferably including any industrial standards of raw material required by the unit should be indicated. The ABC analysis of these raw materials needs to be done.

- Latest quotation
- Material from associate concern
- The transfer pricing
- Alternatives
- Indigenous and imported raw materials. These are some of the details to be included.

- **Utilities**

Power: This is an important item of utilities. There are many projects, which are suffering due to lack of power. Hence, requirement of the power should be assessed properly and the sources should be tied up firmly. Details to be given are -

- Internal Generation
- Particulars of the electrical sub-station
- Distance from plant
- Capacity of the generator
- Details of electricity tariff.

- **Water**

The requirements of water can be segregated for circulating, make-up, process, boiler feed, drinking, cooling etc. Source details like:

- Tube wells
- River etc. and
- Particulars regarding water flow are to be included.

Compressed Air, Fuel etc.: Give information separately regarding the requirements and sources of supply of compressed air, furnace oil, coal etc.

- **Effluents**

As we have seen, there is always an inseparable social objective while setting up a unit. These social objectives apart from employment also include providing an industrial growth without affecting the nature and human life. If the project generates any type of effluents, it must take all the necessary steps for treating the same before it goes out of the factory premises.

- Characteristics, such as alkaline, acidic, toxic/poisonous etc.
- Relevant regulations
- Copy of the approval is to be provided.

- **Plant & Machinery**

This normally constitutes a major part of the project cost. Hence, utmost care should be taken while completing this part of the project report. Under this head it should be explained how the

- Machinery equipment and
- Machinery/equipment suppliers have been selected
- Advice of collaborators
- Contractors, technical advisors/consultants, promoters etc.
- Degree of sophistication/obsolescence
- Advantages of selecting the suppliers.

- **Technology/Technical Arrangement**

The process of selection of technology is a very important aspect of any project. This part has to be properly drafted. The comparison of various technologies needs to be done in terms of viability, country of origin, cost of acquisition, adaptability to local conditions and up gradation, whether proven or not etc. Other points to be noted are -

- Collaboration agreement
- Performance guarantees, warranties
- Payment of damages
- Buy-back clause, know-how fees.
- Know-how basic design engineering, detailed engineering.

- **Manufacturing Process**

- Material flow and process flow
- Process flowchart
- Material balance,
- Utilities and process parameters
- **Labour**
- Total requirements
- Availability
- Manpower development programme
- Category wise classification.

- **Market and Selling Arrangements**

Success of the project depends on the correct estimates about the market for the product.

- Detailed study of the demand and supply
- Market survey
- Capacities to be added in the near future
- Special qualities and features
- Advantages of the products vis-à-vis the products of the competitors
- Highlight the pricing strategy
- Market promotion strategy
- After sales-service
- Data regarding export market, international price
- Own network
- Local agents
- **Other Projects**

It is necessary to give details of other projects including expansion modernization scheme of the company, which are under implementation, or the company or promoters propose to implement, giving

- The estimated cost,
- Means of financing and
- The present status.

This is very important because it gives clear picture as to availability of funds with the promoter for project. This also indicates whether the promoters are diversifying into unrelated field.

- **Implementation Schedule**

The proposed schedule or implementation may be given separately for each activity.

- It will be necessary to support the schedule of implementation by a bar-diagram indicating major activities and
- In some of the mega project one can prepare a PERT chart showing implementation of schedule and the critical path.

- **Project Cost**

With the help of the above the project cost can be finalized under following heads:

1. Land and site development
2. Buildings
3. Plant & machinery
 - Imported
 - Indigenous
4. Technical know-how fees
5. Expenses on foreign technicians and training of Indian technicians abroad
6. Miscellaneous fixed assets
7. Preliminary and pre-operative expenses
8. Provision for contingencies
9. Margin money for working capital

Different institutions may have different formats. Accordingly the above information is suitably altered to meet the institutional requirements.

- **Means of Financing**

The standard format in which the means of financing is given in the project report is as follows:

1. Share capital
 - Equity capital
 - Preference capital
2. Term loan
 - *Rupee loans*
 - Foreign currency loan
 - Non-convertible debentures
 - Supplier's credit
3. Internal cash accruals
4. Government subsidy

The means of financing has to be finalized only after considering the SEBI guidelines, institutional standard norms, other Government guidelines, and the capital market conditions.

Institutions while considering the loan application look at following main points apart from assessing the viability of the project.

1. Promoters' contribution
 2. Debt-equity ratio
 3. Debt service coverage ratio
 4. Asset cover
- **Profitability Statements**

The profitability statements can be considered as heart of the project report. The main statements needed to prepared and attached are as follows:

1. Estimated cost of the project and means of financing
2. Operating statements
3. Cash flow
4. Balance Sheet
5. Assumption statement
6. Working capital requirement
7. Contingency calculations
8. Depreciation calculation (Written down Value and Straight Line Method)
9. Income tax calculation
10. Break-even analysis
11. Calculation of internal rate of return
12. Ratio analysis.

Apart from these main statements, the sensitivity analysis in terms of sales price realization, raw material pricing, capacity utilization etc. should also be done and the necessary statements should be attached.

5.4 Appraisal of Project by Lenders

The financial institutions while appraising the project look at various feasibility aspects as given below;

1. Economic feasibility
2. Technical feasibility
3. Managerial feasibility
4. Organizational feasibility
5. Commercial feasibility

5.4.1 Economic Feasibility

The AfIs being also called as Development Finance Institutions (DFIs) have certain social responsibilities to meet which form part of the economic feasibility. Some of the important points have been listed below:

- a] **Priority List**

For proper industrial development in the country, government gives priority for funding various sectors. Streaming out of this Project Management basic principle while lending to any of the projects, institutions banks give priority to projects coming under this priority list.

- **b] Proper Development of Various Regions in the Country is to be considered**

To help development of backward regions, earlier institutions used to give special concession in promoters contribution interest rates etc.

- **c] Ascertain Sustainable Demand**

The next important factor is to ascertain sustainable demand for the products to be manufactured by the Company. This helps institutions in deciding the capacity utilization that can be achieved by the project. This leads us to an important question of competition from multinationals.

- **d] Impact of Project on the Balance of Payment**

The foreign exchange is a valuable commodity and is to be used effectively. While looking at the economic feasibility it is important to find out the impact of project on the balance of payment scenario of the country.

- **e] Employment Opportunities**

As our nation scores over other nations in terms of labour cost which is mainly due to high population of our country, it is important to know whether the project can generate enough employment.

- **f] Minimum Economic Size**

In the present market scenario, the project has to stand in the global competition. This is possible only if the plants are of minimum economic sizes. This offers technically efficient plant with very effective cost of operations, benefit cost ratio, size of investment and benefits vis-à-vis generation internal rate of return (DCF).

5.4.2 Technical Feasibility

Aspects appraised are

- a] Technology is available
- b] Good technical staff

- « c] Proper designing of the plant
- d] Bids have been invited for selection
- e] Rate of technological obsolescence
- f] Proposed location
- g] Layout of the project
- h] Scope for expansion

5.4.3 Managerial Feasibility

Aspects considered are -

- a] whether promoters are entrepreneurs only or managers
- b] expertise
- c] experience in the related field
- d] past managerial experience
- e] capacity for developing a professional team
- f] proper delegation
- g] management style
- h] known in the related circle
- i] flow of managerial staff

5.4.4 Organizational Feasibility

While analyzing organizational feasibility, institutions normally look at the existing organization of the Company to find out whether the same structuring is adequate enough for the project.

5.4.5 Commercial Feasibility

- a] Procurement of raw material
- b] Licenses from municipality authorities
- c] Supply contract
- d] RBI clearance

5.4.6 Financial Feasibility

- a] Soundness of the promoters
- b] Some of the important ratios
 1. Debt-equity ratio = Ratio of Borrowed Funds to Owned Funds
 2. Current Ratio = Ratio of Current Assets to Current Liabilities
 3. Debt - Service Coverage Ratio (DSCR)
 4. Internal Rate of Return
 5. Return on Capital Employed [ROI] and
 6. A host of other financial parameters we have studied in earlier Units.

5.5 Hints for Financial Working in the Project Report

1. Calculate Capital Cost of Project excluding margin money requirements. This would help in deciding the capacities likely to be created.
2. Estimate Capacity Utilization - i.e., say 60/70/80% etc. depending upon the nature of industry and other relevant factors.
3. Calculate Production and Sales Quantity & Sales value.
4. Calculate Raw Material requirements and CENVAT credit available.
5. Calculate stores and Spares requirement.
6. Calculate Power and Fuel.
7. Calculate Direct Labour.
8. Calculate Selling, General, and Administration expenses.
9. Calculate Depreciation as per the Companies Act, 1956 and Income Tax Act, 1961.
10. Calculate Profit and Loss Account as per CAS/CMA data up to finished goods stage by completing the rest like excise duty on sales as reduced by CENVAT, repairs, other Manufacturing expenses etc..
11. Calculate Working Capital & Margin required as per CAS/CMA.
12. Add Working Capital margin to Capital Cost of Project to finalize Project Cost.
13. Firm up means of finance to match Project Cost.
14. Decide repayment schedule and Calculate interest on term loans.
15. Go to Profit and Loss Account once again to include interest on Working Capital and Term Loan and arrive at Profit Before Tax [PBT].
16. Calculate Income Tax
17. Calculate Profit After Tax [PAT]
18. Provide for dividends
19. Prepare Cash Flow, Balance Sheet, Break-even Analysis, Important ratios and other CMA data.

5.5.1 Project Equity - Various options for Financing

The Equity would consist of:

1. Contribution by the core promoters in the project;
2. Additional contribution by co-promoters;
3. Contribution by the collaborator;
4. Investment contribution by financial institutions/state Finance Corporations State Industrial Development Corporations/International Investment Institutions Multilateral Agencies [ADB, AFIC]/Banks;
5. Venture funding by venture capitalists or by Private Equity Investors;
6. Participation by general public in the Initial Public Offering;

5.5.2 Debt

The debt or the borrowing could be divided into the long-term fund requirements and short term funds requirements.

Long term debt (Term debt)

The long term funds requirements (or term debt as referred to in common parlance) could be met by tapping the following major source of financing:

1. All India Financial Institutions
2. Scheduled commercial banks
3. State Finance Corporations
4. State Industrial Development Corporations
5. Sector specific Government sponsored Institutions
6. Multilateral International Financial Institutions
7. External Commercial Borrowings
8. Debentures

Long Term Working Capital

The requirements of any corporate entity for long-term working capital could be serviced with the following category of financiers:

1. Scheduled Commercial Banks
2. India Financial Institutions
3. Investment Institutions like QIC, LIC, UTI, and Insurance subsidiaries.

Short Term Fund requirements:

These requirements are on a regular basis and are generally financed by way of following instruments:

1. Fixed Deposits from public;
2. Inter-corporate Deposits;
3. Short Term working capital, loans from financial institutions / banks Investment Institutions, Mutual Funds;
4. Short term NCDs/Bonds on retail basis.
5. Commercial paper with maturity upto one year;
6. Obtaining finance by discounting bills rose on customers;
7. Securitization of movable assets like debtors inventories, investments;
8. Acquiring assets by way of Hire Purchase Loans;
9. Acquiring assets on Lease from financiers.

5.3 Post-project Reviews

Much can be learned about the efficiency and effectiveness with which projects are managed in the organization through a Post project review [PPR] sometimes called as 'Post-implementation reviews'

PPRs take a large view to examine the rationale for the project in the first place. The PPR also examines the strategic fit of the project into the overall organizational strategy. PPRs offer insight into the success or failure of a particular project as well as a composite of lessons learned from a review of all the projects in the organization's portfolio of capital projects.

It is important that the review is considered from the differing viewpoints of the various stakeholders involved e.g.

- Project sponsors
- Benefiting functions and units
- Operational users
- Third parties
- Customers

Questions for Self-Study

1. Discuss in detail the contents of a detailed project report
2. What do you mean by economic feasibility?
3. What do you mean by financial feasibility?
4. List out the Hints for Financial Working in the Project Report
5. Explain in detail the various options of financing
6. Explain post project reviews

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Unit- II

Project Management

Introduction

Investment decision otherwise known as capital budgeting decision is perhaps the most important decision taken by a Finance Manager.

Whatever is the objective of the firm, whether profit maximization or wealth maximization, capital budgeting decision affects performance of the firm decisively. These investment decisions have the following implications for the firm.

1. They define the strategic focus and direction of the business. The capital expenditure made in new investments may result in entry into new products, services or new markets.
2. Capital budgeting decisions require large funds and generally have long repayment periods. The results of capital budgeting continue to impact the finances of the firm for many years. Due to long project life, assessment involves number of years of future events leading to difficulty and uncertainty regarding the accuracy of assessment.
3. Capital budget decisions are mostly irreversible. They involve investment in plant and machinery or new soft wares or technology etc. They are normally industry or user specific. If the project does not proceed ahead, it may be difficult to find buyers for the assets and the only alternative would be scrap the assets at a huge loss
4. An under investment will result in inefficient operations like inadequate capacity and, increased expenditure, non competitive production and pricing resulting in poor market share and have serious financial implications. On the other hand an over investment would result in higher depreciation and increased operating costs and result in liquidity crisis.

Therefore Managers carefully align capital investments with the short term and long-term company goals, analyze impact of such investments over a period of time and scrutinize capital budgeting decisions both technically and financially.

While the capital investment decisions of the firm are very important, finance Managers face certain difficulties in fully appraising the decisions. These difficulties are inevitable and are due to the very nature of the investment, which relies on future events for achieving the objects of the investment. The major difficulties are

Measurement of the costs and benefits of the investment proposal

Measuring the costs and benefits of the proposal is difficult particularly when involves intangibles like benefits of employment, improvement in quality of life etc.

Uncertainty associated with future

The precise value of cost and benefit is difficult to quantify as benefits are spread over a period in future which is characterized by uncertainty.

Difficulty of comparison

As the costs and benefits of an investment proposal is spread over period of time occurring at different points of time, comparing the values on a common basis is difficult due to the changes in value of money over a time horizon.

Learning Objectives

The learning objectives of this chapter is to understand in relation to project Management

- Various phases of investment process
- How the investment opportunity is identified
- How the investment proposal is put together
- How the cost of the project and means of finance are balanced
- Concepts like cash flows and time value of money
- How the feasibility of the project is determined

The investment process or Capital budgeting:

The investment process is quite complex and is divided into various activities.

These activities can be grouped into three distinct phases and form a cycle known as

Project Development cycle. The Project Development cycle has three phases namely Pre-investment phase, Implementation phase and operational phase.

1. Pre investment phase

This phase includes the following activities.

1. Setting the objectives of investment
2. Identification of investment / potential opportunities
3. Preparation of investment proposal
4. Studying the feasibility of the proposal
5. Converting a proposal into a financial project
6. Evaluating the project
7. Decision-making – accept or reject the project

Implementation phase

This phase includes the following activities

Setting up of facilities like

- Purchase and development of land
- Preparation of plans, blue prints, Estimates, engineering designs
- Obtaining approvals from various authorities
- Selection of vendors for supply of materials such as machines, cement steel etc.
- Selection of workers

Arranging funds for the project

- Negotiation and drawing up of legal contracts for technology, funds, construction etc

Construction

Actual construction of buildings and other civil works, provision of utilities like water, electricity etc.

- Erecting and installing of machinery

Training

- Training of engineers and other workers in the technology, familiarize workers with the machines/ factory Commissioning of the plant
- The fully built or assembled plant is commissioned and trial runs are made to ensure that the plant is ready to go on stream for regular production. This affords an opportunity to rectify any errors before the actual start of commercial production. This is technically a crucial and challenging activity.

Monitoring and review of project implementation

- Meeting the target dates for completion of various activities
- Avoiding cost and time overruns
- Continuous follow up on all pre commission activities and coordination and proper scheduling between various activities is key responsibility during this phase.

This phase is also known as the EPC Phase – i.e. Engineering, procurement and construction or commissioning phase of the project.

Operational phase

Once the plant or factory is commissioned, continuous production starts. The running of the factory ensuring

- Maintenance of machinery, periodic repairs to ensure less down time
- Ensuring timely and adequate availability of raw materials and other inputs
- Setting production targets and monitoring actual production
- Setting norms for quality and ensuring quality control
- Ensuring adequate working capital is the main activity in the operational phase.

This is otherwise known as Project performance review

Let us study in detail some critical activities in these phases.

Setting objectives of investment:

A company would make a capital investment for various reasons. The nature of the investment would depend on the purpose of investment and accordingly project would be classified. The general classification of investments is as under.

Classification of investment decisions:

The capital budgeting decisions of a firm can be broadly classified into following categories:

Replacement decisions:

In order to continue in business, a company has to periodically replace worn out machineries. In some cases the replacement may be to reduce cost on account of a newer and more efficient machine.

Expansion:

Capacity additions to increase out put of existing products, expanding territorial or geographical distribution networks.

Diversification:

Strategic decisions which may some times change the fundamental nature of the business like entering new territory or new market or to produce new product,

Safety or environmental projects:

Expenditure incurred to comply with changing regulatory requirements, (e.g. establishing central treatment plants for pollution control in leather units). These investments may become necessary due to Labour agreements or insurance policy terms or loan covenants.

Research and Development

In order to remain in business some times companies have to spend heavily on R&D. This is typical of Pharmaceutical or software development companies. The outcome is uncertain and expected cash flows or benefits form the expenditure may not materialize in future.

Long-term contracts

Companies can undertake contracts in the nature of Build Own Operate and Transfer, or contracts for maintenance or provision of services for specific customers. There may or may not be huge initial investment but the running costs has to be borne for a long time and revenues would also accrue over multiple years.

Differences in analytical approaches

Each of these projects requires a different approach in analysis.

Replacement for Maintenance decisions requires consideration of issues like continuance of operations or technology or production process. They are normally made without elaborate computations or decision process. Cost reduction decisions require detailed analysis and are discretionary. Expansion and diversification decisions are complex and need very detailed analysis and are taken only by the top management as they have strategic implications and long-term impact on business. Safety and environmental expenditures are mandatory and non-revenue generating in nature and are decided based on their size outlay and urgency. R& D projects involve probabilities of outcomes and require decision tree approach whereas long-term contracts require a DCF analysis.

In general, larger the outlay and longer the period for cost and revenue accrual, detailed and sophisticated analysis would be called for.

Identification of investment proposals:

Identification of investment proposals is also known as opportunity study. If the company having funds and is looking to invest the same then the study would be general and would encompass all investment proposals. But if the company has a specific proposal, like addition to existing capacity, the thrust and focus of the study would be very specific and limited.

In a company any department can identify an investment opportunity. The production department may identify a new product and generate a proposal to manufacture the same. Marketing department may identify a new territory to expand. The Finance department may suggest implementation of a new automated / computerized accounting system for better control of costs and monitoring. The HR department may suggest an investment in huge training facility.

A company as a strategic step of growth may also generate project proposal, where a committee or a department keeps scanning the environment for good opportunity for investment. In such cases the committee would be constantly checking various things to identify a profitable opportunity. Normally such checks or scan would be in relation to

- Legal frame works permitting or restricting investment opportunities like FEMA/ M RTP
- Industrial, export or import policies
- Treaties, International agreements like GATT, WTO, and Basel II
- Incentives and concessions offered to SSI , micro enterprises etc.
- Incentives and concessions offered to units in back ward areas, SEZs IT Parks etc.
- Changing industrial scenarios as evidenced by press reports, Industry associations' reports and Trade fairs etc.
- Suggestions from customers, suppliers and employees
- Activities of competitors

Once the project idea is conceived the idea needs to be scrutinized before it is presented to the Management for consideration.

Therefore any project idea, which appears interesting to the company, will be subjected to a preliminary project study. Later if the initial project analysis is positive a detailed feasibility study will be undertaken. A detailed project report (DPR) will then be prepared for necessary management action.

Coverage of feasibility study

A feasibility study is an important tool for decision-making. Accurate and adequate information about the project like technology, location, production capacity, demand, and impact on existing operations, cost and benefits to the company, time span for execution, resources needed should be spelt out in the report. Alternatives if any should also be suggested.

Market research or demand analysis, technical viability studies, financial or commercial feasibility studies are otherwise known as functional or support studies to aid the decision-making.

A preliminary feasibility study and the detailed project report later prepared would aid the management to appraise the project in different aspects. Project is appraised generally in the following areas. If one can remember the acronym METRE, then he can remember the various aspects of project appraisal easily. **METRE** stands for

M – Management

E - Economic viability (this includes market, commercial and financial)

T – Technical feasibility

R- Risk and returns

E – Environment

A project may be acceptable in terms of the market potential, technical feasibility, financial viability and returns. The risks associated with the project may be acceptable.

But if the project does not suit the philosophy of the management, or align with the business goal of the firm a company may not pursue such a project.

The Management appraisal is of two kinds. The first one is the appraisal with regard to the current management, its goals, strategic perspective and synergies of the new project. The second is the project's management set up, organizational structure organizational climate, expected management – labour relations etc.,

A strategic perspective would mean what the company wants to achieve, when it wants to achieve it and how much it is willing to expend in resources to achieve it. In short, the Synergy, time and cost (STC) would primarily determine whether the project would get a go ahead.

Mr. Seynive Tilles (HBR) states, “the most tangible expression of a company's strategy is the allocation of fund. Few things determine the future of the company as directly as the way it spends the money. Those activities which are treated generously are presumably the real basis of the company's future”

Strategic management appraisal – The BCG Matrix

The BCG Matrix introduced by the Boston Consulting Group is a tool for strategic (product) planning and resource allocation. Project planners use this to analyzes products on a matrix of two variables namely

1. Relative market share; and
2. Industry Growth Rate

The BCG Matrix is constructed as under:

RELATIVE MARKET SHARE			
INDUSTRY GROWTH RATE		HIGH	LOW
	HIGH	STARS	QUESTION MARKS
	LOW	CASH COWS	DOGS

STARS:

“Stars” represent products that enjoy a high market share and high growth rate.

While these products do earn high profits, they also require expanding production capacities and require commitment of additional investments. When the industry matures growth declines, additional investments are not required and ‘stars’ become cash cows, which produce profits, but does not promise future growth.

QUESTION MARKS:

These are the products, which have low current\present market share but have high growth potential in future. Expansion of additional market share and investment will augment earnings and convert them into “Stars”. However, as there is no guarantee that additional investments will increase the market share (potential may not realize) these are referred to as “Question Marks”.

CASH COWS:

High market share with low growth potential products are called Cash Cows. They have immediate high cash flows but the same may decline in future. Cash cow products have a significant impact on profit and cash flows. Even though cash flows lead to cash surplus, which could be used for investing elsewhere in business, the requirements of investments in the same product, is modest.

DOGS:

Products, which have low market share and limited growth potential, are known as “Dogs”. These products are in the decline stage of product life cycle and their potential is poor. Normally these products are earmarked for phase out over a period, rather than continue with the same.

From the BCG Matrix we learn that

“Cash Cows” - generate funds – need limited investment – on decline will become dogs.

“Dogs”, - already on decline and if and when divested, release funds.- no additional investment

“Stars” are future cash cows and require investments

“Question Marks” require further commitment of funds future prospects unknown – investment has an element of speculation.

In summary the Finance Manager while taking decisions as regards project financing understands that the outcome of the desired investment decisions would be as follows:

STARS	QUESTIONS MARKS
CASH COWS (FUND GENERATION in future)	DOGS (FUNDS RELEASED IF DIVESTED at present)

Strategic management appraisal – GE'S STOP LIGHT MATRIX

The General Electric Company, (GE) incorporated in the USA developed The Stop-Light Matrix for guiding resource allocation, which analyzes various products of the organization in terms of two key issues namely Business strength and Industry Attractiveness. Business strength is the strength of the organization against its competitors. Industry attractiveness is special reason that invites investment or potential of the industry

Products are rated in terms Business strength and Industry attractiveness and decision is taken as regards financial commitment. Products, which are favorably placed, will justify Resource commitment, while products, unfavorably placed, will call for divestment. Products that are placed between the two extremes of parameters may also be considered for moderate investment.

A summary presentation of GE's STOPLIGHT MATRIX is as follows:

		Business Strength		
Industry	Attractiveness	STRONG	AVERAGE	WEAK
		High	Invest	Invest
		Medium	Invest	Hold
		Low	Hold	Divest

Some authors present the GE Matrix in a slightly different form as under

Industry attractiveness

Company Position & Strength	Premium Invest/Grow	Selective Invest/Grow	Protective Selectivity/Earnings	High
	Challenge invest/ Grow	Prime selectivity/ Earnings	Restructure Harvest/ Divest	Medium
	Opportunistic Selectivity/ Earnings	Opportunistic Harvest/ Divest	Harvest/Divest	Low
	High	Medium	Low	

Strategic management appraisal – The SPACE model

Strategic Position and Action Evaluation (SPACE) is “an approach to hammer out an appropriate strategic posture for a firm and its individual business.”

SPACE is an analysis of the following four dimensions in as in a two-dimensional portfolio analysis and involves a consideration of:

1. Company's competitive advantage
2. Company's financial strength
3. Industry strength
4. Environmental stability

Various factors are evaluated for determining each of the dimensions and they are summarized below:

DIMENSIONS	FACTOR		
EVALUATED			
1. Company's competitive advantage	-	Market Share	
	-	Product	Quality
	-	Product life cycle	

- Product Replacement cycle
 - Customer Loyalty
 - Competitor's Capacity Utilisation
 - Technological know-how
 - Vertical integration
 - Return on investment
 - Leverage liquidity
 - Capital
- Required/Available
- Cash Flow
 - Ease of exit from market
 - Risk involved in business
3. Industry Strength
- Growth potential
 - Profit potential
 - Financial Stability
 - Technological know how
 - Resource utilization
 - Capital intensity
- utilization
- Ease of entry into market
 - Productivity
 - Capacity Utilization
4. Environmental stability
- Technological charges
 - Rate of inflation

- Demand variability
- Prices of competing products
- Barriers to entry into market
- Competitive pressure
- Price elasticity of demand

Application of SPACE model:

Various factors on each of the four dimensions, as illustrated above, are evaluated and scored on a seven-point scale varying from 0 to -7, with 0 reflecting the most favorable assessment and -7 the most unfavorable. The average numerical values for four dimensions viz. financial Strength (FS), Industry Strength (IS) Competitive Advantage (CA) and Environmental Stability (ES) are plotted in four dimensions on the axis of the SPACE chart and connected to get a four-sided polygon reflecting the size and direction of the assessment. The polygon would indicate a basic strategic posture. There are four such postures namely

Aggressive Posture indicating that the company can fully exploit available opportunities and enhance its market share. As the company has high financial strength, high industry strength, enjoys competitive advantage and belongs to an attractive industry and operates in a relatively stable environmental conditions. This posture is akin to Michael Porter's generic strategy of overall cost leadership.

Competitive Posture indicating limited financial strength, medium competitive advantage in an attractive industry and operating in a relatively volatile or unstable environment, necessitating the company to maintain and enhance competitive advantage by improving /differentiating product; widening the product line, improving marketing effectiveness and mobilizing, augmenting financial resources. This posture is considered to be quite similar to Michael Porter's generic strategy of product differentiation.

Conservative Posture indicating a company having limited competitive advantage, in a not so attractive industry but enjoying financial strength and operating in a relatively

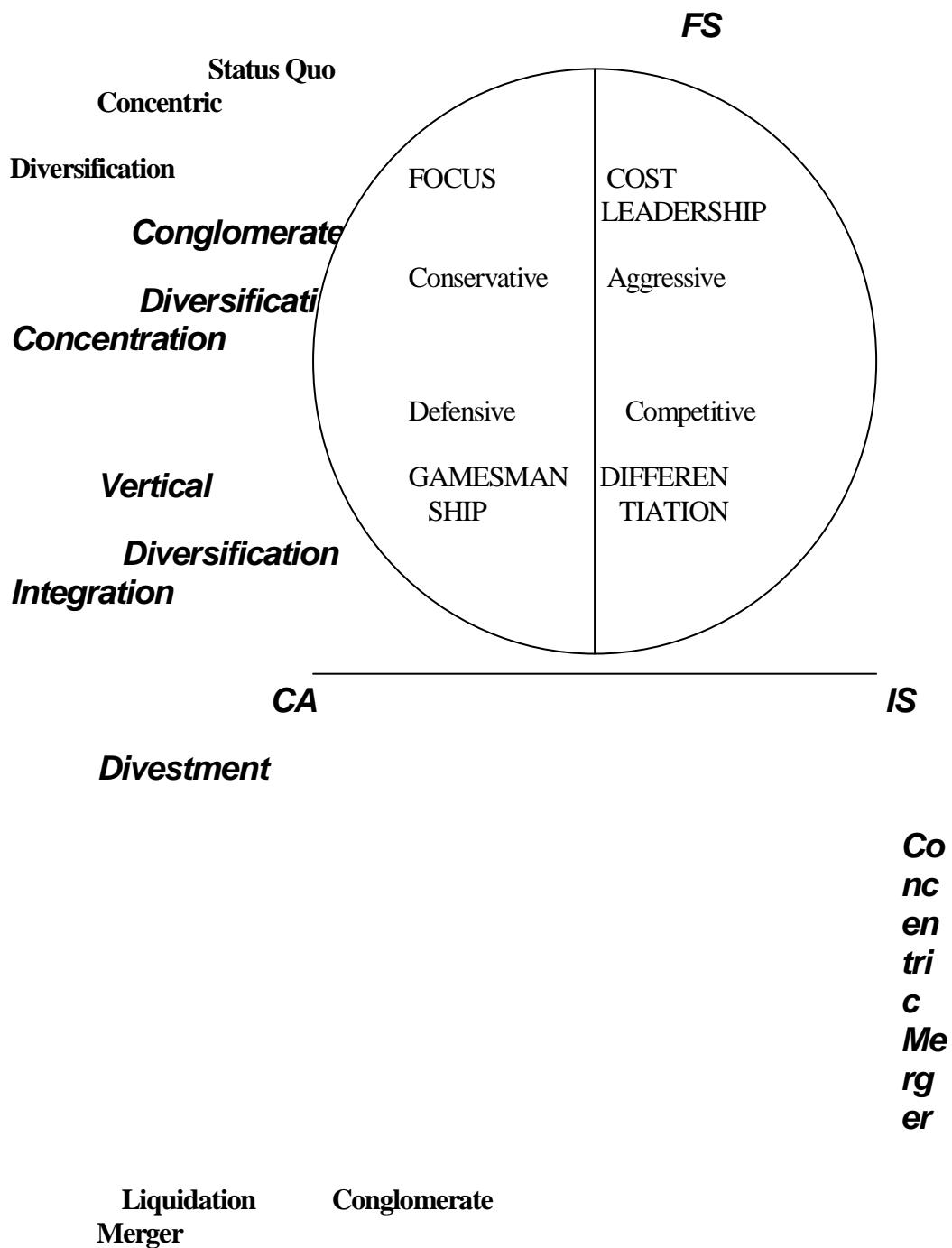
stable environment. Such a company should endeavor to cut down non-performing product, control costs, improve productivity, introduce new products and enhance sales by profitable market expansion. This posture can be compared with Michael Porter's generic strategy of 'focus'.

Defensive Posture indicates a company that lacks both competitive advantage and financial strength and belongs to a not-so-attractive industry and operates in an unstable environment. All the four dimensions are weak and works against the company. It is advisable for a such a company to initiate measures like discontinue unviable products, tightly control costs and monitor cash flows strictly, cutting down/reducing capacity and postponing or limiting investments.

The basic strategic posture, determines the appropriate financial as regards the project-related investment.

SPACE Analysis and Generic Strategies

The SPACE analysis enables determination of the basic strategic posture of a company and helps to work out alternate generic strategies and key options, that are crucial to important resources allocation. The generic strategies and key options associated with them are presented here under:



Retrenchment

Turnaround

ES

The second type of management appraisal would concern the following

Aspects of the management of the project:

Whether the new unit should be an independent company or a division of the existing company or a subsidiary

If an independent unit, then what business form it should have

- *Sole proprietorship,*
- *Partnership*
- *Limited company private or public*

Who should be the board of directors?

Who should head the new unit?

What type of personal qualities the new company executives require like risk taking, initiative commitment etc

What should be projects organizational culture

People oriented system oriented

Will there be Dissensions among the promoters

Will there be dominance by any one particular promoter – like technology provider

Management appraisal is can never be fully quantitative and objective. There will be quite a role for subjective perceptions based on experience and decisions would to some extend depend upon gut feelings, context and confidence.

TECHNICAL APPRAISAL

Technical Feasibility and Financial viability is primarily appraised for any project.. Technical appraisal is mainly undertaken to ensure that the project is technically viable no possible gaps or gray areas in technology, know-how, equipment, input supply, organization of production facilities etc. exists. Technical appraisal is key to assess the financial viability of the project. The computation of projects' ability to earn satisfactory return on investment made and ability to service equity and debt depend on the project technical viability. Technical appraisal is basically concerned with aspects like technology, design, layout of the plant, infrastructure facilities envisaged for the project and the possible problems in various areas related to these technical aspects, which can be broadly grouped under the conception, construction and continuation phases:

The likely problems relating to the Project Conception and Formulation to be appraised in advance that are stated below would be analysed in detail.:

Location	issues in relation to
	<ul style="list-style-type: none">• Project site – accessibility –exact location• Project office - Site Support Operations• Land –purchases-development -cost• Nearness to Raw Material Suppliers

- Work Force availability – mobility – availability of amenities
- Market Access – storage
- Physical, social and community infrastructure and facilities
- Availability of Utilities like Telecommunication, Water, Power etc.
- Ease of Transportation
- Other Industries around the site (development prospects)

Selection of Process / Production Technology

- Whether relevant, up to date
- appropriate and up gradable
- Dependable with proven track record
- Not obsolete or too advanced
- Collaboration tie-ups
- Collaborator details
- Collaborator Track Record

Level of Operations

- Size of the Unit and Plant capacity
- Capacity Utilization
- Product mix

Detailed Project Engineering

- Logistics
- Maintenance / Service back-up
- Spares and consumables
- Quality Standards / orientation

- Raw Material Suppliers / Vendors

Project Implementation / Work Schedule

- Project Competitiveness Indicators
 - Manufacturing Lead time
 - Work-in-Progress
 - Through-out
 - Capacity
 - Performability
 - Flexibility
 - Quality

The likely problems during the Construction and Project Implementation to be appraised in advance could be stated as follows:

- Civil construction
- Civil structures and layouts
- Projected charts and layouts
- Machinery Procurement
- Machinery Installation / Commissioning
- Trial Run

Problems pertaining to the period when the project is in operation

- Raw Material Procurement
- Repairs and Maintenance
- Power Supply Availability and voltage fluctuation
- Water supply / Telecom facilities
- Other infrastructure facilities / utilities status
- Quality control standards / efforts
- Organization of Production Function

(Flexible Manufacturing System)

- Data collection / information
- Feed back / Reporting / Action etc.

Manufacturing Process / Technology

When product and location are decided the manufacturing process and technology that is to be adopted for producing the product assumes importance. A process flow chart is made after a thorough study of the whole process starting from raw material stage to the finished goods taking care to provide for all contingencies depending on the raw material, its usage and the transformation as finished product. Due to globalization and competition process control systems now-a-days available through the computer systems has gained more importance to achieve 100% accuracy.

Technical Arrangements

The unit might require transfer of technical know-how or services of technical and specialized personnel for the manufacturing process to maintain the quality and meet global competition.. for this pre-determined contracts and finalization of terms even before the commencement of the project at the conceptualization stage is necessary.

The type and duration of the technical arrangements and nature and extent of training and development activities need to be examined before entering into actual contract as this has financial impact on the project.

Size of the Plant

Size of the plant is determined by the demand-supply situation of a particular product and end-use of the product. A conscious note is taken of the production capacities of existing projects in determining the size of the plant. Production capacity is directly related to size of the plant, which in turn has a direct bearing on the financial calculation in relation to annual sales. In the initial years about 60-70% production capacity is taken into account for study of viability of the project.

Product Mix

The process, product mix required to arrive at the final product produced, cost factors of the product mix are also taken into account to arrive at cost at various levels of production and its cost impact of the manufacturing.

Selection & procurement of Plant and Machinery

The selection of proper plant and machinery, appropriate and latest technology is very important in the success of the project. The availability domestically or need to import the complete range of plant and machinery and need for training the technical personnel manning the machines, cost of such training, deputation abroad for training are also taken into account while computing the landed cost of the machinery. The cost of locally available machinery, its record of performance, facilities for servicing and maintenance are taken into account before importing the machinery. But no compromise on machine quality and performance is made when comparative cost advantage is analyzed in selection of machinery.

The order time, lead time for delivery, time for installation, tests and trials all would be taken into consideration. As investment in plant and machinery will be huge in larger projects time and cost factor from the first day of investment is considered. In certain projects pre order discussions are held to avoid undue time and costs overruns on machinery procurement. Incase of new projects, purchase of machinery is timed to coincide with civil work completion.

Plant layout

The engineering layouts are designed to ensure maximum utilization of costly shop floor space. Safety norms to ensure smooth working of the machines and to avoid work place hazards and accidents to the labour

are taken into consideration. The layout is designed to have sufficient moving space for worker well ventilated and lighted with sufficient space for outflow of effluents safely.

The building codes and norms for safety, structural design, strength of the building for each type of industry as laid down by Building standards is strictly followed.

APPRAISAL-MARKET

A “technically feasible” project to be “financially viable” should realize the projected unit sales and earn sales revenue, ensure smooth cash flow, funds flow and the resultant surplus generation. Therefore, Market Appraisal of the project becomes important. Market appraisal mainly focuses upon the estimates of aggregate demand for the product/service and market share offered by the proposed project. Therefore, the appraisal should be really critical and realistic and should not project only the optimistic scenario. It is therefore important to appraise and analyze incisively, intelligently and meaningfully various factors affecting the market size, the market share and in the ultimate analysis, the sales volume and the sales revenue generation. The analyst must be clear in his approach to distinguish between the Sales Concept and Marketing concept.

He should be aware that under the sales concept, the industrial concern earned profits by increasing the sales volume. Under the marketing concept, an essential ingredient is customer oriented and profit is the result of customer satisfaction. In essence “Selling tries to get the customer to want what you have. Marketing, on the other hand, tries to have what the customer will want – where, when, in what form and at what price”(Levitt).

While assessing the market, it must be remembered that goods/services are being created not because they will be useful, but because somebody needs and wants them. Therefore major attention to even minor details must be given. The design of the product, packaging, channel of distribution, sales network, price, sales force training, and management, promotional efforts and advertising, the product in planning and market audit of the competitive environment all become important and hence should be analysed.

Market Appraisal should cover and study the following:

- Nature of Business
- Customers profile
- Communication with customers
- Size location and efficiency of distributional channels / Network/Sales force
- Strategy regarding segmentation, targeting and positioning (STP)
- Product differentiation and price discrimination

Results any analysis regarding

- Inadequate demand
- Product defects/quality
- Link between product cost and price
- Poor timing of entry into market
- Competitions/competitive reaction
- Insufficient promotional efforts

The market appraisal should focus on the future based I the analysis of the above factors and should broadly cover the following aspects:

- Likely size and growth of the market/demand
- Market Determination in terms of Geographic, Demographic, Psycho graphic, Synchro graphic groupings
- Potential customers new Market/Customer location
- Competitors analysis and improvements in Pricing policy
- Marketing strategy and Advertising/Promotional strategies (Media planning,)
- Unique sales proposition (USP), if any
- Present/future marketing channels and Distribution Network
- After sales service, if required and CRM plans/policy, if any.

- Product life cycle
- Logistics/supply chain management (Warehousing, Transport etc.)

DEMAND ANALYSIS

No market analysis can be made in the ultimate analysis without a Demand Forecast for the product/market. Demand analysis, is a technique of collection of data, from primary and secondary sources, and preparation of estimates using certain Demand Forecasting Techniques. Demand analysis throws light on effective demand, Customers choice, the ability and willingness to pay for the product and has a direct correlation with Market Appraisal and the Financial Viability of the project. Any project evaluation would be incomplete if the demand analysis is not correctly made and assessed. Therefore, let us discuss, in brief, the various methods of Demand Forecasting.

Primary and secondary sources of information:

The product to be manufactured could be an import substitute. The buyers might be importing from abroad at a high cost. There may be incentives provided by the Government for production of import substitute items to save on foreign exchange. All these could affect demand pattern. The future demand, availability and supply needs to be studied in depth. There may exist a huge export potential for the proposed product., which need to be considered. With faster communication and availability of information freely it is easier to know the demand trends all over the globe and target our product and market it.

The data or input for the demand analysis can be gathered by a market survey. This will naturally involve employing surveyors to carryout

detailed market survey and document the findings to arrive at proper forecasting. This will be a primary source of information, but would be costly in terms of time, money and effort. This information is always used to supplement the secondary information to arrive at a balance. As detailed market surveys are difficult to manage a sample survey is normally used with a statistically significant population f universe as sample.

The key steps in a sample survey are

- Definition of the target population
- Selection of sampling scheme and size of sample
- Preparation of a questionnaire
- Selection and training of field survey staff
- Obtaining responses for the questionnaire
- Scrutiny and verification of data collected
- Statistical analysis and interpretation of the results

Secondary sources of information:

Some of the reliable secondary sources of information are:

- Census of India
- National sample survey reports
- Five year plan reports
- Yearbooks – India yearbook, statistical yearbook, Malayala Manorama year book etc. Economic survey prior to budget by the Ministry
- Publication of RBI - DGFT- various ministries
- Stock exchange directories
- Press reports
- Annual survey of industries by The HINDU
- Trade reports

After collection of the primary and secondary data, the same is analyzed using various demand Forecasting methods which are briefly discussed below:

(A) Qualitative Methods

Jury method

In this method, the opinions of a group of professionals are obtained on the likely sales in future. These individual estimates are then combined into sales estimate.

This method involves trust in the ability of the person consulted and is quite popular among practitioners in the same area of business.

Delphi Method

This is an iterative method and involves opinion of experts

A questionnaire is sent to a group of experts and their views are elicited.

The responses received are summarized, and send back to the same experts without disclosing the identity of experts along with the questionnaire seeking reasons for any “extreme” views expressed in the first round. The same process is continued until a reasonable consensus/agreement emerges among the expert group.

(B) Time Series Projection Methods

Trend projection Method

This method is based on the assumption that the behaviour of the variable would continue in similar/same direction and magnitude, as in the past. While arriving at the forecasting past trend method is adopted as a guide depending on the consumption pattern of the society as a whole. Further, the changes that are likely to take place are considered to arrive at the future demand. It is, however, imperative to present the data in a graphical form to analyze the past data and then fit in the trend line.

The trend may be represented by any one of the following relationships viz.

- i. Linear relationship
- ii. Exponential relationship
- iii. Polynomial relationship
- iv. Cobb Douglas relationship

Exponential Smoothing Method

In this method the forecasts are modified in the light of observed errors..

Moving averages Method

Under this method, the forecast for the next period is equated at a constant time span to the average of the sales for several preceding periods.

(C) Casual Methods

Chain ratio Method

The chain ratio method uses a simple analytical approach to demand estimation. The potential sales of a product may be estimated by applying a series of inter-related/inter dependent factors to measure the aggregate demand.

Consumption-level Method

This method estimates the future level of consumption of a product, based upon the elasticity co-efficient. The income elasticity of demand and the price elasticity of demand obviously are important consideration for this method.

End use Method

There is always an Ends-Means relationship like, the demand for petrol/tyres would depend on the number of vehicles. Using this logic a list of industries (end users) wherein the product is consumed is made and quantity and volume consumed by them is calculated. This enables

preparation of detailed plan for production of definite volumes/quantity vis-à-vis present supply. This also serves as a method for arriving at demand supply gap. The End use method is considered more suitable for estimating the demand for intermediate products.

Leading Indicator Method

There are some indicators, ahead of other indicators, which indicate changes in levels of consumption ahead of other variables. These variables are known as lead indicators and others are known as lagging variable. The change in the urbanization (e.g. government plan to construct a satellite city) , a lead indicator would result in changes in demand for housing, demand for air conditioners or prices of building materials (lagging variable).

Identifying the correct and appropriate lead indicator and establishing the relationship between that and the demand variable to be forecast would be the key process in this method. But unstable relationship between leads and lag indicator over a period of time and difficulty of identifying the appropriate lead variable limit the use of this method.

Econometric Method

Econometric method is building a mathematical model representing the economic relationship between various variables incorporated in the model. It is based on economic theory and is primarily used to forecast the behaviour of such variables given certain conditions. The models can be built for single or multiple variables and can involve single, simultaneous or polynomial equations.

For e.g. the single equation model can be explained by the following equation

$$D_i = a_0 + a_1 P_t + a_2 N_t$$

Where

D_i = demand for a product in year t

P_t = price for the product in year t

N_t = income in the year t

The construction of an economic model requires expression of an economic relationship in mathematical form known as specification. It requires determination of parametric values known as estimation

Accepting or rejecting the specification after appropriate statistical test known as verification. Then prediction, which is projection of the future value of the explained variable, is obtained.

Merits of the model are

Understanding of the complex cause- effect relationship is clear and specific

Provides a basis for testing the assumptions

Judging the results as to their sensitivity to changes in assumptions

But the down side is ht it is expensive and data demanding and requires a expert to compute.

Appraisal – Environmental

Over the years, due to better understanding of nature and concern and developed nations' attitude there has been an increasing awareness about and a desire to prevent the damage being caused to environment by different projects either underway or likely to be taken up.

Konkan Railway, Pune-Bombay Express Highway, Tehri Damn Project, Sardar Sarovar Project, the Zuari Fertilizers in Goa are some of the examples where the environmental/ecological consideration not only delayed the project, resulting in to time overrun but also inflated the cost estimates, endangering the very basic viability of the project. Sterile Industries proposal at Ratnagiri in Maharastra had to be scrapped for ecological considerations. Kudangulam Atomic project and Sethu Canal

in Pak –strait have caused major political storms in the country. Environmental / Ecological appraisal, therefore, assumes a great deal of significance. Such an appraisal/analysis becomes particularly important in the case of Power Plants, Dams, major irrigation Projects, Chemical & such other environment polluting industries. The case of tanners in Tamil Nadu is case in point.

An environment appraisal/analysis considers the following questions because answers could have a serious impact with regard to both the time span and costs involved in the project.

- The likely damage caused by the project to the environment
- Whether the damage is irreversible, permanent
- Whether the impact can be reduced or mitigated
- The cost of the restoration measures or mitigation
- What are the acceptable limits the environment can sustain

The State and Central Pollution Control Boards have industry wise guidelines for issue of certificates in respect of Air, Water and sewerage emissions as well as chemical, biological and radioactivity wastes and their disposals. Due to legislation for pollution control permission to start may become difficult or impossible to obtain. Any disregard to these aspects, in the event of a disaster, may impose on the company both monetary and criminal liability as in the case of Union Carbide Industries. This philosophy of this aspect is explained by the statement, “You have not inherited the earth. You have borrowed it from the next generation”.

Appraisal – Financial

A project should be technically feasible and financially viable also before investment is made. Financial Appraisal focus on the aspect of assessing the financial viability

From the financial perspective, the following aspects are analyzed.

1. Capital cost of the project
2. Sources of funds (Meaning of financing and long term funds)
3. Production, Sales Projections/Estimates
4. Production costs
5. Working capital requirements and sources of working capital

These information are then presented as

1. Projected working results/profitability
2. Break even point Analysis
3. Projected cash flow/Statements
4. Projected Balance Sheet

For easy understanding and comparison and analysis.

1. Capital cost of the project

Capital cost of the project includes the cost and related capitalized expenses in respect of the following:

- a) Land & site development
- b) Buildings
- c) Plant & Machinery
- d) Engineering & Consultancy fees
- e) Misc. Fixed Assets
- f) Preliminary and Pre-operative expenses
- g) Provision for contingencies
- h) Margin money for Working capital.

2. Sources of funds

This capital cost is met by the following sources:

- a) Equity Contribution
- b) Venture capital participation as equity

- c) Long term loans from public raised as debentures
- d) Bank or institutional finance as long Term Loan
- e) Borrowings from friends/relatives etc (secured or unsecured)
- f) Government incentives like subsidy /seed capital etc.

Once cost of the project and means of finance are identified and finalized then the profitability of the operations and the expected cash flows are estimated. The projected financial statements are then used to analyze the viability of the project using financial tools like

Ratio Analysis

- a) Debt Equity Ratio
- b) Current Ratio
- c) Debt Service Ratio
- d) Profit ratio such as Gross profit margin, Net profit margin and retained profit ratio

Break-even Point

Margin of safety and operating and financial leverages

Project evaluation and Discounted Cash Flow Techniques such as

1. Pay back method
2. Average rate of return
3. Profitability Index
4. Net Present Value
5. IRR

In addition in large infrastructure projects a social cost benefit analysis is also done.

Component of Cost of the Project

The various components of the cost of the project, which are required to be financed by long term funds covers the following: The cost referred

here could vary considerably depending upon the location, topography and such other factors.

1. Land and site development

- i. Basic cost of land, stamp duty and conveyance charges and other associated fees/duties
- ii. Premium payable on lease-hold and registration charges
- iii. Cost of leveling and development
- iv. Cost of developing approach and internal roads and enclosures and gates
- v. Cost of bore /open tube wells/water supply arrangements like piping, overhead tanks

2. Civil construction works

- i. Main building housing plant and equipments.
- ii. Buildings for support services (workshops, water supply, laboratories, steam supply etc.)
- iii. Godown, warehouses, open storage/yard facilities.
- iv. Administrative and general use buildings like Guest houses, Time office Security Towers, Canteen, Staff quarters, Project Office Garages etc.,
- v. Other civil works like Sewer, drainage, Effluent Treatment Plants etc.

3. Plant and machinery

- i. Cost of machinery
Cost of machinery purchased locally would include core cost, sales tax, transport charges to site, octroi taxes etc.
Cost of imported machinery would consist of either FOB (Free on Board)or CIF value, transportation cost, import duty, clearing and forwarding charges and loading, unloading charges etc.
- ii. Cost of stores and spares
- iii. Foundation and installation charges will also be added and capitalized with the cost of machinery.

4. Technical know-how and Engineering fees

Payment made to consultants for preparing detailed technical project reports, finalization of a particular technology, selection

of plants/machinery, the vendor/supplier and such other matters.

5. Expenses on training for project commissioning

Expenses towards travel, stay, salaries and allowances of foreign technicians for initially setting up the project and commissioning the same through trial runs and training national technicians abroad have to be considered as a part of project cost.

6 Miscellaneous fixed assets

Miscellaneous Fixed Assets used by the factory would generally include.

- i. Furniture
- ii. Office Equipment
- iii. Vehicles
- iv. Generating sets and Transformers
- v. Effluent Treatment Plant (if applicable)
- vi. Workshop/laboratory/safety equipments
- vii. Deposits for utilities for water/electricity/telephone etc.

5. Preliminary expenses

Expenses incurred on project identification, market research, and feasibility report, company formation are considered as Preliminary Expenses.

6. Capital Issue Expenses

Expenses like underwriting and brokerage fees, printing and postage expenses, advertising and publicity expenses, listing fee, stamp duty etc. incurred to raise capital from the market are referred to capital issue expenses.

7. Pre-operative expenses

Expenses, which are incurred before commercial production, are referred to as pre-operative expenses and they include

- i. Establishment expenses
- ii. Rent, rates and taxes
- iii. Traveling expenses
- iv. Interest and commitment charges on borrowings
- v. Insurance charges
- vi. Mortgage expenses
- vii. Interest on deferred payments

8. Provision of contingencies

Contingencies provision made to cover unforeseen expenses and escalation are provided for normally at

- i. 10% of total cost if implementation period is a year or less and
- ii. An additional 5% provision is made for every additional year beyond a year.

9. Margin money for working capital

Commercial bank do not provide 100% working capital finance and insist on part of working capital being contributed by the borrower. This contribution towards working capital by the promoter is known as 'margin money'.

Sources of Funds/Finance

The usual sources of project finance are as follows:

- i. Equity/share capital
- ii. Terms loans
- iii. Debentures
- iv. Deferred credit/payment
- v. Incentives/subsidies
- vi. Internal accruals (for existing units/companies)
- vii. Misc. sources like
 - Public deposits

- Deposits from Friends/Relatives
 - Unsecured loans from promoters
- viii. Venture capital
- ix. Foreign Direct Investment (FDI)
- x. Foreign Institutional Investment (FII)
- Choice of a particular source, depends upon
1. Government regulations
 2. Terms and conditions of financial institutions like
 - Debt Equity ratio (ideally 1:1)
 - Promoter contribution (25% or more etc.,)
 3. Rte of interest, loan term, market conditions with regard to cost, risk, control and flexibility.

For the purpose of understanding the concept of cost of the project and means of finance a sample financing plan is given below

ABC Ltd decided to finance their project for setting up a studio and software facilities by way of an equity issue. The cost of the project and the means of finance were as follows:

PROJECT COST	Rs. (In lakhs)
– Land and buildings	315
– Equipments	328
– Misc. Fixed assets	76
– Software production, procurement/	
Commissioning	129
– Preliminary and pre-operative expenses	15
– Margin money for working capital	58
– Provision for contingencies	12

	Total	933
MEANS OF FINANCE		Rs. (In lakhs)
– Rights Issues of equity shares	589	
– Public issue of equity shares	344	
	Total	933

While the project finance could be obtained from various sources , the specific means of finance for a particular project under consideration is typically determined by

A) NORMS OF REGULATORY AUTHORITY AND FIs:

The approval of the regulatory authority/agency is a pre requisite to the proposed means of Project Finance and should conform to certain norms laid down by the Government or the Financial Institutions in this regard. This is to ensure prudential norms/practices to project financing decisions and to providing a certain degree of protection to the investor..

B) KEY BUSINESS CONSIDERATIONS:

The key business considerations, which are relevant for the project financing decisions, are:

- i. Costs (Involved)
- ii. Risks (Envisaged)
- iii. Control (Desired)
- iv. Flexibility (Expected)

Project Implementation

After appraisal and sanction of the project, the sanctioned funds are disbursed by the lending agencies and by the management or by venture capitalists if equity is raised. The supervision/follow up of the project starts from disbursement to commissioning by these agencies on an ongoing basis.

Process of disbursement by banking or lending institutions:

1. Issue of sanction letter/ advice indicating the normal terms and conditions and special conditions if any communicates sanction
2. The customer/borrower conveys his acceptance of the terms and conditions (within 30 days from the date of receipt of sanction advice)
3. A loan agreement stating clearly the various terms and conditions of the loan. Is executed by duly authorized signatories.
4. Security to the loan as agreed upon will be charged in favour of the lender.
5. Money disbursed in tranche as agreed on progressive basis ensuring end use.

After completing of all the necessary formalities regarding disbursement of loan, furnishing of security and creating of charge, special attention needs to be focused on the implementation phase to ensure that there are no cost and time over-runs and that the project financed would be executed/implemented within the time schedule and financial outlay envisaged.

During project implementation monitoring agency bestows attention upon internal and external causes, which could lead to time and cost overruns. The various reasons for cost and time over-runs could be summarized as follows:

- Change in the project concept
- Change business environment.

- Overspending or underestimation of costs
- Leakages and deliberate seepages (corrupt practices) in the purchases of construction materials and equipments.
- Delays in recruitment of staff, availability of utilities like water and power
- Failure to adhere to terms of sanction and delay in disbursement.
- Delays Short supplies of materials/ machinery installation
- Changes in Government policies like licensing, excise customs duties etc.
- Foreign currency fluctuations.

These over runs could impact the project implementation resulting in

- Increase in pre-operative expenses.
- Adverse impact on viability of the project and industrial sickness.
- Lost market opportunities.

To avoid such a situation, an information-monitoring system is established with various reports to ensure effective monitoring and follow-up to detect and remedy any adverse overruns.

Project Report – format and content

A Project Report is a detailed plan of action. It helps decision-making and follow-up of the project through various stages of implementation. A Project Report, therefore, is a comprehensive report on all aspects of appraisal financial, marketing, technical, competitive, regulatory or managerial – in detail. It spells out modus operandi for project implementation and realization of the Project objectives.

Such a report referred to as the Detailed Project Report (DPR), is a pre-requisite for Project Funding. The quality of the contents of the DPR has

a significant impact on the extent of reliance that can be placed on using it as a decision tool.

The Detailed Project Report should cover and analyze the following

FINANCIAL ASPECTS:

Intimate Project cost and Means of finance

Specify Margin money/promoters contribution requirements

Advise on Capital structure and Promoter's equity/stake

Provide Detailed Financial Analysis for term Loan/Working Capital Loan

Provide Profitability and rate of returns and Pay Back etc.

Calculate Break-even point

Work out Ratio Analysis, Cash flow/Funds flow

Indicate Diversion of funds (if any)

- From one unit to another
- From current to Fixed Assets.

Spell out Credit/collection policies

Provide information on Trends in financial markets

Specify control measures on Cost/Time over runs

Indicate labour requirements, wage levels and cost,

Indicate working capital requirements,

Specify actions plan for execution of project and expenditure control during construction, Analyze profitability

MARKETING ASPECTS:

Estimate demand for product, market size, market share

List details of competition

Advise on Pricing, Distribution and Promotion

MANAGEMENT ASPECTS:

Draft Promoter's Vision/Mission

Spell out the experience of the promoters in execution of projects in the past.

Provide Information on

Management style & Response

Organization Building & Climate

Organization Structure - Person/System oriented

Succession policy/problems

TECHNICAL ASPECTS:

Should list required equipment by type, size, and cost, specification of sources

Specify in broad terms input and outputs norms

Indicate Technology, alternate techniques of production, choices in process

Indicate plant size, Plant capacity,

Indicate raw materials Spares/components needed with sourcing details,

List and describe alternative locations,

Detail Collaboration tie up, Collaborator Detail and Collaborator Track Record

Provide Detailed Project Engineering, Logistics and Maintenance information

Information on Back-ups, Quality orientation, and Quality standards

List of buildings required and structures by type, size and cost,

Inform specifically supply sources and costs of transportation services, water & power Supply and preparation of layout

Advice on pollution control norms/methods

Regulatory social-public issues

Examine Policy in respect of the specific industry in the areas of

- Economic & Industrial

- Financial & Taxation
- Law and order & Environmental
- Manpower availability & Employment generation
- Social Advantages/disadvantages
- Environmental impact
- Distribution/Disbursed impact

The DPR should conduct a sensitivity analysis to

- Assess degree of risk
- Assess sensitivity to changes in the assumptions and determine their criticality.

Related concepts in project evaluation

Project evaluation comprises of financial, non-financial and technical aspects. Technical aspects deal with engineering and scientific aspects and commercializing technology. Non-financial aspects may include legal requirements, management philosophy and social causes. But whatever the other aspects, financial appraisal or evaluation is a must for every project even though the outcome may not be the decision criteria for establishing the project.

Concept and Computation of cash flows

Financial appraisal of a project deals with cash flows. Cash, which goes out of the firm, is known as cash outflow. Typically an investment in a project is an out flow. The cash that is received in future from the project is an inflow. We should remember that cash is different from income.

Cash flow and not income flow is central to project evaluation. The results of an evaluation of a project are only as good as the accuracy of our estimation of cash flows. The following illustrates computation of cash outflow.

Cash outflow on installation of a machine world include

Cost of new equipment

Labour and erection costs

Maintenance costs

While computing such outflows we should not include interest costs on debt employed.

If the cost is not incurred all at once but over a period of time say as in installment purchase then the out flow will continue in subsequent years also till the entire cost is paid out. In computing cash flows sunk cost are ignored and only incremental costs and benefits must be considered. If the machinery bought has any scrap value or salvage value the same would be an inflow in the year of actual receipt and this may improve the overall cash flow pattern. When the implementation of a project involves additional inventory receivables etc., then the same are treated as cash outflow at the time they occur. As increase or decrease in working capital can occur at any time during the project, the incremental working capital (increases) treated as outflows and decreases treated as inflows when they occur. In the case of replacement of an existing asset with a new one, any salvage value or sale value of the old asset should be treated as cash inflow and the cash outflow should be accordingly adjusted.

Estimation of cash inflows is comparatively more difficult and calls for greater caution and accuracy. The correct computation of cash inflows depends upon accurate estimation of production and sales. The additional sales, the selling price, gross revenue and the costs associated with such sales need to be estimated. It is important that while estimating the revenues, one should consider possibilities like selling price reduction due to competition, Labour cost going up, production delays and losses etc., In essence the estimate takes into account possible future down sides and likely changes in the business environment. It is important that while estimating the cash flows the effect of inflation is also considered. But if the effect of inflation is considered at the time of estimating the net revenue or net savings, then the same need not be adjusted at the time of evaluation.

However while considering costs, the interest associated with the cost should not be considered. In evaluation of proposal, the required return or the cost of capital used as a discounting factor would include the interest /dividend cost. A separate inclusion would therefore result in double counting and hence to be avoided.

Depreciation is an important factor in computing cash flows but it must be remembered that the incremental depreciation alone can be accounted in the computation. Similarly the net revenue should be adjusted for tax and the cash flow is computed as after tax cash flows.

To illustrate with a simple example,

		Amount in Rs.
Sales revenue		1000
Cost (including depreciation of Rs. 70)		600
Net revenue		400
Less Tax at 30%		120
Revenue after taxes		280
Add Depreciation		70
Net cash inflow		350

Some times cash flows are computed in terms of net savings. This happens when an old machine is replaced with a new machine and savings are obtained. As in the case of net revenue these savings have to be adjusted for depreciation and tax. The following example illustrates the computation of net cash inflows and treatment of depreciation.

A new machine is purchased in replacement of an old machine to effect savings. Depreciation is on straight-line method and depreciation rate is 20% and the life of new machine is 5 years with no salvage value. The remaining life of the old machine is also 5 years. The book value of the replaced old machine was Rs. 2000. The annual cash savings by reduction in cost would be Rs. 8000. Tax rate 50%

	Amount in Rs.
Purchase price of a new machine	18500
Installation charges	1500
Cost of the new machine	20,000
Depreciation on the new machine	4000
Depreciation on the old machine	. 400
Cash savings on replacement of old machine	8000
Depreciation on the new machine Rs. 4000	
Less Depreciation on the old machine Rs. 400	
Additional depreciation charge Rs. 3600	
Additional income before taxes Rs. 4400	
Tax @ 50% Rs. 2200	2200
Additional income after taxes Rs. 2200	

Net cash inflows after taxes

5800

Cash flow Patterns

Figure 1

Years	1	2	3	4	5	6
Cash Inflow	0	1000	1000	1000	1000	1000
Cash Outflow	-5000					
Net Cash flow	-5000	1000	1000	1000	1000	1000

Where the cash inflows are equal over the years then they are recognized as annuities.

Figure 2

Years	1	2	3	4	5	6
Cash Inflow	0	6000	12000	16000	11000	5000
Cash Outflow	-15000	4000	7000	10000	7000	4000
Net Cash flow	-15000	2000	5000	6000	4000	1000

In figure 2, the cash flows are uneven over the years due to various factors like additional investment made, the revenues from the project tapering off due to project becoming old, salvage value etc., This only reiterate the point that cash flows can vary depending upon the project and time. The cash flow patterns by themselves do not have any significance in evaluation of projects. But for a seasoned finance manager, they indicate the nature and risk of the project at a glance.

Concept of time value of money

Look at the following examples carefully

The price of 10 grams of gold in 1970 was Rs. 430. The price of the same is Rs. 9000 in 2006.

If we deposit Rs. 1000 in a savings bank account, which gives us 4% return, we would get Rs. 20 additionally at the end of six months as interest and the value of Rs. 1000 invested would be Rs. 1020.

If we compare Rs. 1000 which we can have today with Rs. 1000 we can have one year later, we value the amount of Rs. 1000 available to day more than what would be available after a year.

This relationship of the relative values of money over a period of time is known as time value of money. The value of money over a period is affected by various factors like inflation, rate of interest (rate of return) method of computing the return (interest on interest) and the duration or time involved.

The concept of time value is central to understand financial mathematics and its applications. The process of computing time value of money has two dimensions

- a) Computing future values from present values (known as compounding)
- b) Computing present values from future values (known as discounting).

Compound Interest and future values

The term compounding implies that interest payable on a loan or investment is not paid at the end of the interest payment term but is

added on to the principal and interest is calculated on the total sum in future. This in effect means that interest is paid on interest.

To understand let us take an example.

A person has Rs. 100 in his account. The interest rate is 8%. Interest is payable annually. Let us compute what he would get over a period 5 years with compounding of interest annually at the end of different years.

Period	Beginning Value	Interest earned during The period	End of term value
1	100.00	8.00	108.00
2	108.00	8.64	116.64
3	116.64	9.33	125.97
4	125.97	10.08	136.05
5	136.05	10.88	146.93

From the above table we understand that the 1-year interest is Rs.8 and the investment of Rs.100 will be worth. Rs.108. But the second year interest the investment earns Rs.8 on the Rs.100 and also Rs.0.64 on the interest of Rs.8 added to the principal at the end of the year. In other words there is an interest on interest, which is otherwise known as “Compound Interest”.

Mathematically compound interest can be calculated using the formula

$$A = P_0 (1+r)^n \quad \text{Where}$$

A = the end value after adding the interest (this also known as future value or terminal value)

P_0 = the original investment (or principal) at the beginning of the period

r = rate of interest per annum (expressed as a decimal) and
n= the number of years at the end of which the FV is desired.

In the above example

$$\begin{aligned} A &= 100 \times (1+0.08)^2 \\ &= 100 \times 1.1664 \\ &= 116.64 \end{aligned}$$

Interest compounding at intervals more than once a year

In our illustration we assumed that the interest is paid (or charged) annually. But there are transactions where interest is paid or charged not annually but once in 6 months (Government bonds). Banks offer interest once a quarter or even monthly. In such cases how do we compute the future value?

Even in such case we can use the same formula for computation but with a slight modification. In our formula the r represents annual interest. If interest is paid half yearly then the interest rate for the half year would be r/2. If it is paid quarterly then the rate would be r/4 and so on.

Substituting this in our formula we obtain the future value for Rs. 100 at 8% but compounded semiannually for a period of one year.

$$A = P_0 (1+r)^n \quad \text{Where } P_0 = 100, r = 8/2, n = 1,$$

$$\begin{aligned} A &= 100 \times (1+0.04)^2 \\ &= 100 \times 1.0816 \\ &= 108.16. \end{aligned}$$

At 8% interest the future value of Rs. 100 would be Rs 108 if the compounding is once a year. But if the compounding is semiannual the future value would be Rs. 108.16. The excess of Rs. 0.16 represents interest earned on interest of Rs. 4 paid at the end of six months.

The general formula for computing the future value can be thus expressed as

$$A = P_0 (1 + r/m)^{nm} \quad \text{Where}$$

P_0 = Principal or original investment at time t_0

r = Rate of interest in decimals

n = Number of years of investment

m = Number of times interest is paid in a year.

Some points to remember about compounding interest calculations

For the same rate of interest,

if more number of times interest is paid during the year, greater will be the future value at the end of the given year

Greater the number of years, greater the difference will be in future values, if computed using different methods compounding like yearly and semi annually.

When compounding is continuous the future value can be computed by

$$P \times (2.71828)^{rt}$$

Continuous compounding gives the maximum possible future value at a given rate of interest for a given number of periods.

Future value increases at decreasing rate as the compounding interval shortens.

The formula for computing future values primarily focus on interest rates and amounts. But this concept and formula can be applied in many situations where any sort of compound growth is involved and future position needs to be ascertained.

Present Values

Future values tell us what a Re is worth at a given rate of interest after n number of years. Present value tell us what is the present worth of a Re. receivable after n number of years with a given rate of interest. Present value is just the opposite of future value.

For e.g. future value of Rs.100 due in 5 years at 8% interest is Rs. 146.93. This means that the present value of Rs. 146.93 receivable after 5 years when the interest rate is 8% is Rs. 100.

In other words present value is a future amount discounted by some required rate to reflect its worth as at present.

Understanding present values is very important for financial analysis.

There are number of situations which require an understanding as well as computation of present values.

Consider that you wish to invest Rs. 1000 one year from now. If the current rate of interest is 8%, how much should be set aside now to invest at the end of the year. This problem can be resolved by computing the present value of Rs. 1000

For finding out the future value we used a formula. Let us make use of the same to understand the concept and computation.

In computing the future value we used the formula

$$A = P_0 (1+r)^n \quad \text{Where}$$

A = the end value after adding the interest (this also known as future value or terminal value). Now A becomes our desired future value i.e. Rs. 1000

P₀ = the original investment (or principal) at the beginning of the period will mean the amount I have to set aside or the Present value

r = rate of interest per annum (expressed as a decimal) and

n = the number of years at the end of which the FV is desired.

Substituting the figures we get

$$1000 = P_0 \times (1+0.08)$$

$$\text{Therefore } P_0 = 1000 / 1.08$$

$$= 925.93$$

That the present value of Rs. 1000 at 8% due at one year is Rs. 925.93

Stated another way, if you set aside Rs. 925.93 and if it fetches an interest of 8%, at the end of one year you will have Rs. 1000 to make your investment.

So we can express the formula for present values as

$$P_0 = A / (1 + r)^n \text{ Where}$$

A = Value due at the end of n years

P₀ = Present value

r = rate of interest per annum (expressed as a decimal) and

n= the number of years

This formula can be used where interest compounding is more than once a year.

When discounting is continuous the present value can be computed by

$$A / (2.71828)^m$$

Continuous discounting gives the lowest possible present value at a given rate of interest for a given number of periods.

The interest rate is called compounding in the case of computation of future values as it represents a growth. In calculation of present values, the value is reduced and hence is known as discounting rate.

Present value of an annuity

An annuity is a series of equal or even payments made at fixed intervals for a specific period. For e.g. Rs. 1000 received at the end of each month for the next one year. Annuities can occur either at the beginning or end of the period.

If payment occur at the end of the period they are called ordinary or deferred annuities. E.g. Mortgage or loan payments.

If payments occur at the beginning of the period they are called annuities due.

E.g. rental payments, life insurance premiums. Unless specifically stated annuities are treated as ordinary annuities in financial texts.

In calculating the present value of an annuity we may simplify the computation by directly applying the discount factor shown in the PV tables, which states that value of one Re. per year, n years at r%. as illustrated below.

If Re. 1 is received at the end of each year for three year, PV of this annuity can be calculated as under assuming a discount rate of 8%

PV of Re. 1 to be received at the end of 1 year	Rs. 0.92593
PV of Re. 1 to be received at the end of 2 year	Rs. 0.85734
PV of Re. 1 to be received at the end of 3 year	Rs. 0.79383
Present value of the series	Rs.2.57710

If we use the annuity tables for even streams we find the discount factor 2.5771, which can be used directly.

Amortizing a Loan

One of the important uses of present value concept is to determine the equated periodic installment of repayments for a loan. The distinguishing feature of the Equated Installments (they can be monthly, quarterly, six monthly or yearly) is that the loan is repaid in equal periodic payments, which take care of both the interest and principal.

The loan continues to earn interest on outstanding balance, which is compounded. The repayments are also compounded and used to reduce the outstanding. There is a proportionate adjustment towards interest and principal out of the repayments. At the initial stages greater share of repayment amount is appropriated towards interest burden. At the end of

the loan tenor EI completely clears the entire principal with interest at the given rate and at the given compounding interval.

To understand the concept let us illustrate with a case of simple case.

Loan amount Rs. 25,000

Interest rate Rs. 10%

Tenor of the loan 6 years

The annual equal payments that are made in 6 years at 10% should cover the entire loan of Rs. 25,000 with interest. In other words, the present value of six payments discounted at 10% should equal the present value of Rs. 25,000.

That is $\text{Rs. } 25,000 = \sum x / (1.1)^6$

Using the even annuity table for 10% at 6 years we get a discount factor of 4.3553 that the value of $(1.1)^6$. Substituting the value in the equation we get

$25,000 / 4.3553$, which equals 5740.13 Say 5740. Thus Equated annual Installments of Rs. 5740 will completely amortize the loan of Rs. 25,000 with interest at 10% compounded annually in six years.

Some points to remember about discounting interest (present value) calculations

For the same rate of interest, if more number of times interest is paid during the year, lower will be the present value at the end of the given year. Present value decreases at decreasing rate as the compounding interval shortens

Greater the number of years, greater the difference will be in present values, if computed using different methods of compounding like yearly and semi annually.

Greater the number of years or higher the rate of interest lower will be the present value.

Self-Testing Questions:

1. Economic Viability of any project should be in conformity with the government's Goal to achieve equitable distribution of income – Do you agree?
2. Explain in detail the technical parameters off appraising the project.
3. Explain with examples the importance of economic viability and technical feasibility studies proving that they are complementary to each other for success of any project.
4. The financial appraisal of any project is an ongoing exercise throughout the life of the project. Discuss
5. Managerial appraisal points more to the integrity of the entrepreneur than the Capability to run the unit smoothly – Discuss
6. A project report should lay equal stress on technical, financial, commercial and Managerial appraisal. Do you agree with this statement?
7. What factors would you take into account for identifying promising investment Opportunities?
8. What questions would you raise in a SWOT analysis for project appraisal?
9. What types of information are required for market and demand analysis?
10. What are the important sources of secondary information in India? How would you evaluate the quality of secondary information?
11. "Often secondary information is not adequate for market and demand analysis" Comment.
12. Discuss the steps involved in a sample survey. What factors can vitiate the results of market survey?
13. Describe the types of relationships used in Trend analysis.
14. Critically evaluate trend projection method for demand forecasting.
15. Describe and evaluate the end use method for forecasting.
16. Discuss the leading indicator method for forecasting.
17. What are the sources of uncertainties in demand forecasting? Discuss them.
18. Discuss the steps involved in constructing and using an economic model.
19. What is DPR and what are its components?
20. What is time value of money?

UNIT-III

Financial Evaluation of projects under certainty: Pay back method, Average rate of return method and Net Present Value method-project evaluation under uncertainty and risk

PROJECT APPRAISAL

Project Appraisal is a process of detailed examination of several aspects of a given project before recommending the same. The lending institution has to ensure that the investment on the proposed project will generate sufficient returns on the investments made and that loan amount disbursed for the implementation of the project will be recovered along with interest within a reasonable period of time.

The various aspects of Project appraisal are:

1. Technical Appraisal
2. Commercial Appraisal or Market Appraisal (Demand of the product, supply of the product, distribution channels, pricing of the product and government policies.)
3. Economic Appraisal
4. Management Appraisal (assessing the willingness of the borrower to repay the loan)
5. Financial Appraisal

PROJECT FINANCING

Project financing may be defined as the raising of funds required to finance a capital investment proposal which is economically separable. The assets, contracts cash flows are separated from the parent company and the assets acquired for the projects serve as collateral for loans. The repayments are made from the revenue generated from the projects.

CHARACTERISTICS OF PROJECT FINANCING

1. There is a presence of a special project entity.
2. The component of debt is very high and therefore gives raise to a highly leveraged firm.
3. Project financing is separated form the parent company's balance sheet.
4. Debt servicing and repayments are done only from the cash flows arising from the projects.
5. Project financier's risks are not entirely covered by the sponsor's guarantee.
6. Third parties like suppliers, customers, government and sponsors commit to share the risk of the project.

Conventional Financing Vs Project financing

CONVENTIONAL FINANCING	PROJECT FINANCING
Creditor makes an assessment of repayment of his loan by looking at all cash flows and resources of the borrower.	Cash flows from project related assets alone are considered for assessing the repaying capacity.
End use of the borrowed funds is not strictly monitored by the lender.	The creditors ensure proper utilization of the funds.
Creditors are interested only in their money getting repaid.	Project financiers are keen to watch the performance of the enterprise and suggest measures.
Creditors have no say in the management of the organization.	Project financiers can appoint their nominee is the Board of directors of their clients.

SOURCES THROUGH SHARES

ORDINARY SHARES:

Features

Advantages

Disadvantages

PREFERENCE SHARES

Features

Types

Advantages/Disadvantages

SOURCES THROUGH DEBT

DEBENTURES/BONDS

Features

Types

Advantages/Disadvantages

TERM LOANS

ICICI

IDBI

IFCI

SIDBI

Equity/Ordinary Shares:

Equity share represent ownership capital and its owners- ordinary share holders/ equity holders-share the reward and risk associated with the ownership of corporate enterprises. They are also called ordinary shares in contrast with preference shares.

Preference Shares:

Preference share is a unique type of long term financing in that it combines some of the features of equity as well as debentures. As a hybrid security or form of financing:

- It carries a fixed/stated rate of dividend.
- It ranks higher than equity as a claimant to the income/assets.
- It normally does not have voting rights.
- It does not have a share in residual earnings/assets.

A preference share ordinarily does not carry voting rights. It is, however, entitled to vote every resolution if:

- The dividend is in arrears for 2 years in respect of cumulative preference shares.
- The preference dividend has not been paid for a period of two/more consecutive preceding years or for an aggregate period of three/more years in the preceding six years ending with the expiry of the immediately preceding financial year.

Debenture/ Bonds/ Notes:

Promissory note, debenture / bonds, represent Creditors hip securities and debenture holders are long term creditors of the company. As a secured instrument, it is a promise to pay interest and repay principal at stipulated times. In the contrast to equity capital which is a variable income (dividend/ security, the debenture / notes are fixed income (interest) security).

Term loans:

Term loans are also known as term/ project finance. The primary source of such loans is financial institutions. Commercial banks also provide term finance in a limited way. The financial institutions provide project finance for new projects as also for expansion/diversification and modernization, whereas the bulk of term loans extended by banks is in the form of working capital term loan to finance the working capital gap. Though they are permitted to finance infrastructure projects on a long term basis, the quantum of such financing is marginal. The term may be 6 to 10 years.

Shipping Credit Investment Company of India Ltd (SCICI)

SCICI is promoted by ICICI for the development of fishing and related industries. Financing of projects are based on commercial viability after careful evaluation of each project. This is so because the amount involved will be very high and the gestation period is also very long.

Advantages/Disadvantages

A balance has to be struck between debt and equity. A debt equity ratio of 1:1 is considered ideal but it is relaxed up to 2:1 in suitable cases. Further relaxation in debt-equity is made in the case of capital intensive projects. All long term loans/deferred credit are treated as debt while equity includes free reserves.

PROMOTER'S CONTRIBUTION TO PROJECTS

The norm of promoter's contribution in the project is 22.5% of project cost with a lower contribution for projects promoted by technical entrepreneurs. Normally the promoter's contribution should be in the form of equity capital. If unsecured loans from promoters/directors form an integral part of the means of finance, it should be assumed that they would not be withdrawn during the currency of the loan and do not carry higher interest than that is payable on the institutional loans. Preliminary expenses incurred by promoters are included in the promoter's contribution. It is important that no gap is left in the financing pattern of the project. Otherwise, it will result in delays in the

implementation of the project. The financial institutions stipulate a condition that promoters shall arrange for funds to meet any overrun in the cost of the project

OTHERS

(1) DEFERRED CREDITS

Projects are financed through deferred credits obtained from the suppliers of machinery and equipment and/or bankers to the suppliers. If the credit is routed through the supplier and backed by his financial obligation, it is called supplier's credit and if it is a direct credit given to the project, it is called buyer's credit.

Supplier's credit

Suppliers do provide credit extended over a period, usually a substantial portion nearly 80-90% of the equipment cost as a part of the sale contract. These facilities are available generally in export of machinery and the credit is covered by the insurance and guarantee cover of the export insurance agency of the supplier's country. The supplier sells the machinery against a down payment and asks the buyer to pay the balance over a fixed number of years in half yearly or annual installment, with interest at a specified rate. These credits are mostly backed by bills of exchange drawn on the buyer by the supplier or his banker.

Buyer's credit

When the banker of the buyer gives a guarantee to the deferred payments by either issuing a unconditional guarantee or by accepting or co-accepting the bills drawn on the buyer it is called as buyer's credit. When a bank gives financial guarantees beyond 12 months it is called a deferred payment guarantees.

Deferred payment guarantees can be classified into the following:

1. Expressed in Foreign currencies
 - a) Favouring foreign lenders for financing plant and machinery.
 - b) Favouring Foreign lenders for financing raw material and stores
 - c) Favouring Indian financial institutions.
2. Expressed in Indian currency

Such deferred payment guarantees were very common in the past under a special scheme formulated by the IDBI in order to enable the indigenous machinery suppliers to sell the machine on credit terms.

(2) LEASE FINANCING

Lease as a source of project financing is mainly suitable for expansion projects. This is because of the reason that repayment of lease rentals start immediately after acquisition of the leased asset by the lessee. New projects will take time for generating cash for repayment whereas existing projects that go for expansion can start repaying immediately out of their cash generation from their existing facilities.

(3) UNSECURED LOANS

If there is some shortfall in the mean-of-finance, the promoters/directors can mobilize funds from their friends, relatives and well-wishers. Such loans are always unsecured i.e., the lenders cannot have any charge over the assets of the company. Banks and financial institutions stipulate the following conditions if unsecured loan is to form part of the means-of-finance.

- The promoters shall not repay the unsecured loan till the term loan persists.
- Interest if any payable on unsecured loan shall be paid only after meeting the term loan repayment committees.
- The rate of interest payable on unsecured loan shall not be higher than the rate of interest applicable for term loans.

Normally unsecured loan component is expected not to exceed 50% of the equity capital.

(4) INTERNAL ACCRUALS

Internal accruals form a part of the source of finance in respect of expansion projects. Depreciation which is not cash expenditure and profits retained after payment of

dividends are the main sources of internally generated funds. As existing company that goes for an expansion/diversification/modernization project may opt to finance a portion of the capital investment out of internal cash accruals.

(5) BRIDGE LOANS

This is a temporary loan meant for tying up the capital cost of the project. The necessity for bridge finance arises in situations where finance from particular source is being delayed. However, the availability of finance from that source is certain.

Example: The project cost of a new project is estimated at Rs.100 lakhs. The promoters are able to bring in a capital of Rs. 30 lakhs. The project is eligible for an investment subsidy of Rs.10 lakhs. The financial institution that has appraised the project is ready to sanction a term loan of Rs.60 lakhs. Means of finance for project cost is as under:

Promoter's contribution -	Rs. 30 lakhs
Investment subsidy	- Rs. 10 lakhs
Term loan	- Rs. 60 lakhs
<hr/>	
Rs.100 lakhs	

Though the eligibility of investment subsidy of Rs. 10 lakhs for the project is certain, there maybe certain procedural formalities involved in getting it.

E.g.2 Food processing industries that are eligible for special product subsidy can avail if only their product gets ISI/Agmark certification which is possible only after the project is completed and production taken out.

Thus if the availability of subsidy though ensured, is likely to be delayed, the banks/financial institutions come to the rescue of the project promoters by sanctioning a bridge loan to the extent of the subsidy.

CAPITAL INVESTMENT SUBSIDY

Government provides subsidy for setting up of industries. The subsidy offered is of two types:

- (i) Area Subsidy (ii) Product Subsidy

- (i) **Area Subsidy:** This is available for projects set-up in notified backward areas. Government notifies backward areas from time to time based on the industrial activity prevailing in different parts of the country. It will be

between 15%-20% on the investment on fixed assets. Government also extends subsidy to projects coming up in Industrial estates.

- (ii) **Product Subsidy:** This is available for projects that manufacture specified products. These products that are eligible for subsidy are identified by the government by keeping in view the potential for the economic development of the country in such sectors of industries and notified by the government. It ranges from 10%- 20% for different types of notified products.

A project can avail only one subsidy. For example if food processing is eligible for 20% product subsidy and if the project is going to be located in a notified backward area that is eligible for 15% area subsidy, the project promoters can choose only one, who will obviously choose 20% product subsidy.

DISBURSEMENTS OF LOANS/LOAN ARRANGEMENT

TERMS AND CONDITIONS FOR GRANTING TERM LOANS FOR PROJECTS

Term loans are granted subject to the following terms and conditions.

1. Clear title to land as security.
2. Insurance of assets, building and machinery separately.
3. Scrutiny of Articles of Association to ensure that it does not contain any restrictive clause against covenants of the financial institutions.
4. Lien on all fixed assets.
5. Personal and corporate guarantees of major shareholders and associates concerns.
6. Approval of appointment of managerial personnel by DFI.
7. Payment of dividend and issue of bonus shares subject to the approval of financial institution.
8. Undertaking for non-disposal of promoters shareholding for a period of 3 years.

Before the loan is disbursed, documents have to be executed and submitted. Stamp duty and registration fees have to be paid.

PROCEDURE FOR DISBURSEMENT OF LOAN

After the loan has been sanctioned, the security documents should be obtained and charge on the assets – present and future – created in favour of the bank. Thereafter, suitable disbursements may be made, keeping in view the following aspects:

- 1) The bank should verify the status of implementation of the project. If no progress at all has been made the reasons should be ascertained and satisfactory answers obtained.
- 2) As far as possible, disbursement should be made direct to the supplier of machinery or other services in order to ensure that the proceeds of the term loan are not diverted for unauthorized purposes.
- 3) It is preferable to disburse the loan in installments instead of in one lump sum. Lump sum disbursement of the entire loan will be permitted if the project or scheme involves one-time acquisition of machinery.
- 4) It should be ensured that the projected debt-equity ratio of the project is maintained at all stages of disbursement.
- 5) If the loan is sanctioned by a number of lenders to the project, the concerned bank's disbursement should be in proportion to its share in the loan.
- 6) After the disbursement of one installment, the next installment should be disbursed only after verifying whether the earlier installment had been properly utilized..
- 7) Sometimes the borrower would request for interim loans or bridge loans, before the security and other formalities are completed. Such requests may be acceded to by granting interim advances for short periods of, say, 3 months, provided the bank is satisfied that the requisite formalities would be completed within a short period.

After these requirements are complied, disbursements are made on the basis of assets created at site. There has to be security matching, every disbursement starting with land and buildings. As machines arrive, term loan is disbursed at 75% of their value, the cheque being made in the name of the supplier. In case of large projects, disbursements are need based. In such cases, promoters have to bring in their entire contribution.

Monitoring and Follow-up

The most important and yet quite difficult part of any loan is to monitor proper utilization of the loan and follow-up the borrower's performance and working results, so that the borrower does not default on his financial commitments to the lender.

The follow-up can be split into: (a) follow-up during the implementation stage of the project; (b) follow-up after commencement of commercial production.

The objectives of the follow-up during the implementation stage are:

- (a) To ensure that the borrower mobilizes the various sources for the project in time.
- (b) To ensure that the physical progress of the project is in accordance with the project implementation schedule; and
- (c) To ensure that, in the event of an escalation in the cost of the project, due to reasons beyond the control of the borrower, the promoters bring in their proportionate share.

The above follow-up could be done by obtaining periodical reports from the borrower on the progress – both physical and financial of the project.

Objectives of follow-up after commercial production commence:

Once the project is set up and commercial production commences, the bank should put in place a suitable mechanism to follow-up the performance of the project.

- 1) To ensure that the assets created or acquired for the project are put to effective use and well maintained.
- 2) To monitor periodically the borrower's financial position and working results by comparing the actual performance with the earlier projections; if there is substantial variance, especially negative, the reason thereof should be critically analyzed.
- 3) To ensure such corrective action, as may be warranted, on the basis of warning signals thrown up during the course of monitoring.
- 4) To ensure that the borrower conforms to the terms of the loan more particularly periodical payment of interest and repayment of loan.

CAPITAL BUDGETING AND INVESTMENT DECISIONS

INVESTMENT

Investment is an activity of spending resources (money, labour and time) on creating assets that can generate income over a long period of time or which enhances the returns on the existing assets.

Investments that generate returns over a number of years can be classified as:

Investment in financial assets	<ul style="list-style-type: none"> • Bank deposits, • deposits with companies, • contribution to provident fund (in excess of compulsory deduction), • shares and debentures, • government bonds • purchase of NSC, • personal lending
Investment in physical assets	<ul style="list-style-type: none"> • Purchase of land, • building, • machinery, • plants
Investment in human capital	<ul style="list-style-type: none"> • Expenditure on skill formation through education and training that increases productivity and earning capacity of a person
Miscellaneous investment	<ul style="list-style-type: none"> • Expenditure on replacement of depreciated and obsolete machinery, • product diversification, • R & D, • installation of safety measures for employees, • pollution control for public health and safety, • meeting legal requirements

Techniques of Investment Analysis

The investment decisions are commonly known as capital budgeting or capital expenditure decisions. Capital Budgeting means planning for capital expenditure in acquisition of capital assets such as new building, new machinery or a new project as a whole. Thus capital budgeting involves the following steps.

1. Consideration of investment proposals including alternatives.
2. Application of suitable evaluation technique for selecting the project.
3. Estimation of profits, cash flows and analysis of cost benefit of the project or scheme.

4. Estimation of available funds and utilization thereof.
5. The objective is to maximize the profits with the utilization of available funds.

In the investment decisions, the cash flow is very important. Each proposal involves two types of cash flows.

1Investment i.e., cash outflow 2. Cash inflow as a result of new investment.

Capital investments mean the acquisition of durable assets and includes

1. Modification and Replacement of existing facilities.
2. General Plant improvement.
3. Quality improvement
4. Additional capacity.
5. New products or expansion of existing products.
6. Cost reduction.
7. Research and development.
8. Exploration.
9. Mechanisation Process.
10. Replacement of manual work by machinery

**The various methods for evaluation of capital expenditure
proposals are as follows:**

1. **Pay-back period (PB)**
2. **Average Rate of Return (ARR)**
3. **Net present Value (NPV)**
4. Profitability Index
5. Internal Rate of Return (IRR)
6. Discounted Payback Period(DPP)

1. PAYBACK PERIOD METHOD (PB)

Payback period is defined as the length of time required for the stream of cash proceeds produced by an investment to equal the original cash outlay required by the investment.

FORMULA

Initial Investment in projects

$$\text{Payback period} = \frac{\text{Initial Investment in projects}}{\text{Annual cash inflow}}$$

Annual cash inflow

It is the number of years required to recover the investment. Incase of unequal cash inflow, it can be found out by adding up the annual cash inflow till the total is equal to the investment. Many firms use the payback period as a decision criterion because

it is easy to calculate. Cash inflow is the sum of net profit after tax and depreciation which is a non-cash expense.

ACCEPTANCE RULE

Management of the firm may establish a norm or standard for acceptable pay back

period, usually based on cost of capital. It is called “cut-off” point

The project which gives shortest payback period is to be selected

ADVANTAGES

1. It is a very simple measure of economic feasibility.
2. It is very easy to apply, calculate and interpret.
3. It is easy to understand.
4. It emphasizes the liquidity and solvency of a firm.
5. For projects involving uncertain returns, it is appropriate to select a measure that concentrates on early returns.
6. The payback period is a meaningful indicator of economic feasibility in case of the firms where the risk of obsolescence is high. In comparison to other projects, risky projects are expected to pay for themselves faster.
7. It weighs early returns heavily and ignores distant return.
8. It takes less time to calculate and hence the cost of analysis is low.
9. This criterion emphasizes early Pay-off and hence the projects with shortest payback period will be selected.

LIMITATIONS

1. The main limitation is that this method fails to take into account the time value of money. All cash flows are treated and weighted equally regardless of the time period of their occurrence.
2. It does not measure the profitability of a project. It ignores the cash inflow beyond the payback period. Thus it is a biased indicator of economic value.
3. It does not differentiate between projects requiring different cash investments and thus it does not provide a meaningful and comparable criterion.
4. It does not show the economic return on investment.
5. It fails to consider the magnitude of cash inflows i.e. varying cash-flow patterns.

2. ACCOUNTING RATE OF RETURN OR AVERAGE RATE OF RETURN

This method takes into account the total earnings expected from an investment proposal over its full life time. The method is called accounting rate of return method, because it uses the accounting concept of profit i.e., income after depreciation and tax as criterion for calculation of return.

Computation of A.R.R

a.) *Total income method;*

$$\text{Accounting Rate of Return} = \frac{\text{Net Profit after dep & Tax}}{\text{Original investment} - \text{scrap value}} \times 100$$

b.) *Average investment method;*

$$\text{Accounting Rate of Return} = \frac{\text{Net Profit after dep & Tax}}{\text{Average investment}} \times 100$$

Average investment is again a dispute term. The following four alternatives used;

$$\begin{aligned} \text{(i) Average investment} &= \frac{\text{Original investment}}{2} \quad \text{or} \\ &\quad \frac{\text{Original investment} - \text{scrap value}}{2} \\ \text{(ii) Average investment} &= \frac{\text{Original investment} + \text{scrap value}}{2} \quad \text{or} \\ \text{(iii) Average investment} &= \frac{\text{Original investment} - \text{scrap value}}{2} \quad \text{or} \\ \text{(iv) Average investment} &= \frac{\text{Original investment} - \text{scrap value}}{2} + \text{Additional W.C} + \text{scrap} \end{aligned}$$

ADVANTAGES

1. It is simple to understand and use.
2. It places emphasis on the profitability of the project, rather than on liquidity as in the case of payback method.
3. It considers the entire stream of incomes over the entire life of the project.
4. It can be calculated by using the accounting data without another set of workings like cash flow etc.

LIMITATIONS.

1. The serious limitation is that this method also ignores the time value of money.
2. It gives equal weight to both near money and distant money. It does not consider the differential timing of receipts.
3. Cash inflow is not taken into account. Only net profit tax is considered.
4. It does not consider the length of project life.
5. This method is not consistent with the objective of maximizing the market values per share value do not depend upon the average rate of return.

3. NET PRESENT VALUE METHOD (NPV)

This method follows the DCF Technique and recognizes the time value of money. It is an index used to ascertain the economic worthiness of the investment proposals. If the investment i.e. cash outflow is made in the initial year, then its present value will be equal to the amount of cash actually spent. If the cash outflow is made in the second and subsequent year also, its present value also should be found out by applying the appropriate rate of interest which is the firm's cost of capital. It is the minimum rate of return expected to be earned by the firm on the investment proposals. Similarly all the cash inflows (i.e. Net profit after tax + Depreciation) are also to be discounted at the above rate in order to find out the present value of cash inflows occurring in the future periods. Then the net present value is to be found out by subtracting the present value of cash outflows from the present value of cash

inflows. It is defined as the difference between the present value of cash outflow and present value of cash inflows occurring in the future periods over the entire life of the project.

ACCEPTANCE RULE

If the NPV is positive or at least equal to zero, the project can be accepted

$NPV > 0$ should accepted

$NPV < 0$ should be rejected

NPV is positive = cash inflows are generated at a rate higher than the minimum required by the firm.

NPV is Zero = Cash inflows are generated at a rate equal to the minimum Required.

NPV is Negative = Cash inflows are generated at a rate lower than the minimum Required by the firm.

The market value per share will increase if the project with positive NPV is selected

CALCULATION OF NPV ;

$$NPV =$$

$$\left(\frac{R1}{(1+K)} + \frac{R2}{(1+K)1} + \frac{R3}{(1+K)2} + \dots + \frac{Rn}{(1+k)n} \right) - I$$

Where

NPV = Net present value

R = Cash inflows

K = Cost of capital

I = Cash out flows

MERITS OF NPV METHOD

1. The important one is that it recognizes the time value of money.
2. It uses the discount rate which is the firm's cost of capital.

3. It considers all cash flows over the entire life of the project.
4. By accepting the Project with the highest positive NPV, the profit will be maximized. Hawkins and Pearce state that NPV, the profit theoretically unassailable. If one wishes to maximize profits, the use of NPV always finds the correct collection of projects.
5. Hence it is consistent with the objective of maximizing the wealth of shareholders.
6. It is superior to the other methods.
7. It is simple to find out the acceptable projects.

LIMITATIONS

1. It is difficult to calculate.
2. It is difficult to workout the cost of capital especially the cost of equity capital.
3. Unless the cost of capital is known, this method cannot be used.
4. It may not give correct answer when the projects with different investments are compared, in such cases, profitability index method will be better.
5. It may mislead when dealing with alternative projects or limited funds under the conditions of unequal lives.
6. NPV method favors long lived projects.
7. Both NPV and IRR methods may often give contradictory results in the case of alternative proposals which are mutually exclusive.
8. It may give different ranking in case of complicated projects as compared to IRR method.
9. It assumes that intermediate cash inflows are reinvested at the firm's cost of capital which is not always true.

4. INTERNAL RATE OF RETURN

Internal rate of return is the rate of which is the sum of discounted cash inflows equals the sum of discounted cash outflows. In other words it is the rate at which equals the aggregate discounted cash inflow with the aggregate discounted cash outflows. It is the rate of discount which reduces the net present value of an investment to zero. It can be stated in the form of a ratio

$$\text{IRR} = \frac{\text{Cash inflows}}{\text{Cash out flows}} = 1$$

Calculation;

a) Where cash inflows are uniform the internal rate of return can be calculated by locating the factor in annuity table. The factor is calculated as follows.

$$F = \frac{I}{C}$$

Where:- F = factor to be located in annuity table

I = Investment or cash outflow

C = Cash inflows per year

(b) When cash inflows are not uniform the IRR is calculated by making trial calculations in an attempt to compute the current interest rate which equates the present value of cash inflows with the present value of cash outflows

Procedures:

1. The trial rate of return is taken arbitrarily.
 2. The second trial rate and even third trial rate of determined. The second total rate of return is determined by considering initial cost of the investment and present value cash inflows arrived at as per the trial rate of return. If the present value of cash inflows arrived at as per the first trial rate of the return is less than the initial cost of the investment, then, the second trial rate has to be lower than the first trial rate. On the other hand if the present value of cash inflows arrived at as per the first trial rate is more than the initial cost of investment, the second trial rate has to be higher than the first trial rate.

After determining the present value of a project at two or three trial rate of return, the trial rate of return at which the present value is very closely to initial cost of the project is roughly taken as the initial rate of return. If greater accuracy in the IRR is desired, then the exact IRR can be determined as follows.

NPV at lower rate

Lower trail rate + ----- * diff. between the higher & lower

Diff.between the NPV at trial rate

Lower trail rate and the NPV

At higher trail rate

Merits of IRR Method;

1. like all other DCF based method, IRR also take into account the time value of money and can be applied where the cash inflows are even or unequal
 2. it also consider the profitability of the project over its economic life and thus the true profitability of a project can be accessed

3. Cost of capital or pre determined cut off rate is not a pre requisite for applying IRR method hence it is better than NPV and PI methods. In all those situations where determining cost of capital is difficult
4. IRR provides a ranking of various proposal because it is percentage return
5. it provides for maximizing profitability.

Demerits of IRR method:

1. it is a complicated method and may lead to cumbersome calculations
2. The underlying assumption of IRR that the earnings are reinvested at IRR for the remaining life of the project is not a justifiable assumption. From this point of view NPV & PI which assure re investment at cost of capital are better
3. The results obtained through NPV or PI methods may differ from that obtained through IRR depending on the size, life and timing of the cash flows.

COMPARISION AND CONTRAST OF IRR AND NPV TECHNIQUE

Comparison of both the techniques

1. Both techniques use Discounted Cash Flow (DCF) method.
2. Both recognize the time value of money.
3. Both take into account the cash inflows over the entire life of the project.
4. Both are consistent with the objective of maximizing the wealth of shareholders.
5. Both are difficult to calculate.
6. Both techniques may often give contradictory result in the case of alternative proposals which are mutually exclusive.

Contrast i.e., points of difference

1. Interest rate. NPV uses the firm's cost of capital as Interest rate. Unless the cost of capital is known, NPV method cannot be used. Calculating cost of capital is not required for computing IRR.
2. NPV may mislead when dealing with alternative projects or limited funds under the conditions of unequal lives. IRR allows a sound comparison of the project having different lives and different timings of cash inflows.
3. NPV may give different ranking in case of complicated project as compared to IRR method.
4. NPV assumes that intermediate cash flows are re-invested at firm's cost of capital whereas IRR assumes that intermediate cash inflows are reinvested at the internal rate of the project.
5. The results of IRR method may be inconsistent compared to NPV method, if the projects differ in their (1) expected lives or (2) investment or (3) timing of cash inflow
6. IRR method favors short-lived project so long as it promises return in excess of cut-off rate whereas NPV method favors long-lived projects

7. IRR may give negative rate or multiple rates under certain circumstances. NPV does not suffer from the limitation of multiple rates.

5. PROFITABILITY INDEX (PI) OR BENEFIT COST RATIO

PI is found out by comparing the total of present value of future cash inflows and the total of the present value of future cash outflows. This is otherwise called excess present value index or benefit cost ratio. This can be put in the form of the following formula.

$$(a) \quad PI = \frac{\text{Present value of Cash inflows}}{\text{Present value of Cash out flows}}$$

$$(b) \quad PI = \frac{\text{Present value of future Cash inflows}}{\text{Present value of future Cash out flows}} * 100$$

Acceptance rule;

PI > 1 = accept the project

PI < 1 = reject the project

PI = 1 = may be accepted

PRE-REQUISITES OF CAPITAL BUDGETING

Capital budgeting is essentially a process of conceiving, analyzing, evaluating and selecting the most profitable project for investment.

Capital budgeting is generally irreversible.

The very survival of the firm depends on how well planned, the capital expenditure is.

Long-term capital expenditure includes the following items:

- (a) Expenditure on new capital equipments by a new firm in the short-run;
- (b) Expenditure on long-term assets by a new firm;
- (c) Expenditure on expansion or diversification of assets and addition to the existing stock of capital by old firms;
- (d) Expenditure on replacement of depreciated capital;
- (e) Expenditure on advertisement which bears fruit over time; and
- (f) Expenditure on research, development and innovation.

A **clear vision of plan period** is necessary for the following ends:

- (a) effective planning, execution and control;
- (b) possible dovetailing of old plan with new ones for future and integrated development of the company;
- (c) assessment of economies of scale and determination of plant-size; and
- (d) Financial planning and timely acquisition of necessary finances.

CHOICE OF DECISION RULES	
STEP	DECISION
1	Clearly define the objective of investment
2	Select the criteria for evaluating projects *
3	Decide on the approach for final selection of projects \$

* Important evaluation criteria are

- (a) Pay-back period,
- (b) Discounted cash flow (present value criterion) and
- (c) Internal rate of return (marginal efficiency of investment)

- (a) Accept - Reject approach (when resources are limited)
- (b) Ranking approach (when resources are larger)

DATA COLLECTION

- Collect relevant, reliable and adequate data
- Alternative revenues of investment?
- Cost of investment projects?
- Expected returns from projects?
- Period of maturity?
- Productive life of projects?
- Market rate of interest?
- Availability of external and internal finances?

PROCEDURE FOR ESTIMATING EARNINGS (E) ON CAPITAL

EXPENDITURE

- Earnings of each project should be separately estimates
- 2 most important factors (cost savings and sales expansion) must be taken into account
- Project projections must be based on estimated future prices and costs
- Also take opportunity cost into account
- Present value of earnings must be ascertained
- Average of invested capital per time unit should be used instead of initial capital outlay
- Productivity (should be estimated) = [earnings over life time of asset - investment cost]
- In a highly competitive market, abnormal profits create conditions for self-destruction and this should be thoroughly examined
- Necessary adjustments should be made on account of margin of error

MOST COMMONLY USED CRITERIA

PAY-BACK PERIOD METHOD

The pay-back period is defined as the time required recovering the total investment outlay from the gross earnings, i.e., gross of caporal wastage or depreciation.

Initial Investment in projects

Payback period = $\frac{\text{Initial Investment}}{\text{Annual cash inflow}}$

Example:

$$\begin{aligned} \text{Pay-Off period} &= \frac{40000}{8000} \\ &= 5 \text{ years.} \end{aligned}$$

CALCULATION OF PAYBACK PERIOD

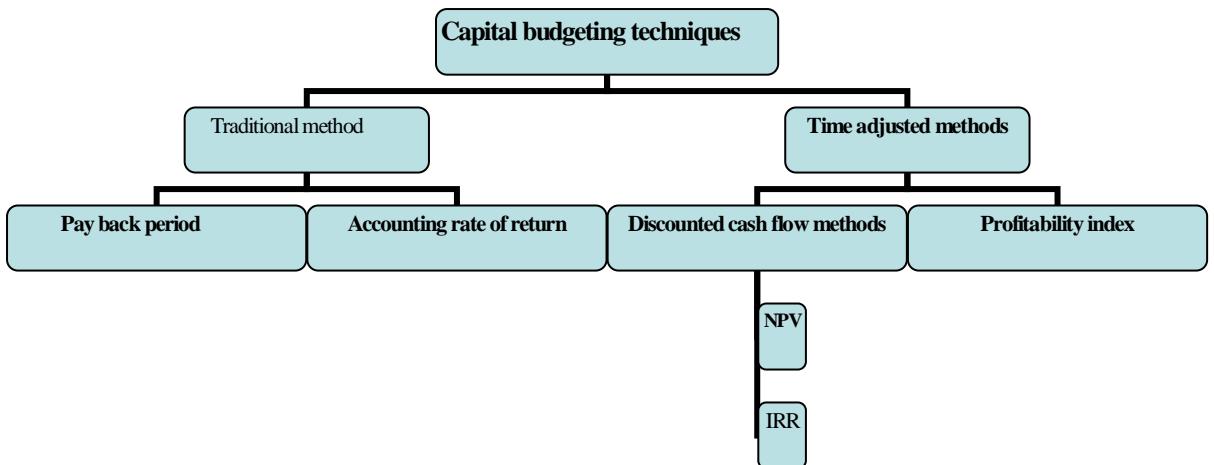
Year	Total fixed outlay	Annual cash flows	Cumulative (Rs.)
1 st	10,000	4,000	4,000
2 nd	-	3,500	7,500
3 rd	-	2,500	10,000
4 th	-	1,500	11,500
5 th	-	1,000	12,500

The break-even for initial outlay (Rs. 10,000) is reached at the end of the 3rd year. Thus, pay-back period is 3 years.

Ranking of projects should be done in case of multiple options. First calculate the pay-back period of each alternative and then rank them in increasing order of pay-back periods.

RANKING OF PROJECTS

<i>Projects</i>	<i>Total outlay (Rs)</i>	<i>Annual return (Rs)</i>	<i>Pay-back periods (yrs)</i>	<i>Rank</i>
A	36,000	6,000	$36,000 / 6000 = 6$	4
B	24,000	8,000	3	1
C	20,000	5,000	4	2
D	15,000	3,000	5	3



NET PRESENT VALUE (NPV) METHOD

Concept of present value of money is well reflected in the proverb “a bird in the hand is worth two in the bush”.

In general, money received today is valued more than money receivable tomorrow.

Cash in hand is valued more because it gives:

- (a) liquidity
- (b) opportunity to invest and earn return

This is called time value of money.

Example:

A sum of Rs. 100 held in cash today is deposited in a bank at 10 percent rate of interest. After one year, Rs. 100 today will increase to Rs. 110. The amount (principal + interest) is worked out as:

$$\begin{aligned}\text{Amount} &= 100 + 100 (10/100) \\ &= 100 + 100 (0.1) \\ &= 100 + 10 = 110\end{aligned}$$

$$\begin{aligned}X_n &= \frac{PV}{(1+r)^n} \\ PV &= \frac{110}{(1+0.1)} = 100\end{aligned}$$

It follows that Rs. 110 expected one year hence is worth only Rs. 100 today. This means that Rs. 100 is the present value (PV) of Rs. 110 to be earned after a period of one year.

Present value of an Income Stream:

$$TPV = R_1/(1+r) + R_2/(1+r)^2 + R_3/(1+r)^3 + \dots + R_n/(1+r)^n$$

$$TPV = \sum R_n / (1+r)^n$$

Net Present Value and Investment Decision:

$$NPV = PV - C$$

$$NPV = \sum R_n [1 / (1+r)^n] - C$$

C = total cost of investment without any recurring expenditure.

The **investment decision rules** can be specified as follows:

- a) If $NPV > 0$, the project is acceptable;
- b) If $NPV = 0$, the project is accepted or rejected on non-economic considerations;
- c) If $NPV < 0$, the project is rejected.

If the investment is a **recurring expenditure**, then

$$\text{Total Present Cost (TPC)} = \sum C_n / (1+r)^n$$

$$NPV = \sum R_n / (1+r)^n - \sum C_n / (1+r)^n$$

$$NPV = \sum [R_n - C_n] / (1+r)^n$$

INTERNAL RATE OF RETURN (IRR)

The Internal Rate of Return (IRR) is defined as “the rate of interest or return which renders the discounted present value of its expected future managerial yields exactly equal to the investment cost of project”.

Alternative Names for IRR:

- (a) MEI – Marginal Efficiency of Investment
- (b) IRP – Internal Rate of Project
- (c) BER – Break-Even Rate

IRR is the rate of return (r) at which the discounted present value of receipts and expenditures are equal.

$$\sum R_n / (1+r)^n = \sum C_n / (1+r)^n$$

$$IRR = \sum [R_n / (1+r)^n] - \sum [C_n / (1+r)^n] = 0$$

Example:

FLOW OF NET INCOMES

	<i>Cost of project</i>	<i>1st year</i>	<i>2nd year</i>
Project A	100	0	140
Project B	100	130	0

<i>NET PRESENT VALUE (NPV) METHOD</i>	
<i>Project A</i>	<i>Project B</i>
<i>Expected rate of return = 10%</i>	<i>Expected rate of return = 10%</i>
$PV = (0/1 + 0.10) +$ $(140/ 1 + 0.10)^2 = 115.70$	$PV = (130/1 + 0.10) +$ $(0/ 1 + 0.10)^2 = 118.18$
$NPV = 115.70 - 100$ $= 15.70$	$NPV = 118.18 - 100$ $= 18.18$
Accept Project A	Accept Project B
<i>Expected rate of return = 20%</i>	<i>Expected rate of return = 20%</i>
$PV = (0/1 + 0.20) +$ $(140/ 1 + 0.20)^2 = 97.22$	$PV = (130/1 + 0.20) +$ $(0/ 1 + 0.20)^2 = 108.33$
$NPV = 97.22 - 100 = - 2.78$	$NPV = 108.33 - 100 = 8.23$
Reject Project A	Accept Project B

<i>INTERNAL RATE OF RETURN (IRR) METHOD</i>	
<i>Project A</i>	<i>Project B</i>
NPV $0 + (140/ 1 + r)^2 - 100 = 0$	NPV $130 / (1 + r) + 0 - 100 = 0$
$r = 0.183$ or 18.3%	$r = 0.3$ or 30%
<i>Project A</i>	<i>Project B</i>

r	NPV	R	NPV
0	40	0	30
10	15.70	10	18.18
18.3 = IRR	0	20	8.33
20	-2.78	30 = IRR	0

Hence, there is a conflict between the two criteria.

SUPPLY SIDE

SOURCES OF CAPITAL

(I) Sources of capital

(II) Cost of Capital

(1) INTERNAL SOURCES OF CAPITAL

Internal savings are generated in 2 ways:

- (a) creating depreciation funds
- (b) Ploughing back the profit through retained earnings.

The main managerial task with regard to raising internal funds is:

- (a) Forecasting the availability of internal funds;
- (b) Determining the depreciation reserve and plough-back profit; and
- (c) Deciding the amount for long term investment.

(2) EXTERNAL SOURCES OF CAPITAL

- (a) Sale of bonds
- (b) Issue of new common stock (or equity)
- (c) Issue of preferred stocks
- (d) Convertible securities, direct loans

CAPITAL BUDGETING AND INVESTMENT UNDER UNCERTAINTY

UNCERTAINTY

Uncertainty refers to a situation in which there is more than one outcome of a business decision and the probability of no outcome is known or can be meaningfully estimated.

For the purpose of decision-making, the uncertainty is classified as:

- (i) complete ignorance (risk taker or risk-averter)
- (ii) partial ignorance (subjective probability distribution)

INVESTMENT DECISIONS UNDER UNCERTAINTY

STRATEGY	STATES OF NATURE			
	N_1	N_2	N_3	N_4
S_1	20	12	6	5
S_2	15	16	4	-2
S_3	16	8	6	-1
S_4	5	12	3	2

(A) WALD'S MAXIMIN CRITERION

The decision maker must specify the worst possible outcome of each strategy and accept a strategy that gives best out of the worst outcomes.

Result: Strategy S₁ (value=5)

(B) MINIMAX REGRET CRITERION

The decision maker must select a strategy that minimizes the maximum regret of a wrong decision.

Regret Matrix

STRATEGY	STATES OF NATURE			
	N ₁	N ₂	N ₃	N ₄
S ₁	0	0	0	0
S ₂	5	2	2	7
S ₃	4	4	0	6
S ₄	15	0	3	3

Result: Strategy S₄ (value=3)

(C) HURWICZ DECISION CRITERION

The decision makers need to construct a decision index of most optimistic and most pessimistic pay-offs of each alternative strategy. The decision index is a weighted average of maximum possible and minimum possible pay-offs, such that the sum of the probabilities equals one.

$$D_i = \alpha \text{Max}_i + (1 - \alpha) \text{Min}_i$$

State	Max	α	αMax	Min	$(1-\alpha)$	$(1-\alpha) \text{Min}$	D
S ₁	10	0.8	8	6	0.2	1.2	9.2
S ₂	20	0.8	16	10	0.2	2	18
S ₃	15	0.8	12	5	0.2	1	13
S ₄	12	0.8	9	-10	0.2	-1	8

Result: Strategy S₂ (value=18)

(D) LAPLACE DECISION CRITERION

The strategy with the highest expected value is selected.

Subjective probability distribution

STRATEGY	STATES OF NATURE			
	N_1	N_2	N_3	N_4
S_1	0.50	0.30	0.20	0.00
S_2	0.60	0.20	0.10	0.10
S_3	0.40	0.40	0.15	0.05
S_4	0.55	0.35	0.10	0.00

STRATEGY	<i>Pay-off multiplied by probability</i>	<i>Expected value</i>
S_1	$20(0.5) + 12(0.3) + 6(0.2) + 5(0)$	14.80
S_2	$15(0.6) + 19(0.3) + 4(0.1) - 2(0.1)$	12.20
S_3	$16(0.4) + 8(0.2) + 6(0.1) - 1(0.05)$	10.79
S_4	$5(0.55) + 12(0.35) + 3(0.1) + 2(0)$	7.25

Result: Select strategy S_1 (value=14.8)

CAPITAL BUDGETING AND INVESTMENT

UNDER RISK

RISK

Risk means low probability of an expected outcome. From business decision-making point of view, risk refers to a situation in which a business decision is expected to yield more than one outcome and the probability of each outcome is known to the decision makers or can be reliably estimated.

There are two approaches to estimate the probabilities of outcomes of a business decision i.e.

- (i) ***a priori*** approach (approach based on deductive logic or intuition)
- (ii) ***posteriori*** approach (estimating the probability statistically on the basis of past data) eg. Standard deviation, coefficient of variation.

INVESTMENT DECISIONS UNDER RISK

(A) THE PAY-OFF MATRIX

A Pay-off matrix is a tabular array of strategic actions and their corresponding pay-offs under different states of nature.

Strategy (S) means one of several alternative actions that can be taken to achieve a certain goal. The states of nature (N) refer to the future market conditions in the long run on which the firm has no control.

STRATEGY	STATES OF NATURE			
	N_1	N_2	N_3	N_4
S_1	20	12	6	5
S_2	15	16	4	-2
S_3	16	8	6	-1
S_4	5	12	3	2

Subjective probability distribution

STRATEGY	STATES OF NATURE			
	N_1	N_2	N_3	N_4
S_1	0.50	0.30	0.20	0.00
S_2	0.60	0.20	0.10	0.10
S_3	0.40	0.40	0.15	0.05
S_4	0.55	0.35	0.10	0.00

STRATEGY	<i>Pay-off multiplied by probability</i>	<i>Expected value</i>
S_1	$20(0.5) + 12(0.3) + 6(0.2) + 5(0)$	14.80
S_2	$15(0.6) + 19(0.3) + 4(0.1) - 2(0.1)$	12.20
S_3	$16(0.4) + 8(0.2) + 6(0.1) - 1(0.05)$	10.79
S_4	$5(0.55) + 12(0.35) + 3(0.1) + 2(0)$	7.25

Result: Select strategy S_1

(B) RISK ADJUSTED DISCOUNT RATE METHOD

Risk adjusted discount rate (d):

$$D = 1 / (1 + r + u)$$

Where r is the risk free discount rate and u denotes the risk probability.

Example: Risk-adjusted present value of return (R_5) expected 5 years hence can be obtained as:

$$PV = 1 / (1 + r + u)^5 * R_5$$

$$\text{Risk-adjusted NPV} = \sum R_n / (1 + r + u)^n - C_o$$

(C) CERTAINTY-EQUIVALENT APPROACH

$$\text{Certainty-equivalent NPV} = \alpha R_n / (1 + r)^n - C_o$$

Where α is risk-equivalent coefficient (factor).

(D) PROBABILITY THEORY APPROACH

Cash flows (Rs.)	1st year		2nd year		3rd year	
	Probability	Expected Returns	Probability	Expected Returns	Probability	Expected Returns
1000	0.5	500	0.5	500	0.7	700
2000	0.25	500	0.4	800	0.3	600
3000	0.15	450	0.1	300	0	-
4000	0.1	400	0	-	0	-
Total	1	1850	1	1600	1	1300

Problems:

The company has determined the following probabilities for net cash flows generated by a project:-

Year 1		Year 2		Year 3	
Cash flows	Probability	Cash flows	Probability	Cash flows	Probability
1000	0.10	1000	0.20	1000	0.30
2000	0.20	2000	0.30	2000	0.40
3000	0.30	3000	0.40	3000	0.20
4000	0.40	4000	0.10	4000	0.10

Calculate the expected net cash flows. Also calculate the present value of the Expected cash flows using 10% discount factor.

Answer

Calculation of Expected net cash flows (ENCF)

Year 1			Year 2			Year 3		
C.F	Probability	Expected value	C.F	Probability	Expected value	C.F	Probability	Expected value
1000	0.10	100	1000	0.20	200	1000	0.30	300
2000	0.20	400	2000	0.30	600	2000	0.40	800
3000	0.30	900	3000	0.40	1200	3000	0.20	600
4000	0.40	1600	4000	0.10	400	4000	0.10	400
ENCF		3000	ENCF		2400	ENCF		2100

$$\text{Present Value (ENFC)} = 3000 * 0.909 + 2400 * 0.826 + 2100 * 0.751$$

Rs.6286.50.

Risk adjusted discount rate Vs.Certainty equivalence

The certainty equivalence approach recognizes risk in capital budgeting by adjusting estimated cash flows and employs risk free rate to discount the adjusted cash flows.

The risk adjusted discount rate adjusts for risk by adjusting the discount rate.

The certainty equivalence approach is superior than the risk adjusted discount rate because it can measure risk more accurately.

Certainty equivalence

Problem

1. A project involves an out lay of Rs.100000. its expected cash inflows at the end of the year 1 is Rs.40000. therefore it decreases every year by Rs.2000. It has an economic life of 6 years. The certainty equivalent factor is $\alpha_t = 1 - 0.05 t$. Calculate the NPV of the project if the risk free rate of return is 10%

Solution:

The NPV is calculated as follows:

Year	Estimate CIF	Certainty equivalence factor(CE)	CE value	D.F @10%	Present value
0	-100000	1.00	-100000	1.00	-100000
1	40000	0.95	38000	0.909	34542
2	38000	0.90	34200	0.826	28249
3	36000	0.85	30600	0.751	22981
4	34000	0.80	27200	0.683	18578
5	32000	0.75	24000	0.621	14904
6	30000	0.70	21000	0.564	11844
Net present value Rs.					31098

Exercise: 1

The expected cash flows of a project, which requires an investment of Rs.1000000

Years	Cash flows
-------	------------

1. 200000

2.	300000
3.	400000
4.	300000
5.	200000

The risk adjusted discount rate for the project is 18%. Is the project worth while?

Exercise: 2

Vels Hydraulics limited considering an investment proposal involving an outlay of Rs.4500000 the expected cash flows and certainty equivalence co-efficient are:

Years	Expected cash flows	C.E. Co-efficient
1	1000000	0.90
2.	1500000	0.85
3.	2000000	0.82
4.	2500000	0.78

The risk free rate is 5%. Calculate NPV of the Proposal.

(E) DECISION TREE METHOD

First, the decision makers are required to make a choice (or series of choices) from alternative investment avenues available to them.

Second, the decision-makers know for sure that all the decisions will yield a positive outcome, but they cannot tell in advance the exact outcome of a decision.

A decision tree is a graphical device to map all possible managerial decisions in a sequence and their expected outcomes under different states of the economy.

Strategy (1)	State of Economy (2)	Demand Prospect (3)	Probability (P) (4)	Present Value of cash flows (million Rs.) (5)	Expected Values = (4) × (5) (million Rs.) (6)
		High	0.3	800	240
		Medium	0.2	600	120
		Low	0.1	500	50
		High	0.1	600	60
		Medium	0.2	400	80
		Low	0.1	300	30
					Rs. 580 million
		High	0.3	600	180
		Medium	0.2	500	100
		Low	0.1	400	40
		High	0.1	500	50
		Medium	0.2	400	80
		Low	0.1	200	20
					Rs. 470 million

Project A:

Total expected value = Rs. 580 million

Less: Project cost = Rs. 500 million

Net expected value = Rs. 80 million

Project B:

Total expected value = Rs. 470 million

Less: Project cost = Rs. 400 million

Net expected value = Rs. 70 million

Result: Invest in Project A.

(F) SIMULATION

Simulation is a mathematical technique used to produce alternative target variable under certain stipulated conditions.

A simulation model is built. Nets the probability distributions are generated. A computer programme is used to stimulate the target variables (rate of return, profit or cash flows). Iterations are done for various factors.

The computer builds a frequency distribution of the rates of return on different sets of conditions. The decision makers can choose one or many from the options generated by simulation technique.

What do we mean by "simulation?"

When we use the word ***simulation***, we refer to any analytical method meant to imitate a real-life system, especially when other analyses are too mathematically complex or too difficult to reproduce.

Without the aid of simulation, a spreadsheet model will only reveal a single outcome, generally the most likely or average scenario. Spreadsheet risk analysis uses both a spreadsheet model and simulation to automatically analyze the effect of varying inputs on outputs of the modeled system.

One type of spreadsheet simulation is **Monte Carlo simulation**, which randomly generates values for uncertain variables over and over to simulate a model.

How did Monte Carlo simulation get its name?

Monte Carlo simulation was named for Monte Carlo, Monaco, where the primary attractions are casinos containing games of chance. Games of chance such as roulette wheels, dice, and slot machines, exhibit random behavior.

The random behavior in games of chance is similar to how Monte Carlo simulation selects variable values at random to simulate a model. When you roll a die, you know that either a 1, 2, 3, 4, 5, or 6 will come up, but you don't know which for any particular roll. It's the same with the variables that have a known

range of values but an uncertain value for any particular time or event (e.g. interest rates, staffing needs, stock prices, inventory, phone calls per minute).

What do you do with uncertain variables in your spreadsheet?

For each uncertain variable (one that has a range of possible values), you define the possible values with a probability distribution. The type of distribution you select is based on the conditions surrounding that variable. Distribution types include:



To add this sort of function to an Excel spreadsheet, you would need to know the equation that represents this distribution. With Crystal Ball, these equations are automatically calculated for you. Crystal Ball can even fit a distribution to any historical data that you might have.

What happens during a simulation?

During a single trial, Crystal Ball randomly selects a value from the defined possibilities (the range and shape of the distribution) for each uncertain variable and then recalculates the spreadsheet.

WHAT IS A MODEL?

Crystal Ball works with spreadsheet models, specifically MS Excel spreadsheet models. Your spreadsheet might already be a model, depending on what type of information you put in your spreadsheet and how you use it.

Data vs. analysis

If you only use spreadsheets to hold data -- sales data, inventory data, account data, etc., then you don't have a model. Even if you have formulas that total or subtotal the data, you might not have a model. For analyzing data, [you can use a time-series program](#).

A **model** is a spreadsheet that has taken the leap from being a

data organizer to an analysis tool.

A model represents a process with combinations of data, formulas, and functions. As you add cells that help you better understand and analyze your data, your data spreadsheet becomes a spreadsheet model.

HOW DO YOU ANALYZE THE RESULTS OF A SIMULATION?

For every spreadsheet model, you have a set of important outputs, such as totals, net profits, or gross expenses, which you want to, simulate and analyze. Crystal Ball lets you define those cells as **forecasts**.

A **forecast** is a formula or output cell that you want to simulate and analyze.

You can define as many forecasts as you need, and when you run a Monte Carlo simulation with Crystal Ball, Crystal Ball remembers the values for each forecast for each trial.

During the simulation, you can watch a histogram of the results, referred to as a Frequency Chart, develop for each forecast. While the simulation runs, you can see how the forecasts stabilize toward a smooth frequency distribution. After hundreds or thousands of trials, you can view the statistics of the results (such as the mean forecast value) and the certainty of any outcome. The example below is a forecast for Total Remediation Cost.

What is certainty?

Certainty is the percent chance that a particular forecast value will fall within a specified range. For example, in the chart above, you can see the certainty of the remediation project costing more than \$8,724 by entering the \$8,724 amount as the lower limit. Of the 2000 trials that were run, 80.13% of those had a cost greater than \$8,724, so your *certainty* of the remediation costing more than \$8,724 is 80.13%.

Certainty is the percent chance that a particular forecast value will fall

within a specified range.

Therefore, the forecast results not only show you the different result values for each forecast, but also the probability of any value. Other charts allow you to examine different facets of your model:

The Sensitivity Chart lets you analyze the contribution of the assumptions (the uncertain variables) to a forecast, showing you which assumptions have the greatest impact on that forecast. What factor is most responsible for the uncertainty surrounding your net profit? Which geological assumptions are most important when calculating oil reserves? Sensitivity analysis lets you focus on the variables that matter most.

The Overlay Chart lets you display multiple forecasts on the same axis, even when the forecasts are from separate spreadsheet models. Which of six potential new projects has the highest expected return with the least variability (smallest range of values) surrounding the mean? With the Overlay Chart, you can compare and select the best alternatives.

The Trend Chart lets you stack forecasts so that you can examine trends and changes in a series. How do your risks change over time?

(G) SENSITIVITY ANALYSIS

Sensitivity analysis is a simple version of a full-fledged simulation technique. While simulation technique uses the whole range of probability distributions of each decision variable, sensitivity analysis uses the probabilities in the high range only. This helps the decision makers in eliminating unimportant variables thereby concentrating on the most important ones.

Procedures

1. Set up the relation ship between the basis underlying factor (like the quantity sales, units selling price, life of the projects, etc.) and NPV
2. Estimate the range of variation and the most likely value of each of the basic variables
(Typically are factors varied at a time)

Sensitivity analysis – advantages

1. It compels the decision maker to identify the variables which affect the cash flows forecasts. This helps him in understanding the investment project in totality
2. It indicates the critical variables for which additional information may be obtained. The decision maker can identify the “weak spot” in the project and rectify them.
3. It Helps in identifying inappropriate forecast and guides the decision maker to concentrate relevant variables.

Sensitivity analysis – Disadvantages

1. It does not provide clear cut result. the term' optimistic' and pessimistic mean different things to different people
2. It fails to focus on the interrelationship between variables. For eg. Sales volume may be related to price or cost. A price cut may lead to high sales and low operating cost.

Problem

Ameth Corporation is considering the risk characteristics of a certain project. The firm has been identified that the following factors, with their respective expected values have a bearing on the NPV of this project.

Particulars	Rs.
Initial investment	30000
Cost of capital	10%
QTY. Manufactured and sold annually	1400
Price per unit	30
Variable cost per unit	20
Fixed cost	3000
Depreciation	2000
Taxation	50%
Life of the project	5 years
Net salvage value	Nil

Assume that the following underlying variables can take the values as shown below:

Underlying variables	Pessimistic	Optimistic
Qty. Manufactured and sold	800	1800
Price per unit	20	50
Variable cost per unit	15	40

- a).Calculate the sensitivity of NPV to variation in i) Qty. Manufactured and sold ii) Price per unit and iii) Variable cost per unit
- b).Calculate accounting break even & financial break even of the above project.

Answer

- i).The sensitivity of net present value to variations in quantity manufactured and sold is calculated below:

Particulars	Range		
	Pessimistic	Expected	Optimistic
Investment	Rs.30000	Rs.30000	Rs.30000
Sales quantity	800	1400	1800
Price per unit	Rs.30	Rs.30	Rs.30
Sales	Rs.24000	Rs.42000	54000
Variable cost per unit	Rs.20	Rs.20	Rs.20
Variable cost	Rs.16000	Rs.28000	Rs.36000
Fixed cost	Rs.3000	Rs.3000	Rs.3000
Depreciation	Rs.2000	Rs.2000	Rs.2000
Pre tax profit	Rs.3000	Rs.9000	Rs.13000
Taxes	Rs.1500	Rs.4500	Rs.6500
Profit after taxes	Rs.1500	Rs.4500	Rs.6500
Cash flow from operation	Rs.3500	Rs.6500	Rs.8500
Salvage value	Rs.0	Rs.0	Rs.0
Net present value (NPV)**	-Rs.16732	-Rs.5360	Rs.2222

**NPV = - Investment + cash flow from operation @10% for 5 Years

ii) The sensitivity of net present value to variations in price per unit is calculated below:-

Particulars	Range		
	Pessimistic	Expected	Optimistic
Investment	Rs.30000	Rs.30000	Rs.30000
Sales quantity	1400	1400	1400
Price per unit	Rs.20	Rs.30	Rs.50
Sales	Rs.28000	Rs.42000	Rs.70000
Variable cost per unit	Rs.20	Rs.20	Rs.20
Variable cost	Rs.28000	Rs.28000	Rs.28000
Fixed cost	Rs.3000	Rs.3000	Rs.3000
Depreciation	Rs.2000	Rs.2000	Rs.2000
Pre tax profit	Rs.5000	Rs.9000	Rs.37000
Taxes	Rs.2500	Rs.4500	Rs.18500
Profit after taxes	Rs.2500	Rs.4500	Rs.18500
Cash flow from operation	Rs.500	Rs.6500	Rs.20500
Salvage value	Rs.0	Rs.0	Rs.0
Net present value (NPV)**	-Rs.31895	-Rs.5360	Rs.47711

**NPV = - Investment + cash flow from operation @10% for 5 Years

iii) The sensitivity of net present value to variations in the variable cost per unit is calculated below:

Particulars	Range		
	Pessimistic	Expected	Optimistic
Investment	Rs.30000	Rs.30000	Rs.30000
Sales quantity	1400	1400	1400
Price per unit	Rs.30	Rs.30	Rs.30
Sales	Rs.42000	Rs.42000	Rs.42000
Variable cost per unit	Rs.40	Rs.20	Rs.15
Variable cost	Rs.56000	Rs.28000	Rs.21000
Fixed cost	Rs.3000	Rs.3000	Rs.3000
Depreciation	Rs.2000	Rs.2000	Rs.2000

Pre tax profit	Rs.19000	Rs.9000	Rs.16000
Taxes	Rs.9500	Rs.4500	Rs.8000
Profit after taxes	Rs.9500	Rs.4500	Rs.8000
Cash flow from operation	Rs.7500	Rs.6500	Rs.10500
Salvage value	Rs.0	Rs.0	Rs.0
Net present value (NPV)**	-Rs.58431	-Rs.5360	Rs.7908

**NPV = - Investment + cash flow from operation @10% for 5 Years

b) Calculate the accounting break even point and financial break even point of the above project.

Accounting Break eve point:

Sales	Rs.42000
Variable cost	Rs.28000
Fixed cost	Rs.3000
Depreciation	Rs.2000

$$\text{The accounting BEP} = \frac{\text{Fixed costs} + \text{Dep.}}{\text{Contributionmarg inratio}}$$

$$= \frac{3000 + 2000}{0.333} = \text{Rs.15000}$$

Where the Contribution margin ratio is

$$= 1 - \frac{\text{variable cost}}{\text{sales}} = 1 - \frac{28000}{42000} = 0.333$$

Financial BEP:

Variable cost	0.667 Sales
Contribution	0.333 Sales
Fixed Cost	Rs.3000
Depreciation	Rs.2000
Pre tax profit	0.333 Sales – 5000
Taxation @ 50%	0.5(0.333 Sales- 5000)
Profit after tax	0.5(0.333 Sales-5000)
Cash flows	2000+0.5(0.333 sales-5000)

Since the cash flow lasts for 5 Years, its present value at a discount Rate of 10% is:

$$\begin{aligned} \text{PV (cash flows)} &= (0.1665 \text{ Sales} - 5000) \times \text{Discounted present value} \\ &= (0.1665 \text{ Sales} - 5000) \times 3.791 \end{aligned}$$

The project breaks even in NPV terms with the present value of these cash flows equals the initial investment of Rs.30000. Hence the financial break even occurs when

$$\begin{aligned} (0.1665 \text{ Sales} - 5000) \times 3.791 &= 30000 \\ 0.631 \text{ sales} - 1895.5 &= 30000 \\ 0.631 \text{ sales} &= 30000 + 1895.5 = 31895.5 \\ \text{Sales} &= 31895.5 / 0.631 = 50548 \end{aligned}$$

PRACTICAL PROBLEMS:

- Payoff ltd is producing articles mostly by manual labour and is considered to replace it by a new machine. There are two alternative models M and N of the new machine. Prepare a statement of profitability showing the pay back period from the following:-

	Machine M	Machine N
Estimated life of the machine	4 years	5 years
Cost of Machine	Rs.9000	Rs.18000
Estimated savings in scrap	Rs.500	Rs.800

Estimated savings in direct wages	Rs.6000	Rs.8000
Cost of maintenance	Rs.800	Rs.1000
Cost of supervision	Rs.1200	Rs.1800

Ignore taxation.

Solution;

Statement of calculating pay-back period

	Machine M	Machine N
Savings in scrap	Rs.500	Rs.800
Savings in direct wages	Rs.6000	Rs.8000
	-----	-----
Total savings (A)	6500	8800
	=====	=====
Cost of maintenance	Rs.800	Rs.1000
Cost of supervision	Rs.1200	Rs.1800
	-----	-----
Total cost (B)	2000	2800
	=====	=====
Net cash flows (A-B)	4500	6000
Pay back period	9000/4500 2 years	18000/6000 3 years

Since machine M has shorter pay back period, it should be preferred.

2. ABC ltd. Is considering two projects each requires an initial investment of Rs.10000. The net cash inflows from investment in the two projects X and Y are as follows:-

Cash inflows

Years	Project X	Project Y
1.	5000	1000
2.	4000	2000
3.	3000	3000
4.	1000	4000
5.	---	5000
6.	---	6000

The company has fixed three years pay-back period as the cut-off point.

Solution:

Years	Cash inflows			
	Project X		Project Y	
	CIF	Cum.CIF	CIF	Cum.CIF
1.	5000	5000	1000	1000
2.	4000	9000	2000	3000
3.	3000	12000	3000	6000
4.	1000	13000	4000	10000
5.	---	13000	5000	15000
6.	---	13000	6000	21000

$$\text{Pay-back period X} = 2 + \frac{1000}{3000} = 2 + 0.33 = 2.33 \text{ Years}$$

$$\text{Pay-back period Y} = 4 \text{ Years}$$

Inference: - The Company has fixed the cut-off point of 3 years and also the payback period of project X is shorter than Project Y and cut-off point, we can choose project X.

3. There are two Projects X and Y. X requires an initial investment of Rs.26000 while Y requires an investment of Rs.38000 The cost of capital is 12%. On the basis of the

following and the present value of Re.1 at 12%. You are required to state which project should be accepted. Under NPV method.

Cash inflows

Years	Project X	Project Y	Presents value Of
<u>Re.1@12%</u>			
1.	9000	8000	0.893
2.	7000	10000	0.797
3.	6000	12000	0.712
4.	5000	14000	0.636
5.	4000	8000	0.567
6.	4000	2000	0.507
7.	3000	16000	0.452
8.	3000	---	0.404
9.	3000	---	0.361
10	3000	---	0.322

Solution:

Years	DF@12%	<i>Cash inflows</i>		
		Project X	Present value	Project Y
			Cash inflows	Cash inflows
1.	0.893	9000	8037	8000
				7144
2.	0.797	7000	5579	10000
3.	0.712	6000	4272	12000
4.	0.636	5000	3180	14000
5.	0.567	4000	2268	8000
6.	0.507	4000	2028	2000
7.	0.452	3000	1356	16000
				7232

8.	0.404	3000	1212	---	---
9.	0.361	3000	1083	---	---
10	0.322	3000	966	---	---
			-----	-----	
Present value of CIF			29981	45344	
Initial investment			26000	38000	
			-----	-----	
-					
Net Present Value			3981	7344	
			=====	=====	

4. A project cost of Rs.16000 and is expected to generate cash inflows of Rs.4000 each for 5 years calculate IRR.

$$\text{Factor} = \frac{\text{Initial investment}}{\text{cashflows}}$$

$$= \frac{16000}{4000} = 4.00$$

IRR= 8%

5. A company is contemplating investment in a project which requires an initial investment of Rs.40000 and generating a cash inflows of Rs.16000 each for 4 years calculate IRR.

$$\text{Factor} = \frac{\text{Initial investment}}{\text{cashflows}}$$

$$= \frac{40000}{16000} = 2.5$$

IRR= 22%

6. A company has to consider the following project;

Initial cost Rs. 10000

Years:	1	2	3	4
--------	---	---	---	---

CIF	(Rs.)	1000	1000	2000	10000
-----	-------	------	------	------	-------

Compute IRR and comment on the project if the opportunity cost is 14%

Solution

Assuming DF@ 10% and @ 20 %

Years	CIF	DF@10%	PV	DF@20%	PV
1.	1000	0.909	909	0.833	833
2.	1000	0.826	826	0.694	694
3.	2000	0.751	1502	0.579	1158
4.	10000	0.683	6830	0.482	4820
			-----		-----
Total present value			10067		7505
Less: initial investment			10000		10000
			-----		-----
NPV			67		-2495
			=====		=====

$$\begin{aligned}
 \text{IRR} &= 10\% + \frac{67}{67 - (-2495)} * 10 \\
 &= 10\% + \frac{67}{2562} * 10 \\
 &= 10+.026 \\
 &= 10.26\%
 \end{aligned}$$

IRR is 10.26% is less than the cut-off rate, that is $10.26 < 14\%$, Therefore the project should be rejected.

7. Rank the following projects on the basis of

(a) payback (b) Accounting rate of return and (c) Net present Value

Particulars	Year	Project	Project	Project
-------------	------	---------	---------	---------

		A	B	C
Investment	0	30,000	30,000	30,000
Annual savings	I	13,800	36,150	-
Annual savings	II	13,800	-	-
Annual savings	III	13,800	-	46,287

Discount factors@ 10% for the year 1, 2 and 3 are 0.909, 0.826 and 0.751 respectively.

Solution.

(a) Payback Period

$$\text{Project A} = 2 \text{ years} + \frac{2400}{13800} = 2.17 \text{ yrs.}$$

$$\text{Project B} = 2 \text{ years} + \frac{30,000}{36,150} = 2.83 \text{ yrs.}$$

$$\text{Project C} = 2 \text{ year} + \frac{30,000}{46,827} = 2.64 \text{ yrs.}$$

Hence, the project A has low payback period which is better than Project B and Project C.

(b) Accounting Rate of Return (ARR)

$$\text{ARR} = \frac{\text{Average Annual Savings}}{\text{Original Investment}} \times 100$$

$$\text{Project A} = \frac{13,800}{30,000} \times 100 = 46\%$$

$$\text{Project B} = \frac{12,050}{30,000} \times 100 = 40.16\%$$

$$\text{Project C} = \frac{15,609}{30,000} \times 100 = 52.03\%$$

Project C is selected based on higher ARR.

(c) NPV

Calculation of NPV for Project A

Year	CI	PV at 10%	PV of CI
1	13,800	.909	12,544
2	13,800	.826	11,398
3	13,800	.751	10,638
Total PV of CI		44,580	
(-) Total PV of CO		30,000	
NPV		14,580	

Calculation of NPV- Project B

Year	CI	PV at 10%	PV of CI
1	36,150	.909	32,860
2	-	.826	-
3	-	.751	-
Total PV of CI		32,860	
(-) Total PV of CO		30,000	
NPV		2,860	

Calculation of NPV for Project C

Year	CI	PV at 10%	PV of CI
1	-	.909	-
2	-	.826	-

3	46,827	.751	35,167
Total PV of CI			35,167
(-) Total PV of CO		30,000	
NPV		5,167	

Project C is selected due to higher NPV.

Ranking

Project	Payback	ARR	NPV
A	1	2	1
B	2	3	3
C	3	1	2

PROBLEMS

1. Jolly company has an investment opportunity costing Rs.40, 000 with the following expected cash inflow (i.e., after tax and before depreciation):

Year	Inflow	PVF 10%	Year	PVF 10%
1	7,000	0.909	6	0.564
2	7,000	0.826	7	0.513
3	7,000	0.731	8	0.467
4	7,000	0.683	9	0.424
5	7,000	0.621	10	0.386

Using 10% as the cost of Capital (rate of Discount) determine the (i) NPV and (ii) PI

2. A company is considering as to which of two mutually exclusive projects it should undertake. The Finance Director thinks that the project with the higher NPV should be chosen whereas the managing director thinks that the one with the higher IRR should be undertaken especially as both projects have the same initial outlay and length of life. The company anticipates a cost of Capital of 10% and the net after tax cash flows of the projects are as follows:

(Figures in Rs.'000)

Year	0	1	2	3	4	5
Project X	(200)	35	80	90	75	20
Project Y	(200)	218	10	10	4	3

Required

- (a) Calculate the NPV and IRR of each project
- (b) State, with reasons, which project you would recommend.

The discount factors are as follows:

Year	0	1	2	3	4	5
PVF 10%	1	0.91	0.83	0.75	0.68	0.62
PVF 20%	1	0.83	0.69	0.58	0.48	0.41

3. A project Costs Rs.20, 00,000. It yields profit during the life of the project i.e., 5 years which are follows:

Year	Profit after Tax and Dep.
1	1,00,000
2	1,50,000
3	2,50,000
4	2,60,000
5	1,60,000

The plant and machinery can be sold after 5 years for Rs.1,60,000. Calculate the rate of return.

Text Books:

1. I M. Pandey-Financial Management, Vikas Publishing House Pvt.Ltd, 8th Edition,1999.
2. Prasanna Chandra, Financial Management, Theory and Practice, Tata Mc Graw Hill Publishing Company Ltd, 5th Edition-2001.

Reference Books:

1. Aswat Damodaran, Corporate Finance Theory and Practice, John Wiley & Sons-2000
2. Hrishikes Bhattacharya-Working Capital Management, Strategies and Techniques, Prentice-Hall of India Pvt.Ltd., New Delhi-2001.
3. James C.Vanhorne-Financial Management and Policy-Pearson Education Asia (Low priced edition) 12th edition-2002.
4. Khan and Jain-Basic Financial Management & Practice-Tata Mc Graw Hill-5th edition-2001.

UNIT - IV

A PROJECT REPORT:-

A project report is a statement prepared by an expert after the detailed study and analysis of the various elements of a project.

Project report include the information on the following aspects.

- (i) Economic Aspects
- (ii) Technical Aspects
- (iii) Financial Aspects
- (iv) Production and managerial aspects.

INTRODUCTION

Project appraisal is a way of detailed examination of several elements of a given project before recommending the same. In other words project appraisal is the systematic analysis of costs and benefits of a proposed project with the ultimate aim of assuring a rational allocation of limited funds among alternative investment opportunities in a view of achieving certain specified goals.

MEANING:-

Project appraisal means the assessment of a project interims of its economics, social and financial viability. In other words it is the multidimensional analysis of the project ie a complete scanning of the project.

DEFINITION:-

Project appraisal can be defined as the promoter taking a second look critically and carefully at a project as presented by the promoter person who is in no way involved in or connected with its preparation and objective and view of the project in its totality as also in respect of its various components.

CONCEPT OF PROJECT APPRAISAL:-

Due to the impact of New Economic and Industrial Policy financial institutions are ready to provide required fund to the project. At the same time institution that is going to fund the project has to satisfy itself before providing financial assistance for the project. The main aim of the financial institution has to examine whether the investment on the proposed project will generate sufficient return on the investments made and that the loan amount disbursed for the implementation of the project will be recovered along with interest within a reasonable period of time or not.

Project appraisal is ex-ante analysis. It identifies and values the expected benefits of a project. Project evaluation is ex-post analysis of an executed project. It determines the real costs and benefits of the project. By comparing the real costs and benefits the project real profitability is certained by evaluation stage. However, sometimes the concepts of appraisal and Evaluation are used interchangeably.

APPRAISAL PROCESS:-

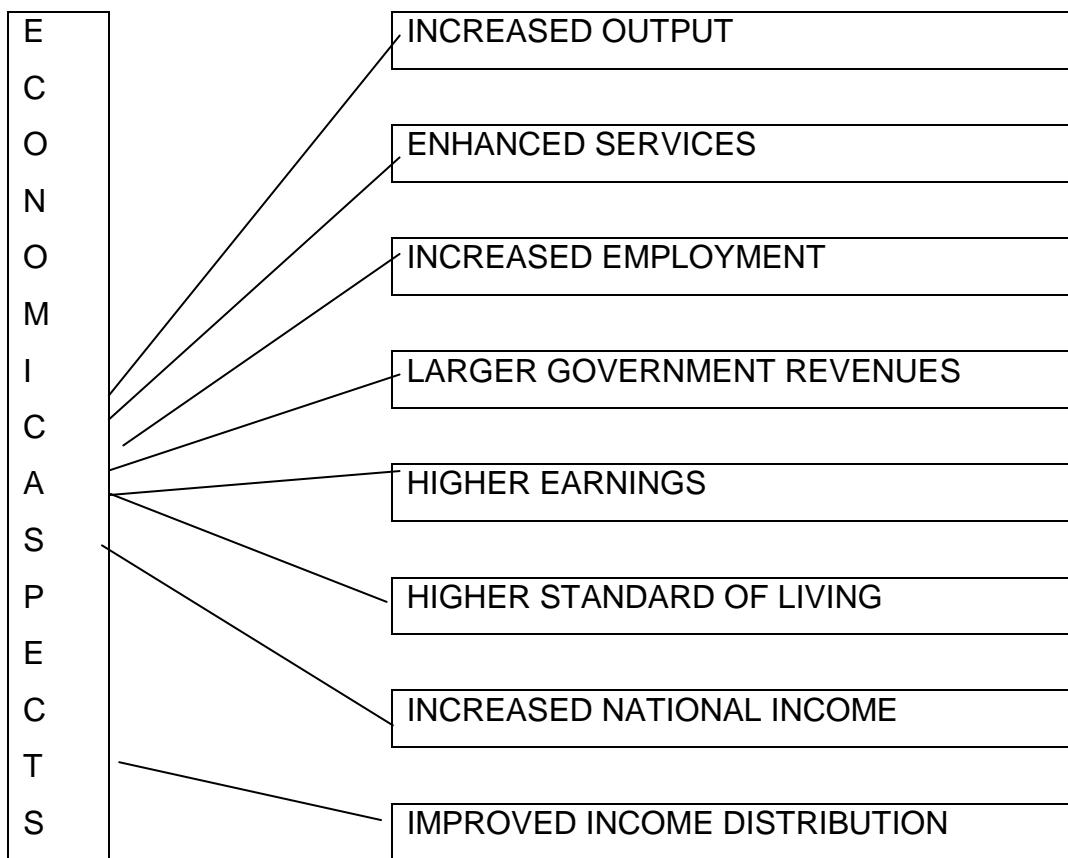
Project appraisal is a systematic and a scientific tool. It indicates whether the project is in a potential environment which enjoys priority for Economic development of the region / state concerned. The following are the process involved in Appraisal of a project.

- | | |
|------------------------|--------------------|
| (I) Economic | (IV) Managerial |
| (II) Technical | (V) Operational |
| (III) Organisational | (VI) Financial |

I. ECONOMIC ASPECTS:-

Economic appraisal measures the effect of the project on the whole economy. The economic appraisal are the fundamental as they basically precede all other aspects, because the banker will provide finance to the project only on the assurance of projects having high - priority use of region's resources. The economic benefits brought about by a successful

project normally take the form of an increased output of goods or services either directly or indirectly. Automatically the increased level of production generate many different forms of additional income. Such as increased employment of Labour, more government revenues, higher capital appreciation to the owners and so on.



II. TECHNICAL ASPECT:-

Technical appraisal of a project broadly involves a critical study of the following factors.

(a) RAW MATERIAL SUPPLIES:-

The process of manufacturing may sometimes vary with the raw material selection. Certain industrial units are located nearer to the source of raw

material. But certain industrial units are located far away from the Raw material Supplies. But anyhow nearest sources of raw material is the advantageous for the industrial units.

(b) PROXIMITY OF MARKETS:-

In case markets are geographically spread, nationally or internationally, manufacturing units may be established in close proximity to the major markets.

(c) AVAILABILITY OF TRANSPORT:-

Transportation facilities are the ultimate need of industrial development. Places with a high transport disadvantage are not likely to attract industries. In India there may significant variations in transport costs between different locations. In order to overcome this difficulties Government of India providing transport subsidy to industrial units located in industrially backward and hill regions.

(d) POWER AND FUEL SUPPLY:-

Power and fuel supply influence in the greater role of establishing industrial units. Specifically cheap power or fuel and its uninterrupted supply is an important attraction for constructing industries. Electrification of various parts of the country, including the villages is encouraging decentralization of industries.

(e) MANPOWER:-

For the establishment of industrial units depend upon the availability of Labour forces. ie not only for the Quantity but also the skill levels of the available manpower. Cheap Labour is particularly important for industries where labour accounts for a significant part of the total value added.

(f) NATURAL AND CLIMATIC FACTORS:-

Natural and climatic factors also play an important role in the establishment of industrial units as the absence of these conditions will

necessitate additional expenditure to create favourable conditions artificially.

(g) STRATEGIC CONSIDERATIONS:-

Establishment of strategic industries, the special care is taken to assure that the location chosen is not easily accessible to the military forces of other countries.

(h) INCENTIVES AND DISINCENTIVES:-

In India the union and State Government offer a various fiscal, monetary and physical incentives for industries for Economically backward areas. But incase of certain disincentives like higher taxes may discourage industries in certain regions. Government may ban for setting up new industrial unit in congested areas.

(i) SOCIO - ECONOMIC AND POLITICAL FACTORS:-

Socio - economic and political factors is highly influenced in the establishment of public sector units. And at the same time some of the large scale public sector units are located in backward regions due to the socio - economic factors.

(j) MISCELLANEOUS FACTORS:-

Apart from the above factors, some other factors that may influence the decision of industrial location i.e. proximity of complementary industries, prospects of development of the region, personal factors, historical factors etc.

TECHNICAL FEASIBILITY:-

The project must be technically feasible. This is judged by a detailed assessment of the following factors.

- (i) Selection of process / technology
- (ii) Scale of operations
- (iii) Raw material (IV) Technical know how

- (iv) Collaboration agreements
- (v) Product mix (VII) plant layout
- (vi) Location of the project (IX) project scheduling and implementations.

III. ORGANISATIONAL ASPECTS:-

In case of lender and a development institution, the bank places particular stress on the need for an efficient organization and responsible management for the execution of the project. During appraisal, these two essential dimensions of a project are examined. The foremost aim of this appraisal is to make sure that the project is adequately carried out and that a locally-staffed institution, capable of contributing effectively to the development of the sector in Questions created.

IV. MANAGERIAL ASPECT:-

Management is the very important factor that can sole responsible for making a project either success or failure. A good project at the hands of a poor management may fail while a not-so-good project at the hands of an effective management may succeed. Banks and financial institutions that lend money for financing projects lay more emphasis on management appraisal. The Companies Act, the Industries (Development Regulation) Act etc. empower Government to exercise power of control over the management, including the take over of management of industrial undertakings. If a proper appraisal of the managerial aspects is made in the beginning itself, in this way future problems can be avoided to a very large extent.

V. OPERATIONAL ASPECT:-

In the project appraisal scale of operation is signified by the size of the plant. Economic size of the plant for a given project can be arrived at by an analysis of capital and operating costs as a function of the plant size.

If the size of the proposed project is below its economic size, means, it must be analyzed carefully as to whether the project will survive at the proposed size or not performance of existing units operating at below economic size will throw some light on this aspect.

VI. FINANCIAL ASPECTS:-

Financial appraisal refers to find the financial viability of the project. In this regard careful scrutiny of the following aspects i.e. cost of the project, sources of finance, profitability, Repayment Capability, Repayment Schedule and so on.

METHODOLOGY FOR PROJECT EVALUATION:-

Project appraisal is a process of transmitting information through the feasibility studies into a comprehensive form in this way the decision maker undertake a comparative appraisal of various projects and embark a particular project or projects for allocating scarce sources. In order to achieve the overall objectives of the enterprise in view all those of the project, appraisal process carried out by employing certain criteria viz. profitability or social profitability.

Methodology is a systematic way for completion of given work. The following techniques are generally suggested as the project appraisal methods.

- (i) Payback period
- (ii) Accounting rate of return method
 - (a) Return on average investment method
 - (b) Return on original investment method
- (iii) Discounted pay back method
- (iv) Net present value method

- (v) Internal Rate of return methods
- (vii) Profitability index or Benefit cost Ratio.

Apart from these a public sector project is appraised by employing social cost benefit analysis, so as to highlight its importance to the country's industrial development or society development.

I. PAY BACK PERIOD:-

Meaning -

i. Pay-back period method

It is a traditional method for evaluating the profitability of investment proposals. Pay back period is the period in which the project will generate necessary cash to recover original investment of the project. Normally, shorter pay back period of the project should be recommended.

Procedure for the calculation of pay back period

a) In the case of even cash inflows

$$\text{Pay back period} = \frac{\text{Original cost}}{\text{Annual cash inf low}}$$

$$\text{Annual cash inflow} = \text{Net savings or net profit} + \text{Depreciations}$$

Note: Suppose cash inflow is given in the problem, no need to find out cash inflow.

If cash inflows are not given in the problem, we have to find out cash inflow.

b) In the case of uneven cash inflows

If cash inflows are not uniform, the calculation of pay back period takes a cumulative way ie, arriving at net cash inflow until the total is equal to original cost of the project.

ii. Post Pay Back Method

Calculation

Total cash inflow from the Proposal

during its Economic life	x x
--------------------------	-----

Less original cost	x x
--------------------	-----

Post pay back profitability x x

SUITABILITY OF PB METHOD:-

- (i) Payback technique is suitable when the project has shorter gestation period and also the project cost is small.
- (ii) In a period of cash shortage and depends on the internal generation of cash under this situation it is the best method of appraisal.
- (iii) This method is suitable in which project belongs to high risk category.
- (iv) It is the best method for deciding upon overseas investments when there is political uncertainty in such countries.

MERITS OF PAY BACK PERIOD:-

- (i) It is easy to workout and simple to understand.
- (ii) It is preferred on the ground that returns beyond three or four years are so uncertain that is better to disregard them altogether in a decision.
- (iii) It give the guidance for industries with a high rate of technological obsolescence in which the receipts beyond payback are regarded as totally uncertain.
- (iv) As the method considers the cash flows during the payback period of the project the estimates would be reliable and the results may be comparatively more accurate.

DEMERITS:-

- (i) This method could not consider the earnings beyond the pay back period.
- (ii) It ignores the time value of money.

Problems & Solution -

Problem 1 : Each of the following projects require a cash outlay of Rs.10,000. You are required to suggest which project should be accepted if the standard pay back period is 5 years.

Year	Project X Rs.	Project Y Rs.	Project Z Rs.
1	2500	4000	1000
2	2500	3000	2000
3	2500	2000	3000
4	2500	1000	4000
5	2500	-	-

Solution

All the three projects recovered their original capital Rs.10,000 with in the period of 4 years. Here project X has constant cash inflow. Project Y initially has higher cash inflows but gradually decreased.

Project Z initially has low cash inflows but it has gradually increased.

As per the constant return point of view project X is recommended.

Problem 2 : A Company has to choose one of the following two mutually exclusive projects. Both the projects have to be depreciated on straight line basis. The tax rate is 50%

Cash inflows (Profit before Depreciation and tax)

Year	Project A Rs.	Project B Rs.
0	15,000	15,000
1	4,200	4,200
2	4,800	4,500
3	7,000	4,000
4	8,000	5,000
5	2,000	10,000

You have to use pay -back period as the criterion

[M.SC ITM May 2000 PU]

Solution

Project - A

Year	Profit Rs.	(-) Depreciation Rs.	Profit After Depreciation Rs.	Tax Rs.	PAT Rs.	Add Depreciation Rs.	Cash Inflows Rs.	Cumulative Cash Inflows Rs.
1	4200	3000	1200	600	600	3000	3600	3600

2	4800	3000	1800	900	900	3000	3900	7500
3	7000	3000	4000	2000	2000	3000	5000	12500
4	8000	3000	4000	2000	2000	3000	5000	17500
5	2000	3000	-1000	--	-	3000	2000	19500

[PAT = Profit after Tax]

Pay back period = 3 years and 6 months

Working

Investment is Rs.15,000

Upto three years ie first three years

Capital recovered is Rs.12,500

Balance of Rs.2500 recovered during the 4th year

I year	3,600	
II year	3,900	
III year	5,000	

	12,500	
Balance	2,500	

	15,000	

=	$\frac{12 \text{ months}}{5,000} \times 2,500$	= How many months?

Time taken for recovery of this amount of Rs. 2,500 = 6 months. Pay back period = 3 years 6 months.

Project - B

Year	Profit Rs.	(-) Depreciation Rs.	Profit After Depreciation Rs.	Tax Rs.	PAT Rs.	Add Depreciation Rs.	Cash Inflow Rs.	Cumulative Cash Inflows Rs.
1	4200	3000	1200	600	600	3000	3600	3600
2	4500	3000	1500	750	750	3000	3750	7350
3	4000	3000	1000	500	500	3000	3500	10850
4	5000	3000	2000	1000	1000	3000	4000	14850
5	10000	3000	7000	3500	3500	3000	6500	21350

(PAT = Profit after tax)

Note : If necessary only prepare cumulative cash inflows, otherwise there is no need.

Pay back period = 4 years and 8 days

Result and decision : Project A is preferable, because it has a shorter pay back period as compared to project A.

Workings Initial investment is Rs. 15,000

Its recovered :

I year	-	3,600
II year	-	3,750
III year	-	3,500
IV year	-	4,000

		14,850
Balance		150

		15,000

Time taken for recovery of this amount Rs.150/- = 8 days.

For recovery of Rs.6,500 in the 5th year

Time required = 365 days

For recovery of Rs.150 in the 5th year

Time required being $\frac{365}{6500} \times 150 = 8$ days

Depreciation

	Project A	Project B
$\frac{\text{Cost}}{\text{Life}}$	$= \frac{15,000}{5 \text{ years}} = \text{Rs.3,000}$	$\frac{15,000}{5 \text{ years}} = \text{Rs.3,000}$

Problem 3 : Using the information given below compute the pay-back period under

a) Traditional pay-back method and b) Discounted pay-back method

Initial outlay Rs.80,000

Estimated life 5 years

Profit after tax

End of the years	year 1	Rs. 6,000
	2	Rs.14,000
	3	Rs.24,000
	4	Rs.16,000
	5	Nil

Depreciation has been calculated under straight line method. The cost of capital may be taken 20% p.a and the PV of Re.1 at 20% p.a is given below.

Year	1	2	3	4	5
P/V factor	.83	.69	.58	.48	.40

[MBA Nov.98 Madras] [M.Com Calcutta]

Solution

Year	PAT (A) Rs.	Add Depreciation Rs.	Profit Before Depreciation but after Tax Rs.	P/V factor at 20%	Present Value
1	6,000	+ 16,000	= 22,000	.83	18,260
2	14,000	+ 16,000	= 30,000	.69	20,700
3	24,000	+ 16,000	= 40,000	.58	23,200
4	6,000	+ 16,000	= 22,000	.48	15,360
5	Nil	+ 16,000	= 16,000	.40	6,400
(PAT = Profit After Tax)				Total present value	83,920
				Less : Initial investment	80,000
				Net Present Value	3,920

Traditional payback method

I year Rs.	22,000
II year Rs.	30,000

Amount recovered for 2 years	52,000
Balance Rs.	28,000

80,000

III year profit is Rs.40,000. But we require only Rs.28,000 to meet the original investment of Rs. 80,000.

$$= \frac{12 \text{ months}}{40,000} \times 28,000 = \text{How many months?}$$

i.e. 2 years 8 months

b) Discounted pay back method

I year	18,260
II year	20,700
III year	23,000
IV year	15,360

	77,520
Balance Rs.	2,480

In the V year Cash inflow is Rs.6400. But actually we require only Rs.2480 to meet the original investment of Rs.80,000

$$\therefore \frac{12 \text{ months}}{6,400} \times 2,480 = \text{How many months?}$$

ie 4 years 4 months

Pay back period = 4 year 4 months

Note: Depreciation

II. ACCOUNTING RATE OF RETURN METHOD:-

It considers the earnings of project during its entire economics Life. It is known as Return on investment method. Simply return on investment is the ratio of earnings after depreciation to original cost of investment.

This method is otherwise known as accounting rate return method or return on investment or average rate of return method. It can be expressed in the following ways.

i) Average rate of return = $\frac{\text{Average annual profit}}{\text{Original investment}}$

ii) Return Per unit of investment method

$$\text{Return per unit of investment} = \frac{\text{Total Profit}}{\text{Net Investment}} \times 100$$

iii) Rate of Return on average investment method

$$\text{Return on average investment} = \frac{\text{Pr of it after depreciation tax}}{\text{Average investment}}$$
$$\text{Average investment} = \frac{\text{Original Investment}}{2}$$

iv) Average return on average investment method

$$\text{Average return on average investment} = \frac{\text{Average annual profit}}{\text{Average investment}} \times 100$$

v) Rate of return on original investment method

$$\text{Return on original investment} = \frac{\text{Pr of it}}{\text{Original investment}}$$

III. NET PRESENT TECHNIQUE:-

Net present value may be defined as the excess of present value of project cash inflows over that of outflows.

IV. INTERNAL RATE OF RETURN:-

The internal rate of return for an investment proposal is the discount rate that equates the present value of initial cost of the investment with the present value of the expected net cash flows. In other words, it is the rate which discounts the cash flows to zero. Normally, the internal rate of return is found by trial and error method. It can be stated in the form of the following way.

$$\frac{\text{Cash inflows}}{\text{Cash outflows}} = 1$$

Procedure for calculation

a) Where cash inflows are uniform

In any project, the cash inflows are uniform. The IRR can be calculated by locating the factor in annuity table. The factor is calculated as follows.

$$F = \frac{I}{C}$$

Where F = Factor to be located

I = Initial Investment

C = Cash inflow per year

The factor, thus calculated, will be located in table II on the line representing number of years corresponding to estimated useful life of the asset.

b) Where cash inflows are not uniform

The internal rate of return is calculated by making trial and error method.

Procedure

i) First trial rate may be calculated in the following way.

In order to have an approximate idea about the rate, it will be better to find out the factor to be calculated in the following formula.

$$F = \frac{I}{C}$$

The above factor is treated as first trial rate.

ii) The second trial rate and third trial rate is determined

iii) After applying the second and third trial rates, we have to apply the following formula for the purpose of arriving at exact IRR.

$$IRR = \text{Lower trial rate} + \frac{\text{NPV at lower rate}}{\text{NPV at lower rate} - \text{NPV at higher rate}} \times \text{Difference between higher and lower trial rate}$$

V. PROFITABILITY INDEX OR BENEFIT - COST RATIO:-

It is a time adjusted method of evaluating profitability of the investment proposals. By calculating the profitability indices for various projects the financial manager can rank the projects according to their profitability.

$$\begin{aligned}
 \text{Profitability index} &= \frac{\text{Present value of cash inflows}}{\text{Initial cashoutlay}} \\
 &\quad (\text{or}) \\
 &= \frac{\text{Present value of future cash inflows}}{\text{Present value of future cash outflows}} \times 100
 \end{aligned}$$

Decision Rule

Present value index of the project is equal to or more than 1 or 100% is to be selected.

VI) DISCOUNTED PAY BACK METHOD

Under this method, the present value of all cash inflows and outflows are calculated at an appropriate discount factor. The present values of all inflows are cumulated in order of time.

Problem : A Ltd company is considering to invest in a project requiring a capital outlay of Rs.2,00,000. Forecast for annual income after depreciation but before tax is as follows.

Year	Rs
1	1,00,000
2	1,00,000
3	80,000
4	80,000
5	40,000

Depreciation may be taken as 20% on original cost and taxation at 50% of net income.

You are required to evaluate the project according to each of the following methods.

- a) Pay-back method.
- b) Rate of return on original investment method.
- c) Rate of return on average investment method.
- d) Discounted cash flow method taking cost of capital as 10%
- e) Net present value index method.
- f) Internal rate of return method.

[M.Com Madurai] [MCA
Madras]

Solution

Profitability Statement

Year	Profit after depreciation Rs.	Less Tax Rs.	PAT Rs.	Add Depreciation Rs.	Profit before Depreciation but after tax Rs.

1	1,00,000	50,000	50,000	40,000	90,000
2	1,00,000	50,000	50,000	40,000	90,000
3	80,000	40,000	40,000	40,000	80,000
4	80,000	40,000	40,000	40,000	80,000
5	40,000	20,000	20,000	40,000	60,000

a) Pay Back Period

I year	90,000
II year	90,000

	1,80,000
Balance	20,000

	2,00,000

Balance amount recovered from III rd year

$$\text{i.e. } \frac{12 \text{ months}}{80,000} \times 20,000 = 3 \text{ months}$$

∴ Pay back period= 2 years 3 months.

b) Rate of Return Original Investment Method

Year	Net Profit after Tax and depreciation (Rs.)
1	50,000
2	50,000
3	40,000
4	40,000
5	20,000

Total Return	2,00,000

Rate of Return on original investment

$$= \frac{\text{Re turn}}{\text{Original investment}}$$

Return represents the Average Return

Average Return should calculate in the following

$$= \frac{\text{Total return}}{\text{Number of years}}$$

$$= \frac{2,00,000}{5}$$

Average Return = Rs.40,000

$$\begin{aligned} \text{Rate of return on original investment} &= \frac{40,000}{2,00,000} \times 100 \\ &= 20\% \end{aligned}$$

ii) Rate of Return on Average investment method

$$= \frac{\text{Return}}{\text{Average investment}} \times 100$$

Return = Rs.40,000

$$\begin{aligned} \text{Average Investment} &= \frac{\text{Original investment}}{2} \\ &= \frac{2,00,000}{2} = 1,00,000 \end{aligned}$$

Rate of Return on Average investment

$$= \frac{40,000}{1,00,000} \times 100 = 40\%$$

c) Discounted cash flow method [Cost of capital @ 10%]

Year	Cash inflows	Discount Factor At 10% p.a.	Present Value Rs.
1	90,000	0.909	81,810
2	90,000	0.826	74,340
3	80,000	0.751	60,080
4	80,000	0.683	54,670
5	60,000	0.621	37,260
		Total present value	3,08,130
		Initial Investment	2,00,000
		Net Present value	1,08,130

d) Net present value index

$$\frac{\text{Total present value of cash inflows}}{\text{Total present value of cash outflows}} = \frac{3,08,130}{2,00,000} = 1.541$$

$$1.541 \times 100 = 154.1\%$$

e) Internal Rate of Return method: The annual cash inflows are not uniform. We have to apply the following formula to determine the approximate rate of return.

$$F = \frac{I}{C}$$

F = Factor to be located
 I = Initial investment
 C = Average annual Cash inflow
 $F = \frac{2,00,000}{80,000}$
 = 2.5

Showed Table No II at this factor rate of return in the column for 5 years is 28%

Discounted cash flow [cost of capital @ 28%]

Year	Cash inflows Rs.	Discount Factor At 28%	Discounted Cash inflows Rs.
1	90,000	.781	70,290
2	90,000	.610	54,900
3	80,000	.477	38,160
4	80,000	.373	29,840
5	60,000	.291	17,460
		Total Present values	2,10,650
		Less : Initial investment	2,00,000
		Excess Present Value	10,650

Note : The present value is higher in the level of Rs.10,650. Now we apply higher discount rate i.e Taking 30% as cost of capital.

Discounted cash flow at cost of capital is 30%

Year	Cash inflows Rs.	Discount Factor	Discounted Cash inflows Rs.
1	90,000	0.769	69,210
2	90,000	0.592	53,280
3	80,000	0.455	36,400
4	80,000	0.350	28,000
5	60,000	0.269	16,140
		Total present value	2,03,030
		Less : Initial investment	2,00,000
		Excess Present value	3,030

The excess present value at 30% is Rs.3,030. So the internal rate of return be slightly higher than 30% Small amount will not affect huge level in the organisation. Hence internal rate of return is more or less 30%.

Results & Decision

Investigation of project with the help of all the techniques show that the new project seems to be fairly attractive.

COMMERCIAL APPRAISAL:-

Market appraisal occupies a prime place in project appraisal. Really the modern management concept gives the importance to the marketing management than in earlier years. This is because of the reason that the survival and success of any project depends on the Question as to whether the product offered by the project is commercially successful or not. Market analysis should give a comprehensive account of the market opportunity as well as the marketing. Strategy appropriate for converting the opportunity into a reality.

Commercial successfullness of a project offered the following angles.

- (I) Demand for the product
- (II) Supply position for the product
- (III) Distribution channels
- (IV) Pricing of the product
- (V) Government policies

(I) DEMAND FOR THE PRODUCT:-

The term Demand can be defined as the number of units of a particular goods or services that consumers are willing to purchase during a specified period under a given set of conditions. If any organization will find it difficult to earn profit if its products are not demanded by the consumers, even though technologically advanced production process and efficient financial management.

Demand analysis forms a major part of project appraisal, because of important role played by demand as a determinant of profitability estimate of expected future demand for the product proposed to be manufactured constitutes a key element in all planning processes. Generally some of the techniques are followed by firms while determining its future demand.

(a) SURVEY METHODS:-

- (i) Jury of expert's opinion method
- (ii) Consumers survey method
- (iii) Sales forecast composite

(b) STATISTICAL METHODS:-

- (i) Trend analysis
- (ii) Regression techniques

If the business man want to obtain maximum profit, he should analysis the following major aspects.

- (i) Analysis of market opportunity and specifying marketing objectives.
- (ii) Planning the process of marketing the product
- (iii) Organisation of the marketing process
- (iv) Control of the implementation of the marketing plan which facilitate taking corrective action when the actual results deviate from the estimates or expectations.

Normally market opportunities expressed in terms of demand forecasts and market shares are based on a host of factors outside the control of the promoter whereas marketing strategy and marketing process are largely under his control.

II. SUPPLY POSITION FOR THE PRODUCT:-

In the economics sense supply means the amount offered for sale per unit of time. In other words if it is effective supply, supply always relates to a price and to a commodity. According to the law of supply other things being equal, supply expands when price rises and contracts when

price falls. At the time of project appraisal the supply factor influencing tremendous effect. Because the total production and productivity effect depend upon the supply position. Due to the relationship between cost of production and profitability of the firm. If supply increase the price also increased but supply decreases price also decreased. The following factor is responsible for the changes in supply.

- (i) Changes in the price of factor of production
- (ii) Changes in technology
- (iii) Changes in Government policy
- (iv) Changes in the price of other goods
- (v) Strikes and lockout by the workers.

III. DISTRIBUTION CHANNELS:-

A channel of distribution (some times called a marketing channel) is a group of individuals and organizations that direct the flow of products from producers to customers. The main function of this element is to find out appropriate ways through which goods are made available to the markets.

Distribution channel are most complicated phenomena encountered in the project appraisal of the firm. The concept of distribution as a 'gap' is only of theoretical value. This approach fails to explain planning and control aspects needed in channel management. Some times one type of product a particular channel would be ideal but for another type an alternative channel may be more suitable. In both cases gap is the same but different approaches are necessary. In our Indian economy there is an increasing emphasis on specialisation and the division of labour. As a result of this gap gets developed between producers and users.

Generally the distributive channel render some important functions to the business are as follows.

- (i) Physical movement from the point of production to the point of consumption.
- (ii) Storage function
- (iii) Communication of information concerning the availability, characteristics and price of the goods in transit inventory and on purchase.
- (iv) Enable to create various utilities to the products through the prompt and efficient functioning of physical distribution system.

During the project appraisal the following points must be considered while selecting the channels.

- | | |
|-------------------------------|-----------------------------|
| (i) Nature of market | (iv) Competition |
| (ii) Nature of products | (v) Financial consideration |
| (iii) Consumers Buying Habits | (vi) Cost of channel |

IV. PRICING OF THE PRODUCT:-

Price is the value placed on what is exchanged. In other words price is the measurement of value commonly used in exchanges. Either in the manufacturing of product or Establishment of new industrial units the pricing decisions are of permanent importance in marketing strategy. The price of the product should be related to the achievement of marketing and corporate goals.

In addition, pricing division is important for its direct and indirect effect upon profits. For instance price not only effects the margin through its revenue impact but effect the Quantity sold through its influence on demand. Organisational objectives depend upon the pricing objectives.

The following are the important pricing objects are as follows:-

- (i) Return on Investment
- (ii) Market share
- (iii) Meeting competition
- (iv) Profit.

At the time of project appraisal the price policies are designed the following aspects should be considered to make the policy effective and meaningful.

- (i) Utility to the buyer
- (ii) Return to the buyer
- (iii) Comparable and substitute products - actual and brand
- (iv) Custom and customary prices
- (v) Prestige position of the product and brand
- (vi) Presence of buying habits, motives and
- (vii) Psychological aspects
- (viii) Cost of production
- (ix) Stages in the product life cycle

V. GOVERNMENT POLICIES:-

Government and political policies is characterized by numerous laws passed by the central and State Governments and even by the local administration. The legal framework as often seen, and appears to be true, is a political remedy to popular issues. Further irrespective of the political ideologies, intervention in the marketing process has almost become common in any nation. The history of business legislation during the past hundred years has been characterized by three distinct legislative philosophies.

- (i) To prevent monopoly and protect competition
- (ii) To protect individual consumers
- (iii) To protect society

The legal environment is also referred to as public policy environment.

The vast governmental network of laws and regulations, policy decision, government bureaucracy, and the legislative processes have varied impact on project appraisal.

SOCIAL COST BENEFIT ANALYSIS:-

The foremost aim of all the individual firm or a company is to earn maximum possible return from the investment on their project. In this aspect project promoters are interested in wealth maximization. Hence the project promoters tend to evaluate only the commercial profitability of a project. There are some projects that may not offer attractive returns as far as commercial profitability is concerned but still such projects are undertaken since they have social implications. Such projects are public projects like road, railway, bridge and other transport projects, irrigation projects, power projects etc. for which socio-economic considerations play a significant part rather than mere commercial profitability. Such projects are analysed for their net socio economic benefits and the profitability analysis which is nothing but the socio-economic cost benefit analysis done at the national level.

All the projects impose certain costs to the nation and produces certain benefits to the nation. The cost may be of two types i.e. direct cost and indirect cost. In this respect the benefit derived from any project will also be of two types i.e. direct benefits and indirect benefits.

The social cost benefit analysis is a tool for evaluating the value of money, particularly of public investments in many economies. It aids in decision making with respect to the various aspects of a project and the design programmes of closely interrelated project. Cost benefit analysis has become important among economists and consultants in recent years.

MAIN FEATURES OF SOCIAL COST - BENEFIT ANALYSIS:-

- (i) Assessing the desirability of projects in the public as opposed to the private sector
- (ii) Identification of costs and benefits
- (iii) Measurement of costs and benefits
- (iv) The effect of (risk and uncertainty) time in investment appraisal
- (vi) Presentation of results - the investment criterion.

STEPS INVOLVED IN SOCIAL COST BENEFIT ANALYSIS:-

- (i) Estimates of costs and benefits which will accrue to the project implementing body.
- (iii) Estimates of costs and benefits which will accrue to the community.
- (iv) Estimates of costs and benefits which will accrue to the National Exchequer.

STAGES OF SOCIAL COST BENEFIT ANALYSIS:-

- (i) Determine the financial profitability of the project based on the market prices.
- (ii) Using shadow prices for the resources to arrive at the net benefit of the project at economic process.
- (iii) Adjustment of the net benefit for the projects impact on savings and Investment.
- (iv) Adjustment of the net benefit for the projects impact on income distribution.
- (v) Adjustment of the net benefit for the goods produced whose social values differ from their economic values.

ECONOMIC INDICATORS OF SOCIAL COST BENEFIT ANALYSIS

- (i) Economic Rate of Return
- (ii) Effective Rate of Protection
- (iii) Domestic Resource Cost.

LIMITATIONS FO SOCIAL COST BENEFIT ANALYSIS

Social cost Benefit analysis suffer from the following limitations.

- (i) The problems of Qualification and measurement of social costs and benefits are formidable. This is because many of these costs and benefits are intangible and their evaluation in terms of money is bound to be subjective.
- (ii) Evaluation of social costs and benefits has been completed for one project, it may be difficult to judge whether any other project would yield better results from the social point of view.
- (iii) The nature of inputs and outputs of projects involving very large investment and their impact on the ecology and people of the particular region and the country as a whole are bound to be differing from case to case.

COMMERCIAL OR FINANCIAL PROFITABILITY:-

In order to assess the operational efficiency of a project and its profitability most of the industrially advanced countries including India have employed various techniques for the purpose of profitability analysis.

Profit is the primary objective of an enterprise. The word profit implies a comparison of the operations of business between two specific dates which are usually separated by an interval of one year.

The maximization of profit within a socially acceptable limit implies that a proper regard for public interest has been shown. Really it is the growth of profit which enables a firm to pay higher dividends to its ordinary shareholders.

According to the Economists point of view profit is the reward for entrepreneurship.

FACTORS AFFECTING PROFIT:-

Various factors influence the profit variations. They are as follows.

- (i) The volume of sales plays a tremendous part in profit making. So long as a sustained maximum volume continues at the top of capacity curve, break - even point would be far away.
- (ii) To attain real sophistication in profit calculation, the true profits at any given volume which should exist at a planned break even point are separated from the profits created by the performance at one attained volume.
- (iii) A change in variable costs and selling prices changes both the break even point and the marginal profit.
- (iv) The rate of marginal profit is affected by a change in variable costs, selling price and operating performance as against planned performance.
- (v) When both the fixed and variable costs change and when they move in tandem, the effect of break even point is pronounced and definite. When they move in opposition to each other, the effect is very weak.
- (vi) The marginal break - even point is that point of output at which out of pocket costs are recovered. Depreciation and amortisation costs are excluded from them.

All the business organizations ultimate aim is to earn a profit. But the first problem is to determine the factors which determine the level of

profitability. Profitability should first measure the relationship between profits and the funds committed in the business to earn that profit. The first step in devising the strategy is to measure the task. For private industry the measure of task is the gap between the level of profit achieved by a business without the introduction of any major changes and the level of profit which the target profitability measurement indicates should be earned.

The measurement and control of profitability in a company or any other business organization should form one of the principal objectives of the finance function of a management.

Profitability is an indication of the efficiency with which the operations of the business are carried on. Poor operational performance may indicate poor sales and hence poor profits. A lower profitability may arise due to the lack of control over expenses. Bankers and other financial institutions look at the profitability as an indicator whether or not the firms earns substantially more than it pays interest for the use of borrowed funds and whether the ultimate repayment of their debt appears reasonably certain. Owners are very much interested to know the profitability as it indicates the return which they can get on their investments.

TECHNIQUES USED TO MEASURE PROFITABILITY:-

The following are the techniques generally adopted to measure the profitability of the project or the organization.

- i. Overall profitability Ratio.
- ii. Gross profit Ratio.
- iii. Net profit Ration.
- iv. Earning per share.

(i) OVERALL PROFITABILITY RATIO:-

It is otherwise called as Return on Investment or Return on capital employed. It indicates the percentage of return on the total capital

employed in the business. Return on Investment may be either the Return on Average investment or Return on original Investment. It should be computed on the basis of the following formula.

(a) RETURN ON INVESTMENT:-

(i) Return on original Investment:-

$$\text{Formula : } \frac{\text{Return}}{\text{Original Investment}}$$

(ii) Return on Average Investment:-

$$\text{Formula : } \frac{\text{Return}}{\text{Average Investment}}$$

Return: It refers to profit after tax.

$$\text{Average Investment: } \frac{\text{Original Investment}}{2}$$

(b) Return on capital employed:-

$$\frac{\text{Operating profit}}{\text{Capital employed}} \times 100$$

The term operating profit means profit before interest and Tax.
The term capital employed has been given different meanings by different accountants.

Some of the popular meanings are as follows:-

- (i) Sum total of all assets whether fixed or current.
- (ii) Sum total of fixed assets.
- (iii) Sum total of long term funds employed on the business.

i.e.	Share capital	xx
	Reserves and samples	xx
	Long term loans	xx

		xx

(-)	Non business assets	xx
	Fictitious assets	xx

		xx

Capital employed	----
	xx

2. GROSS PROFIT RATIO:-

This ratio expresses relationship between Gross profit and net sales. It should be computed with the help of the following formula.

$$\text{Formula: } \frac{\text{Gross profit}}{\text{Net Sales}} \times 100$$

3. NET PROFIT RATIO:-

This ratio indicates net margin earned on a sale of Rs.100. It is calculated as follows.

$$\text{Formula: } \frac{\text{Net operating profit}}{\text{Net Sales}} \times 100$$

Net operating profit is arrived at by deducting operating expenses from Gross profit.

4. EARNING PER SHARE:- (E.P.S.)

In order to avoid confusion on account of the varied meanings of the term capital employed, the overall profitability can also be judged by calculating earning per share with the help of the following formula.

$$\frac{\text{Net profit after Tax and preference divided}}{\text{Number of Equity shares}}$$

5. PRICE EARNING RATIO:- (P.E.R.)

This ratio indicates the number of times the earning per share is covered by its market price. This is calculated according to the following formula.

$$\frac{\text{Market price per Equity share}}{\text{Earning per share}}$$

6. OPERATING OR EXPENSES RATIO:-

This ratio is a complementary of net profit ratio. In case the net profit ratio is 20%, it means that the operating ratio is 80%. It is calculated as follows.

$$\text{Formula} \quad \frac{\text{Operating costs}}{\text{Net sales}} \times 100$$

7. Pay out Ratio:

This ratio indicates what proportion of earning per share has been used for paying dividend. The ratio can be calculated as follow.

$$\frac{\text{Dividend per equity share}}{\text{Earning per equity share}}$$

8. Dividend yield ratio:-

This ratio is particularly useful for those investors who are interest only in dividend income. The ratio is calculated by comparing the ratio of dividend per share with its market value. Its formula can be put as follow.

$$\frac{\text{Dividend per equity share}}{\text{Market price per shares}} \times 100$$

Indicators for measuring income:-

T.A.Lee has suggested following indicators for measuring income. He is of the opinion that income is

- (i) A guide to dividend and retention policy.
- (ii) A measure of management effectiveness.
- (iii) A measure of management stewardship of the entity resources.
- (iv) A means of evaluating the result of past decision and of working on future decisions.
- (v) A managerial aid in a variety business entity.

Profit planning:-

Profit planning represents an overall plane of operation, covers a definite period of time and formulate the planning decision of management. It consists of the operating budget covers revenues and expenses

Steps in preparation of profit plan:-

- i. To prepare the sales budget.
- ii. The conversions of projected sales into projected production as a basis for planning.
- iii. Direct materials budget deals with the number of units of each kind of raw material.
- iv. Purchase budget determines the number of unit to be purchased and the timing of the purchases.
- v. Manufacturing expenses or overhead budget is prepared for each department
- vi. The budgeted cost of goods sold is estimated.
- vii. Distribution and administrative expense budgets are prepared together with the sales budget.
- viii. The budgeted balance sheet indicates the effects of planned operations on the assets, liabilities and capital of the company.
- ix. The profit plan is put into operation.

Characteristics of profit planning:-

- (i) Profit planning is an indicator of the future holds for a company.
- (ii) Flexibility
- (iii) Excellent direction and control
- (iv) Support
- (v) Organization
- (vi) Confidence
- (vii) Performance
- (viii) Individual
- (ix) Management by exception
- (x) Effective communication
- (xi) Cost consciousness

Profit motive is the prime mover of business activity. In real sense profitability is the most useful overall measure to the health of an enterprise. In other words the profitability of an enterprise in any one year is the relationship between the profit made and the funds employed to earn the profit profitability analysis is a useful tool or technique to maximizing profit and to bankers and financial institutions to arrive at the viability of the enterprise and its financial needs

Social or national profitability:-

Public projects like road, railway, bridge and other transport projects, irrigation, projects, power projects, etc for which socio economic considerations play a significant part, rather than mere commercial profitability. Such projects are analysis for their net socio economic benefits and the profitability analysis of such projects is known as national profitability analysis which is nothing but the socio- economic cost benefit analysis done at the national level

Steps involved in determination of national profitability:-

- (i) National profitability analysis takes into account the real cost of direct costs and real benefit of direct benefits,. For instance, some of the inputs may be subsidized. Only the subsidized prices of input is what is relevant for assessing commercial profitability. However the national profitability analysis takes into account the real cost of inputs i.e. cost of input had they not been subsidized. Accordingly the required adjustment to direct cost of input are made for national profitability analysis.
- (ii) National profitability analysis takes into account the indirect costs and indirect benefits to the nation. While a nation bears the indirect, the people of the nation enjoy the indirect benefit. Hence indirect costs and benefits are given due recognition and accounted for in social cost benefit analysis. It is however difficult to assess exactly the quantum of indirect costs and indirect benefits. For example a pharmaceutical company and its contribution to the society might be more than what the society pays as price for the drug. Thus the social benefit might be much more than the benefit that accrue to the pharmaceutical company by way of returns. Just as benefit has two different meanings to the project promoters and to the society.

The cost of for as the pharmaceutical company is concerned is only the financial cost which is nothing but the direct cost. Apart from this there are indirect costs to the society viz. environmental pollution caused by the pharmaceutical industry, the harmful side effects of the drugs produced if any etc. Suppose construction of a bridge over a river. It's indirect benefits may include improved communication facilities reduction in

transportation costs, reduction in traveling time etc. while the indirect cost may include acquisition of private land by the state, removal of industrial, commercial, agricultural activities that prevailed in the land that was acquired disturbance of ecological balance etc.

National profitability analysis can thus be regarded as a refinement over commercial appraisal taking the hidden factors into account. National profitability analysis is mainly used for evaluating public investment projects.

From the society's standpoint, the project should maximize the aggregate consumption or the addition to the flow of goods or services in the economy investor looks for maximization on his individual basis, the society's interest should look for maximization of the total output of the economy. The need total thus arises to have an analysis done of social costs and social benefits.

The various inputs required for the project are drawls out of the resources of the economy and constitutes social costs. And the output of the any of the publics project represent social benefits. The input of goods and services and the outputs should be valued with reference to their relative value tom society

Commercial Vs financial profitability:-

The national development point of view there are always more projects than there are resources and hence the necessity to appraise projects for selection. While the obvious choice will be the projects with higher returns the complexity arises because of the need to appraise projected outcome based on forecasts in a world of uncertainly, particularly in the context of endemic inflation. In the case of large projects, particularly public sector projects involving the building up of infrastructure it is essential to assess the social merits of the investment proposals.

Projects emanate from diverse and dispersed sources, such as individuals firms or institutions, and government at the state and central levels. In instance where the state government is not the owner of the business. The traditional yard stick of commercial or financial profitability is used for selection of projects for implementation. The financial

benefits get related to the financial costs of the project and if there is a net surplus the project merit choice. While the process of selection of individual projects thus meets the profit criteria of the individual investors or promoters, the combination of choices may not necessarily result in the most socials profitable allocation of resources. For developing economies this is the very important factor but it cannot be ignored.

Commercial or financial profitability as the sole deciding factor has two major limitations viz.

- (i) Financial or market values seldom match with social values and
- (ii) What is beneficial to one segment of society may not necessary be so to the entire society.

In financial analysis the market values of input and outputs are reckoned and compared. And since market distortions are many these values fail to reflect the relative worth on the society's value scale. From society's stand point, goods and services should be valued in terms of relative contributions to consumption. In the same manner the social value of resource should be reckoned interns of its opportunity cost, represented by the output or consumption value that it is capable of yielding in its next best alternative use. In a free market economy the dominance of the forces of demand and supply has the effect of the market prices being kept close to social valuation. In a developing economy however there are several distortions entering into the market prices and they are far removed from their social valuation. The distortions arise from the monopolistic status of many large enterprise a system of administered prices in a controlled economy and from various government policy measures such as taxes, duties, controls and foreign exchange regulations.

A project may confer considerable good to society that does not get reflected in financial projections others though financially very rewarding may have some harmful effects on society that the financial results fail to interpret. These effects that are outside the purview of financial projections are known as externalities and are essential ingredients in the social profitability computations. The emphasis in social cost benefit analysis is the import on the whole society and not one segment.

The economic problem of choice:-

The nation's aim to maximize the aggregate consumption or the standard of living the options are many and diverse, but the resources are limited. The resources can be deployed for setting up thermal, hydro or nuclear power projects or for rural electrification or for establishing import substitution or export oriented industries. The decision makers at the national level have the task of making the right choices among these alternative and allocate scarce resources in a manner that will generate maximum benefit to the economy.

International project appraisal:-

The assessment of strengths and weaknesses of an organization is necessary for evolving a strategy that can achieve corporate objectives

Meaning; -

International project appraisal also known by a variety of names such as internal company analysis, profiling the organization, capability or resource audit position and strategic advantage analysis, is the process of evaluating a company's posture relative to its business competition within and outside the country, overall performance and its capability in terms of strengths and weaknesses.

Significance of International project appraisal:-

- (i) The organization's deficiency should also be compared with those of its successful competitors such perceptive self appraisal when matched with environmental analysis facilities management to grasp the opportunities and combat the threats inherent in the environment.
- (ii) International project appraisal has such a vital significance in international corporate planning that without such an exercise it will not be possible to formulate economic strategy for an organization on the objective basis.
- (iii) It helps the management in choosing the most suitable niche for the organization.
- (iv) Economic opportunity may abound in different parts of the World but not the ability to pursue it.
- (v) Position audit of the organization highlights its distinctive capabilities on which empire of foreign business can be gainfully built. It also enables management to formulate suitable competitive strategy.
- (vi) It focuses sharply on the areas where it is strong and can operate most effectively with this kind analysis the management can decide on the type of business company should engage in a country and what business to abandon.

It provides an insight into the weakness of the organization, through this way the management can take steps to remove the weaknesses of the organization in the long run.

Steps in international project appraisal:-

With the intention of developing the strategic advantage profile of an organization the management should first collect information from external or internal sources both from formal as well as informal channels and then interpret as well as informal channels and then interpret them incisively to determine its strengths and weaknesses. The following steps involved in international project appraisal.

(i) Identifying strategic factors:-

The first step in the process of corporate analysis is the identification of all those factors which are crucial to the success of an international organization. These factors may relate to different aspects of the organization . these factors could conveniently be found in different functional areas such as marketing finance personal, research and development.

(ii) Determining the importance of factors;-

After identifying crucial factors for corporate appraisal the management will have to determine the importance of each of these factors. Since all the factors may not be of equal value to the organization for accomplishing its purpose it will be very necessary to attach due importance to them.

(iii) Determining strengths and weaknesses:-

Once the relative significance of different factors has been assessed the Management should then attempt to determine the position of the organization in each of these factors. Normally the strengths and weakness of a firm can be assessed by with the firms own past results, comparing with accomplishment of competitors and also by comparing with what they ought to be.

(iv) Constructing strategic advantage profile of a firm:-

After weighing the significance of each factor for the company in its environment, the management compiles a strategic advantage profile for the firm and compares it with

profiles successful competitors of the potential of host countries to develop a pattern of the firms strengths and weaknesses relative to its present and proposed product market strategy.

ASSESSMENT OF INTERNAL CAPABILITIES

The Multinational Organisation Should confined the competence analysis to those crucial factors which contribute to the accomplishment of the overall desired result of the organization analysis of international project will be made with reference to marketing, manufacturing finance human resource and management.

1. Marketing
2. Manufacturing
3. Finance
4. Human resource.
5. Size Advantage
6. Infrastructure system
7. Management:-

TECHNIQUES OF COMPETENCE ANALYSIS:-

Some of the techniques used to determining the Financial Soundness of the international project appraisal.

(I) Common size statement

It is a financial tool of studying key changes and trends in the financial position of a company. In this technique each item is stated as percentage of the total of which that item is a part.

(II) Ratio Analysis

Ratio as tools of measuring the liquidity, profitability, efficiency and financial position of the company.

(III) Fund flow Analysis:

Fund flow statement derived from as analysis of changes that have occurred in assets and liabilities items between two balance sheet dates, enable the investors creditors and

other interested parties to evaluate the use of funds by the enterprise and to determine how these uses are financed.

(III) Break-even Analysis:

It is used to study the cost volume profit relationship at varying levels of output and to determine the point where revenue and cost agree exactly.

(V) Market Research:

Market research method is employed as a supplement to financial analysis, where in opinions of leading customers, top executives of leading organization and scientists who are capable of evaluating technological capabilities and trends and obtained by seeking interviews with them.

(VI) Factor Rating:

Under this method various factors affecting the capability of an organizations are rated in terms of their influence on financial marketing and operations management of the firm. Some of the methods for rating factors such as opinion survey, equilibrium approach etc.

Suggested Questions:

1. Explain meaning and scope of project appraisal.
2. Briefly explain the project appraisal process.
3. What are factors involved in Technical appraisal of the project.
4. Write short note on concept of project appraisal.
5. List out the methodology for project evaluation.
6. What is meant by payback period ? Explain the merits and demerits of pay back period.
7. Explain the stages of commercial appraisal of the project.
8. What is meant by social cost-Benefit Analysis?
9. List out the features of social cost Benefit Analysis.
10. Explain the stages of social cost Benefit analysis.
11. What are the limitations of social cost Benefit analysis?
12. What is meant by profitability? What are the factors affecting profit of the organization.
13. List out the Techniques used to measure profitability of the concern.
14. Commercial Vs National profitability.
15. Discuss social or national profitability.
16. What is meant by international project appraisal? Bring out the significance of international project appraisal.
17. What are the steps involved in international project appraisal?

Unit- V

5.0 Project management – introduction

Overview of project management
Development of a Project System
Components of a Project Management System
Steps in project management
Project management environment
Benefits of project management
Obstacles in project management
Project management – a profession
Project manager and his role

5.1 What is a project?

Definition of project
Features of a project
Types of projects
Classification of project
Project life cycle
Phases of project life cycle
 Pre-investment phase
 Implementation phase
 Operation phase
Project life cycle curves

5.2 Project planning

Nature of project planning
Need for project planning
Functions of project planning.
Steps in project planning
Project Planning Structure
Planning and decentralizing:
Areas of project planning
Types of project plan
Project objectives and policies
Project policies and principles:
Tools of project planning

5.3 Project implementation

Project implementation stages

- 5.4 Project control**
 - Projected Control Purposes:**
 - Problems of Project Control**
 - Gantt charts**
 - Weaknesses in bar charts**
 - Milestone charts**
- 5.5 Network techniques - PERT and CPM**
 - Objectives of Network Analysis**
 - Managerial applications of network analysis.**
 - Advantages of Network Analysis**
 - Limitations of Network Techniques**
 - Terminology of Network Analysis.**
 - Construction of Network Diagram**
 - Critical Path Method (CPM)**
 - Advantage of CPM**
 - Limitations of CPM**
 - Programme Evaluation and Review Technique (PERT)**
 - Methodology of PERT**
 - Application of PERT**
 - Limitations of PERT**
 - Advantages of PERT-Cost**
 - Limitations of PERT-Cost**
- 5.6 Crashing the Project**
- 5.7 Project Abandonment**
- 5.8 Resource Levelling**
- Resource Smoothing**
- 5.9 Line balancing**

5.0 Project Management – Introduction

Project management is an existing new profession, which receives attention in these days. It is concerned with the management of resources successfully to complete the project, the resources being time, money, materials and equipment and the most expensive resource of all – namely the human resource.

Project management is concerned with achieving a specific goal in a given time using resources available for that period only.

Project management can mean different things to different people. Project management as regards ongoing projects within a company refers the art of creating the illusion that any outcome is the result of a series of predetermined, deliberate acts when, in fact, it was dumb luck. It is designed to make better use of existing resources by getting work to flow horizontally as well as, vertically within a company.

An overview definition of project management is the planning, organizing, directing and controlling company resources for a relatively short-term objective that has been established to complete specific goals and objectives. Further more, project management utilizes the system approach to management by having functional personnel assigned to a specific project.

Project Management has been evolved as a distinct discipline ever since the Second World War. Though it is special discipline it got elevated only in the recent times, it has been in practice ever since the times of construction activities in this world. Constructions such as British Aisles, the Taj Mahal, Eiffel Tower, London Bridge etc., stand testimony to the fact that the doctrine of Project Management are not new.

Project Management resembles functional management in all respects for all practical purposes with a little difference. It is concerned with the management of resources successfully to complete the project, the resources being time, money, materials and equipment and the most expensive resource of all – namely the human resource. To understand the project management one must first understand the basic concepts and different approaches to the study of management. An overview of different management approaches with specific emphasis on System approach to management and its relevance to project management, brief mention about the steps in project management, benefits and

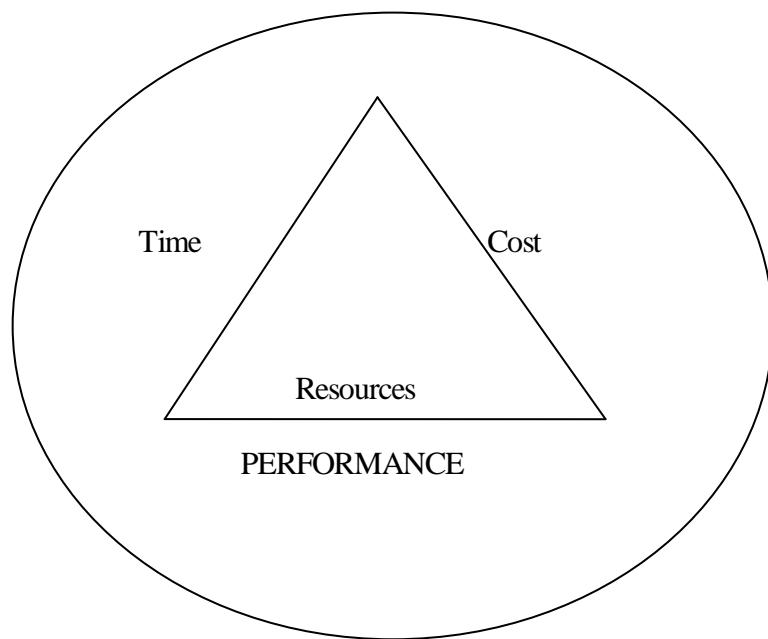
limitation of project management, and also an outline about effective project management are discussed in this lesson.

Thus, the project management is designed to manage or control company resources on a given activity, within time, within cost and within performance.

This has been depicted in the following diagram.

OVERVIEW OF PROJECT MANAGEMENT

GOOD CUSTOMER RELATIONS



Project management involves project planning and project monitoring and includes such item as

- ♣ Project planning.
- ♣ Definition of work requirements.
- ♣ Definition of quantity of work.
- ♣ Definition of resources needed.

- ♣ Project monitoring.
- ♣ Tracking progress, comparing actual to predicted.
- ♣ Analysing impact and making adjustments.

Thus, the successful project management can be defined as the process of achieving the project objectives within the cost (budget), at the desired performance and within the allocated time.

Development of a Project System

The three major groups of management theorists – the structuralists, the functionalists and the behaviourists – differ somewhat on how the project manager deals with problems shifting job environments but they are unanimous on the utility of the task force as a useful device in group problem solving situations.

The structuralists argue that the project manager, as a unifying agent, integrates the parochial interests of autonomous organizational elements towards a common objective through the formation of some standard organization instead of functional or product departmentalization.

The functionalists argue that project management is in reality simply the application of the systems concept to organizational problems. They visualize integration into a separate organizational system of activities related to particular projects or programmes. Management science techniques, computer simulation approaches and information decision systems are just a few of the tools that will make it possible for management to visualize the firm as a total system.

The behaviouralists see the task force as organized around problems (not products, programmes, projects or tasks) arranged in an organic rather than a mechanical model in which the executive becomes the link pin or coordinator but human speaking the diverse languages of research and who has skills to relay information and mediate between groups. People will be differentiated

not vertically according to rank and status but flexibly and functionally according to skill and professional training and replacing bureaucracy as we know it.

Components of a Project Management System

The vital components of a project from the systems perspective are:

- **Objective:** The fundamental rationale of a system that must be accomplished.
- **Requirement:** A sine qua non or a fundamental and irreducible constituent of a whole system that may even satisfy the objective to some extent.
- **Alternative:** A surrogate, a secondary course of action. If one fails out the other will substitute and fulfil the needs of a system.
- **Selection criteria:** The matter of ‘carrying out’ is focused on assessing the choice and selecting the best course of action.
- **Constraint:** A demarcation point, which describes the frontiers of a system within which the alternatives must move and devote their resources.

It can be inferred that the basic theories and philosophies, governing the age-old corps and projects had a stormy attack by the systems approach to management. Owing to the fact that project management is a subset of total management cult, it would be comforting oneself to describe the principles of general systems theory. The general systems approach can be squared with a information across many fields of knowledge. Systems theory attempts to strike at problems with a holistic view rather than through an analysis of the individual components.

STEPS IN PROJECT MANAGEMENT

Project Management basically consists of the following five steps.

Grouping work into packages which acquires the properties of a project. This means that the works so grouped are related to each other, contribute to the same goals and can be bound by definite time, cost and performance targets.

Entrusting the whole project to a single responsibility centre known as the project manager, for coordinating directing and controlling the project.

Supporting and servicing the project internally within the organization by matrixing or through total projectisation, and

Building up commitment through negotiations, coordinating and directing towards goals through schedules, budgets and contracts.

Ensuring adherence through negotiations, coordinating and directing towards goals through schedules, budgets and contracts.

Defining what is to be done, maintaining its integrity and ensuring that it is done and performed as desired, within time and cost budgets fixed for it through a modular work approach, using organisational and extra-organisational resources is what is project management.

PROJECT MANAGEMENT ENVIRONMENT

Project management performance will largely depend on the real-world environment. The project management environment in India, is very different from any other country. There are many problems which are peculiar to our country and these are experienced by all those who are concerned in the execution of both small and big projects. One has to be aware of these problems in order to be able to cope with the same for successful implementation of a project.

The most important problem is lack of mutual trust and respect amongst the participating agencies: owner, financial institutions, consultants, vendors and contractors. The owner believes that the agencies/contractors would take him for a ride and, therefore, he should, as far as possible, do things himself. When consultants are not appointed, projects are likely to have congenial weaknesses such as wrong selection of technology, wrong site, high risk element, etc. Sometimes the owner may appoint a consultant for a nominal fee and ask him to

prepare a report which he can sell to the bank. These reports often do not reflect reality as they are made without any in-depth study, and if cleared, would give birth to defective projects. This, no doubt, reflects on a consultant's lack of professional ethics and can be avoided if the financial institutions use a proper accreditation system for consultants.

However, accreditation of consultants may not set everything right. A site may often be selected purely on personal rather than on techno-economic considerations. The same may happen with the selection of technology or even with the selection of the consultant.

It is often suggested that besides technical and financial appraisal of a project the financial institutions should appraise the entrepreneur himself. It is also suggested that the financial institutions should introduce an on-going audit system to prevent diversion of funds and other forms of financial irregularities. In other words, the financial institutions may not trust the owner/promoter since an owner may disown a project and the financial institutions have more stake in the project than the owner himself.

Sometimes a promoter may intentionally underestimate the project cost with the intention of reducing his contribution. This would inevitably lead to cost overrun which normally the financial institutions are expected to finance. Of course, the financial institutions can insist on proportional overrun finance by the owner, but since the promoter's stake is low, the institutions take their own time to decide to finance the overrun, meanwhile the project cost undergoes further overrun. A project, thus, faces a fund crisis leading to extension of project completion time. With the extension of the project schedule further fund problems occur. Financing cost and inflation overtake the revised cost estimates. Since contingency provisions are too inadequate to meet the inflationary conditions of the economy, institutions have to provide further funds. But, this again is not easily sanctioned.

Most vendors and contractors, therefore, do not trust the owner regarding payment. At the very first sign of delay in payment, they start slackening. They cannot also be expected to be too enthusiastic about a project where fund problems are foreseen. A vendor, in such circumstance, may not start the work at all. This not only delays the project but sours the relationship between the owner and the vendor.

Over the years, a number of projects have been affected by enormous increase in prices of cement, steel and transport and energy costs. These are non-controllable costs as far as the owner is concerned and, therefore, the owner looks towards the financial institutions for relief. But the overruns even in such cases do not get automatically sanctioned as the financial institutions do not trust the promoter and would first like to be satisfied about the reasons for overrun.

Financial institutions often hesitate to disburse their term loans unless the promoters bring their entire contribution. Sometimes they withdraw their commitments due to temporary resource constraint, or when they find a project facing serious technical problems. Thus, due to financial insecurity some projects cannot progress as desired and end up with huge time and cost overruns.

The problems discussed above can broadly be grouped into four classes of environmental problems: ***Social, Economic, Technical and Managerial***. As discussed before, if these problems are not tackled, time and cost overruns cannot be stopped. Yet management of environment is beyond the scope of project management. There is no point, therefore, in discussing these problems in any further detail as they are beyond the scope of this lesson.

While one cannot change the environment for the duration of a project, one can definitely protect oneself from its adverse influences. This can be done by creating a strong shield which will not only resist the adverse effects of the

environment but also influence the environment marginally, at least, along the boundary. This is referred to as boundary management.

A project can shield itself effectively against the environment only if it engages good agencies, uses good systems and has adequate funds to meet the requirements of the project. Good systems and good agencies will require good funds. However, the funds must be used properly otherwise a project cannot be completed at least cost which is the ultimate criteria for measuring the efficiency of project management. Unfortunately, at the moment, we are unable to provide such a shield to all our projects and that must be the only reason for our poor performance in the execution of the projects.

Projects in India have to be executed to a highly unfavourable environment but project management must cope with the situation. It has been suggested that a project must be insulated against adverse environmental influences by mobilizing good agencies, good systems and above all adequate funds.

BENEFITS OF PROJECT MANAGEMENT

Project Management helps to avail the following benefits:

Identification of functional responsibilities to ensure that all activities are accounted for regardless of personnel turnover.

- Minimizing the need for continuous reporting.
- Identification of time limits for scheduling.
- Identification of a methodology for trade-off analysis.
- Measurement of accomplishment against plans.
- Early identification of problems so that corrective action may follow.
- Improved estimating capability for future planning.

- Knowing when objectives cannot be met or will be exceeded.

OBSTACLES IN PROJECT MANAGEMENT

To enjoy the various benefits of project management given above, the following obstacles should be overcome carefully.

- ¶ Project complexities
- ¶ Execution of customer's special requirements
- ¶ Organisation restructuring is a typical task]
- ¶ Project risks
- ¶ Changes in technology
- ¶ Forward planning and pricing.

PROJECT MANAGEMENT – A PROFESSION

Project management has been evolved as a distinct ever since the Second World War. It has got elevation the recent times.

Novelty is the hallmark of every project, hence it should exhibit fascination and dynamism. This requires professional approach in conceiving, implementing and controlling projects. Though the functional management and project management are related, the degree of professional approach is highly essential for the efficient management of projects. The project management is mainly driven by intellectual operation and skilled and mechanical operations. Project management is covered by the matrix form of organisation structure where a role is defined according to a combination rather than functional specialization.

Only managers with sufficient spirit and dynamism can withstand the overwhelming dizziness in these incessant operations.

Hence, the project management requires sound expertise and exposure, which may not be possessed by the project promoter. So they have to resort the assistance from projects consultants and project managers. A brief description about the role of project manager and need functions of project consultants are given below.

PROJECT MANAGER AND HIS ROLE

This is to signify a person who has the overall control of the project and shoulders responsibilities for its execution and performance. Therefore, he is thoroughly involved in planning the work and monitoring, directing and leading the participants and seeks to reach the project goal in time-cost-quality conundrum. The project manager is either a specialist or a person having predominantly technical background with sufficient experience, exposure, expertise on multifaceted, multidimensional and multi disciplinary projects. It is well evidence from the monumental constructions and projects that have been around us since heydays, that the role of a project manager is quite distinct and demands an all round performance.

A project manager is always found shared in the eternal circle of doing, learning and changing. Only managers with sufficient spirit and dynamism can withstand the overwhelming dizziness in these incessant operations. An ideal candidate for project managership should have some prominent personal characteristics as outlined by R. Archibald.

- Flexible and adaptable.
- Preference for significant initiative and leadership.
- Aggressiveness, confidence, persuasiveness, verbal fluency;

- Ambition, activity, forcefulness;
- Effectiveness as a communicator and integrator;
- Broad scope of personal interests;
- Poised with enthusiasm, in agitation, spontaneity;

Able or willing to devote most of his time to planning and controlling.

- Able to identify problems;
- Willing to make decisions that are acceptable;
- Able to maintain a proper balance in the use of time,

This ideal project manager would probably have doctorates in engineering business and psychology, sustained with a handful years of experience on similar natured projects or as project officer occupying different positions, and should have physical fitness to undertake such machiavellian tasks with feeling of positive stress. Good projects managers in industry today would probably be lucky to have 60% to 80% of these traits. Good project managers are willing to identify their shortcomings and know that managing a project is no less arduous than driving a mobile in a heavy traffic, they have to balance between the wheels that are mutually exclusive and yet engineered to run coherently, they ensure that goal is reached by properly accelerating the vehicle the vehicle to manager the traffic avoiding accidents.

5.1 WHAT IS A PROJECT?

The various scholars and practitioners dealt with the concept of ‘Project’ in their own way. Simply stated, a project pre supposes commitment of task(s) to be performed within well defined objectives, schedules and budget. Webster New 20th Century Dictionary refers it as a scheme, a design, a proposal of something intended or devised. The Dictionary of Management regards it as an

investment project carried out according to a Plan in order to achieve a definite objective within a certain time and which will cease when the objective is achieved. Similarly, a project according to the Encyclopedia of Management is ‘an organized until dedicated to the attainment of a goal the successful completion of a development project on time, within budget, in conformance with pre-determined programme specification.’

Another school of thought looks upon a project as a combination of interrelated activities to achieve a specific objective. For instance, a project according to Project Management Institute, USA, is a system involving the co-ordination of a number of separate department entities throughout the organisation, and which must be completed within prescribed schedules and time constraints. To Sinhas, a project is not a mere action or an activity or an attempt towards a particular aim; it is rather an integrated effort, including multifarious actions and activities, towards that aim.

One group of scholars emphasize that a project – a unique and non-repetitive activity-aims at systematically co-ordinating inputs in the direction of intended outputs. To quote Harrison, “a project can be defined as a non-routine, non-repetitive one-off undertaking, normally with discrete time, financial and technical performance goals. A development project, says Hirschman, connotes purposefulness, some minimum size, a specific location, the introduction of something qualitative, new, and the expectation that a sequence of further development moves will be set in motion.

These are still others whose primary emphasis is on appraising investment proposals from the economic Social profitability angles. According and to Little and Mirrless, “ we mean by a project any scheme, or part of a scheme, for investing resources which can reasonably be analyzed and evaluated as an independent unit”. The Manual on Economic Development Projects too defines a project as the compilation of data which will enable an appraisal to be

made of the economic advantages and the disadvantages attendant upon the allocation of country's resources to the production of specific goods and services. All the above definitions thus suggest that a project is an action – oriented enterprise.

Banks and financial institutions have to examine the viability of a project before providing financial assistance. They have to ensure that the project will generate sufficient return on the resources invested in it. With the shift from security-oriented lending to purpose-oriented lending, the study of viability of a project has become more vital for financing a project. Further, sanction of financial assistance after proper appraisal alone is not sufficient for success of a project. Disbursement of funds according to the requirements of the project and close supervision and follow-up are also equally essential to recover the financial assistance provided. In order to develop proper co-ordination with the entrepreneurs, many banks and financial institutions are not only providing financial assistance to viable projects but also assist the entrepreneurs during all phases of a project viz., identification, selection, appraisal, implementation and follow-up. All the phases are inter-related and the experience gained during appraisal and supervision of projects helps the banks and financial institutions to guide the entrepreneurs in identification and selection of new projects. The projects which are coming to banks and financial institutions for financing may be divided into following categories: -

- (i) New Projects -For setting up new units.
- (ii) Expansion projects -For increasing the capacity of existing units.
- (iii) Diversification Projects -For manufacturing new products by existing units.
- (iv) Backward Integration projects -For manufacturing certain products which are being used as raw material by the existing unit.

- (v) Forward Integration Projects -For manufacturing certain products which require the products of the existing unit as raw material.
- (vi) Modernisation Projects. -It can be for any one or more than one of the following objects -
- a) Changing obsolete machinery
 - b) Enlarging the product mix product range to meet changing requirements of the market.
 - c) Reducing the manufacturing cost or for improving the quality of the product
 - d) Changing the requirement of raw material (shifting from present raw material to some other raw material)
- (vii) Rehabilitation - For reviving sick units and making them viable to compete with normal/healthy units.

DEFINITION OF PROJECT

A project is a one-shot, time limited, goal directed, major undertaking, requiring the commitment of varied skills and resources. It has also been described as a combination of human and non-human resources pooled together in a temporary organisation to achieve a specific purpose. The purpose and the set of activities which can achieve that purpose distinguish one project from another.

-Project Management Institute, U.S.A.

“We mean by a project any scheme, or part of a scheme, for investing resources which can reasonably be analyzed and evaluated as an independent

unit. The definition is thus arbitrary. Almost any project could be broken down into parts for separate consideration, each of these parts would then by definition a project”.

- **I.M.D. Little and J.A. Mirrless.**

“ A specific activity with a specific starting point and a specific ending point intended to accomplish a specific objective. It is something you draw a boundary around at least a conceptual boundary and say this is the project”.

-**J. Price Gittinger.**

“Compilation of data which will enable an appraisal to be made of the economic advantages and disadvantages attendant upon the allocation of country’s resources to the production of specific goods and services....”

- **United Nations.**

It may, therefore be summarized that a project is essentially a self contained, independent entity.

FEATURES OF A PROJECT

- ⇒ A project can be identified by its features. The special features of a project that would differentiate from any other on going activity are given below:
- ⇒ A project fixed set of objectives. Once the objectives have been achieved, the project ceases to exist.
- ⇒ It has a specific life span.
- ⇒ Project has a separate entity and normally entrusted to one responsibility centre.
- ⇒ Project calls for a teamwork.

- ↔ Project has a life cycle reflected by growth, maturity and decline.
- ↔ Uniqueness is a salient feature of any project. No two projects are exactly similar.
- ↔ Change is an inherent feature in any project out its life.
- ↔ Project is based on successive principle and hence it is difficult to learn fully the end results at any stage.
- ↔ A project works for a specific set of goals with the complex set of diversified activities.
- ↔ High level of sub-contraction of work can be done in a project.
- ↔ Every project has risk and uncertainty associated with it.
- ↔ Project needs feasibility any appraisal studies. So that the sponsors sweet dream becomes realizable.

TYPES OF PROJECTS

Much of what the project will comprise and consequently its management will depend on the category it belongs to. The location, type, technology, size, scope and speed are normally the factors which determine the effort needed in executing a project. Though the characteristics of all projects are the same, they cannot be treated alike. Recognition of this distinction is important for management. Classification of project helps in graphically expressing and highlighting the essential features of the project.

Projects are often categorized in terms of their speed of implementation as follows:

NORMAL PROJECTS

- Adequate time is allowed for implementation.
- All the phases in a project are allowed to take their normal time.

- ▶ Minimum requirement of capital.
- ▶ No sacrifices in terms of quality.

CRASH PROJECTS

Requires additional costs to gain time.

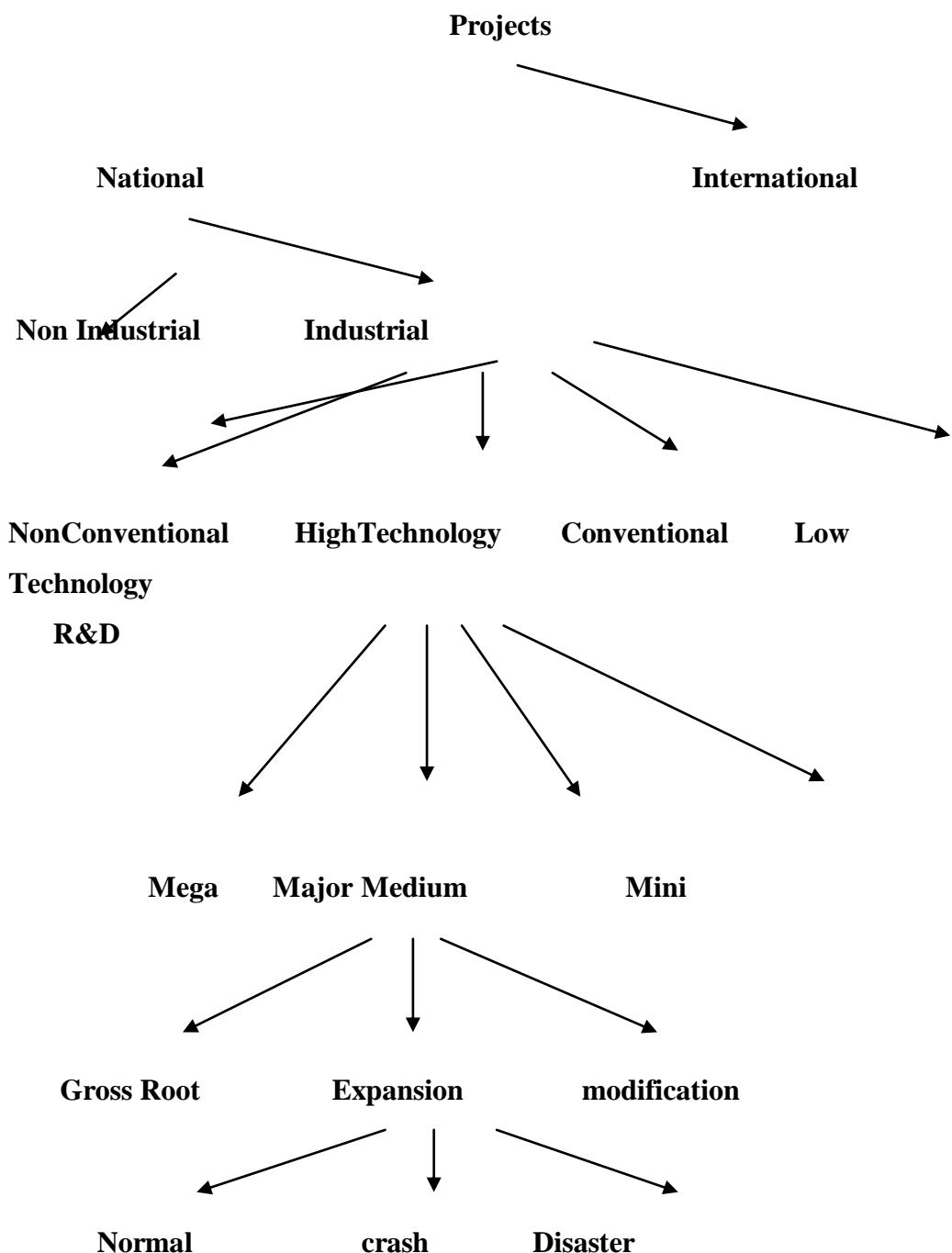
Maximum overlapping of phases is encouraged.

DISASTER PROJECTS

Anything needed to gain time is allowed in these projects. Round the clock work is done at the construction site. Capital cost will go up very high. Project time will get drastically reduced.

Besides that, projects in general are classified on several basis as given in the following illustrative list.

- United Nations Asian and Pacific Development Institute Categories of projects



CLASSIFICATION OF PROJECT

The project can be classified on several bases. Major classifications of the projects are given below:

1. On the basis of Expansion:

1. Project expanding the capacity
2. Project expanding the supply of knowledge

2. On the basis of Magnitude of the resources to be invested:

1. Giant projects affecting total economy
2. Big projects affecting at one sector of the economy.
3. Medium size projects
4. Small size projects (depending on size, investment & impact)

3. On the basis of Sector:

1. Industrial project
2. Agricultural Project
3. Educational Project
4. Health Project
5. Social Project

4. On the basis of objective:

1. Social objective project
2. Economic objective project.

5. On the basis of productivity:

1. Directively productive project.

2. Indirectively productive project.

6. On the basis of nature of benefits:

1. Quantifiable project
2. Non-quantifiable project

7. On the basis of government priorities:

1. Project without specific priorities
2. Project with specific priorities

8. On the basis of dependency:

1. Independent project
2. Dependent project

9. On the basis of ownership:

1. Public sector project
2. Private sector project
3. Joint sector project

10. On the basis of location:

1. Project with determined location
2. Project where location is open.

11. On the basis of social time value of the project:

1. Project with present impact
2. Project with future impact

12. On the basis of National Policy:

1. Project determined by inward looking policy
2. Project determined by outward looking policy

13. On the basis of risk involved in the project:

1. High risks project
2. Normal risks project
3. Low risks project

14. On the basis of economic life of the project:

1. Long term project
2. Medium term project
3. Short-term project.

15. On the basis of technology involved in the project:

1. High sophisticated technology project
2. Advanced technology project
3. Foreign technology project
4. Indigenous technology project

16. On the basis of resources required by the projects:

1. Project with domestic resources
2. Project with foreign resources

17. On the basis of employment opportunities available in the project:

1. Capital intensive project
2. Labour intensive project

18. On the basis of management of project:

1. High degree of decision making attitude
2. Normal degree of decision making attitude
3. Low degree of decision making attitude

19. On the basis of sources of finance:

1. Project with domestic financing
2. Project with foreign financing
3. Project with mixed financing
4. Project with financial institutions

20. On the basis of legal entity:

1. Project with their own legal entity
2. Project without their own legal entity

21. On the basis of role played by the project:

1. Pilot project
2. Demonstration project

22. On the basis of speed required for execution of the project:

1. Normal project
2. Crash project
3. Disaster project

PROJECT LIFE CYCLE

Every programme, project or product has certain phases of development. The different phase of development in an investment proposal or project is called project life cycle. A clear understanding of these phases permits entrepreneurs, managers and executives to have better control over existing and potential resources in the achievement of the desired goals.

PHASES OF PROJECT LIFE CYCLE

Project life cycle is a complex process consisting of different steps arranged in a sequential order. Different authors have described these steps in different sequential manner but the concept of the cycle is almost similar in each case.

According to United Nations Guidelines for Rural Centre Planning, there are 7 steps in the project life cycle such as project identification and appraisal, pre-feasibility study, feasibility study, detailed design project implementation, operation maintenance, monitoring and evaluation.

Rondineli, Dennis & Apsy Palia in their book “Project Planning and implementation in Developing countries” identified the following 12 steps in the project life cycle. Project identification and definition, project formation,

preparation and feasibility analysis, project design, project analysis, project selection, project activation and organisation, project implementation and operation, project supervision (monitoring and control) project completion or termination, output diffusion and transition to normal administration, project evaluation, follow-up and action.

World Bank Guidelines reveals the following six major steps in the project life cycle. Conception (identification), Formation (preparation), Analysis (appraisal), Implementation (Supervision), operation and evaluation.

All the steps given in different studies can be grouped into three main phases viz.,

- Pre-investment phase
- Implementation phase and
- Operational phase

A brief description of each of these phases is given below:

PRE-INVESTMENT PHASE

The first phase of the cycle describes the preliminary evaluation of an idea. It consists of identification of investment opportunities, preliminary project analysis, feasibility study and decision-making. Project idea emanates from the following problems; potential and the needs of the people of an area; plan priorities when planning is done by the government demand and supply projection of various goods and services; Pattern of imports and exports over a period of time; natural resource which can serve as the base for potential manufacturing activity; scope of extending existing lines of activity consumption pattern in other countries at comparable stages of economic stage of economic development.

On the basis of the investment opportunities, it is possible to conceive a number of projects out of which a particular project may be consistent with

development objectives of the area. During this phase, the following aspects of the project must be carefully designed so as to enable implementation.

- Project infrastructure and enabling services
- System design and basic engineering package
- Organisation and manpower
- schedules and budgets
- Licensing and governmental clearances
- Finance
- Systems and procedure
- Identification of project manager
- Design basis, general condition for purchase and contracts
- Construction resources and materials.
- Work packaging

This phase is involved with preparation for the project to take out smoothly.

Once a project opportunity is conceived, it needs to be examined.

Preliminary project analysis concerns with marketing, technical financial and economic aspects of the project. It seeks to determine whether the project is *prima facie* worthwhile to justify a feasibility study and what aspects of the projects are critical to its viability and hence call for an in depth investigation.

More details, through and complete feasibility study results in a reasonably adequate formulation of the projects in terms of location, production capacity production technology and material inputs. The feasibility study contains fairly specific estimates of project cost, means of financing sales revenues, production costs, financial profitability and social profitability.

Based on the thorough feasibility study the project owner or sponsors or financiers can decide whether to accept or reject a particular project. In other

words, the decisions whether investment on the project should be made or not has to be made at this stage.

IMPLEMENTATION PHASE

The implementation phase of an industrial project involves setting up of manufacturing facilities. After judging the worthiness, project needs to be designed for implementation. Drawings, blue prints and the sequences in which the various activities concerning the project need to be carried out. The main activities under this phase are:

Project and engineering design: It consists of site probing and prospecting; preparation of blue prints, plant design, plant engineering, selection of machinery, equipment.

Negotiations and contractions: It covers the activities like project financing, acquisition of technology, construction of building and civil works, provision of utilities supply of machine and equipment, marketing arrangement etc.

Construction: This step involves the activities like site preparation, construction of building, erection and installation of machinery and equipment. Training engineers, technicians and workers. Plant commissioning.

OPERATION PHASE

It is the longest phase in terms of time span. It begins when the project is commissioned and ends when the project is wound up. This is a transition phase in which the hardware built with the active involvement of various agencies is physically handed over for production. This phase is basically a clean up phase for project personnel. The main concern of this phase is on smooth and uninterrupted operation of machinery and plant, development of suitable norms of productivity, establishment of a good quality for the product and securing the

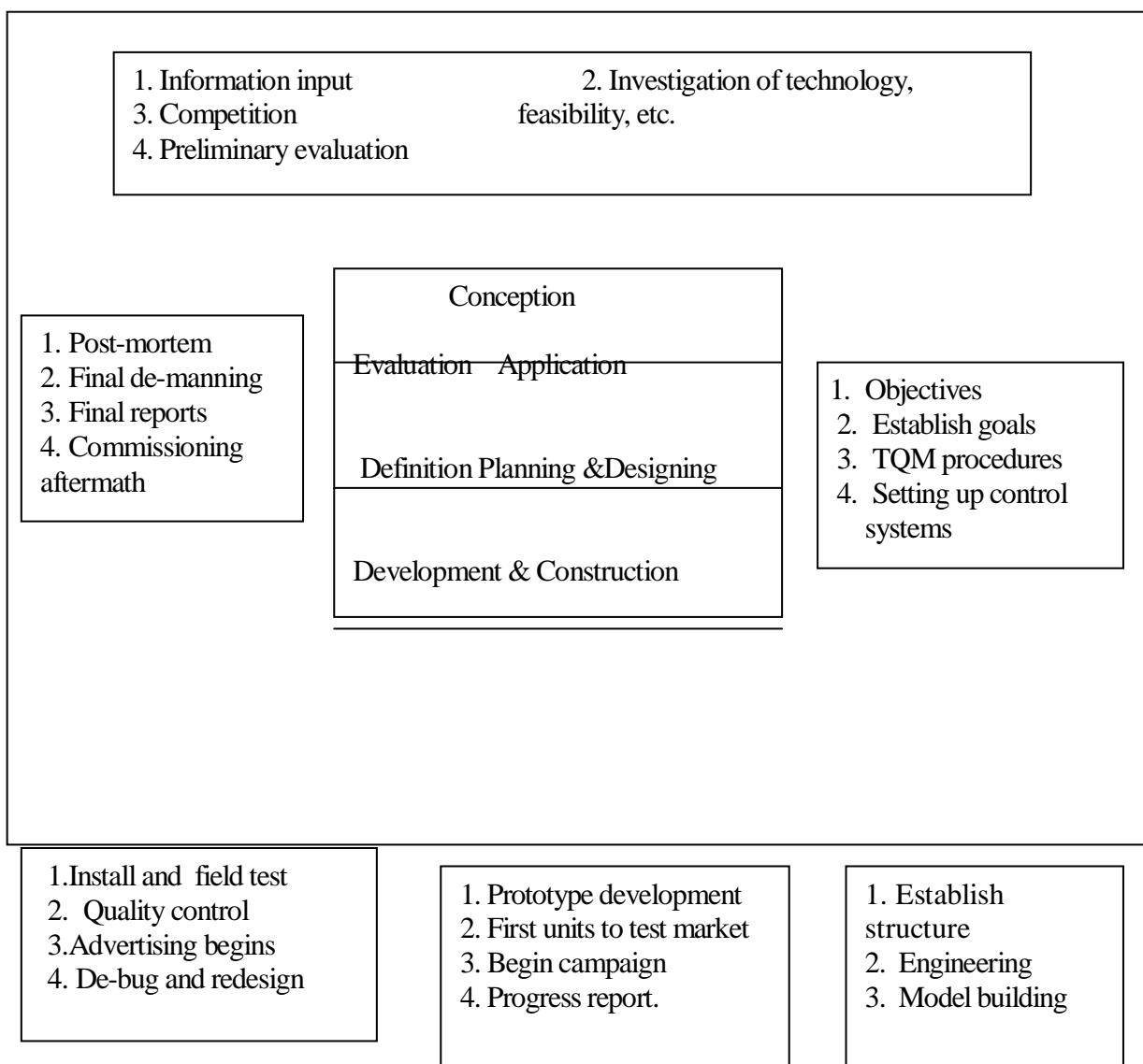
market acceptance of the product. It aims to realize the projections made in the project regarding sales, production, cost of profits. Project monitoring and project evaluation are two vital activities under this phase.

Project monitoring is a step towards achieving properly identified objectives through a carefully laid down strategy. Each activity in the project implementation should be carefully watched so that, the progress may be measured and any deviation from the expected progress be identified in time.

Project evaluation refers to post-investment analysis. It aims at finding out whether the project has achieved the objectives for which it was taken up and whether it has created the anticipated or intended impact. This helps in developing an insight for future investment and better planning.

Thus the life cycle of a project narrates the methodology of developing maintaining and controlling an investment proposal at its various phases in the life cycle. The various steps in the project life cycle are given in the following diagram.

PROJECT LIFE CYCLE CURVES



PROJECT LIFE CYCLE CURVES

The project life cycle phases form an interesting pattern indicative of growth, maturity and decline almost similar to product life cycle. The following figure shows the typical project life cycle curve.

It can be seen from that curve that effort built up in a projects is very slow but effort withdrawals is very sharp. It can also be seen that time taken in the formative and clean up stages together is more than the implementation stages. These parabolic patterns of growth, maturity and decline itself in all phases of the project life. This curve enables a project manager to ascertain the state of health of any project at any point of time.

5.2 PROJECT PLANNING

Project Planning is foreseeing with blue print towards some predicted goals or ends. Project plan is a skeleton which consists of bundle of activities with its future prospects; it is a guided activity. It is a plan for which resources are allocated and efforts are being made to commence the project with great amount of preplanning, project is a way of defining what we are hoping to do about certain issue. The project alone is not responsible for what happens during the course of a planning. Project is a final form of written documents that guides us as to what steps need to be taken next.

NATURE OF PROJECT PLANNING

One cannot conceive a project in a linear manner. It involves few activities, resources, constraints and interrelationships which can be visualized

easily by the human mind and planned informally. However, when a project crosses a certain threshold level of size and complexities, informal planning has to be substituted by formal planning. Besides that it is an open system oriented planned change attempt which has certain parameters and dimension. So that, the need for formal planning is indeed much greater for project work than for normal operations. The pre-defined and outlined in detail plan of action helps managers to perform their task more effectively and efficiently.

There are always competing demands on the resources available in a region or a country because of the limited availability and ever expanding human needs. Planning for the optimum utilization of available resources becomes a pre-requisite for rapid economic development of a country or a region. Project planning makes it possible to list out the priorities and promising projects with a view to exercising national choice among various alternatives available. It is a tool by which a planner can identify a good project and to make sound investment decisions.

NEED FOR PROJECT PLANNING

One of the objectives of project planning is to completely define all work requested so that it will be readily identifiable to each project participant. Besides that there are four basic reasons for project planning.

- To eliminate or reduce uncertainty.
- To improve efficiency of the operation.
- To obtain a better understanding of the objectives.
- To provide a basis for monitoring and controlling work.

FUNCTIONS OF PROJECT PLANNING.

The following functions are to be performed carefully in the Project Planning process.

- ♣ It should provide a basis for organizing the work on the project and allocating responsibilities to individuals.
- ♣ It is a means of communication and co-ordination between all those involved in the project.
- ♣ It induces the people to look ahead.
- ♣ It instills a sense of urgency and time consciousness.
- ♣ It establishes the basis for monitoring and control.

In planning a project, the project manager must structure the work into small elements that are:

Manageable, independent, integratable and also measurable in terms of progress. Planning must be systematic and flexible enough to handle unique activities, disciplined through reviews and controls and capable of accepting multifunctional inputs.

STEPS IN PROJECT PLANNING

Planning decisions involves a conscious choice or selection of one behaviour alternative from among a group of two or more behaviour alternatives. The three main steps involving project planning decisions are:

1. An individual becomes aware that there are alternative ways of action which are relevant to the decision to be made.

2. He must define each of the alternatives. Hence, the definition involving a determination of consequences or impact of each of the proposed alternatives.
3. The individual must exercise a choice between the alternative i.e. he has to make a decision with maximum input, feed back and participation of superiors as well as subordinates.

Planning is a systematic attempt to achieve a set of goals within the specified time limit under the constraints of available resources restrictions involving the least sacrifice. Broadly speaking planning involves two different methodologies.

- a) Planning by incentive and
- b) Planning by direction.

Planning by incentive mainly depends on the controlling of economic tools to push economic resources towards the attainment of set goals within the specified period.

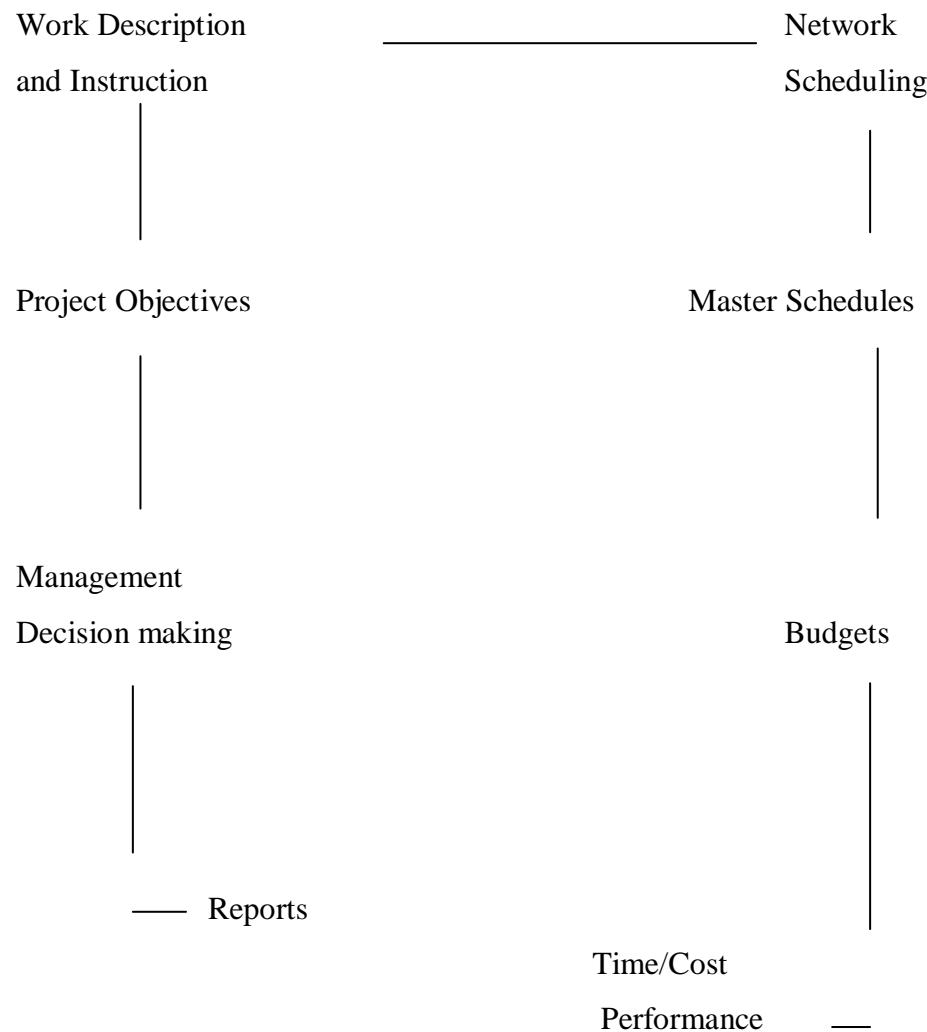
Planning by direction gives more emphasis on the direct participation of the central planning authority in the economic activities to attain the set goal within the estimated time limit.

Planning is decision making based upon futurity. It is a continuous process of making entrepreneurial decisions with an eye to the future, and methodically organizing the effort needed to carry out these decisions. The following figure vividly explains the key elements involved in the planning

structure. This type of well-structured project plan helps to establish an effective monitoring and control system.

Project Planning Structure

The various activities involved in Project planning is given in the following chart as Project Planning Structure.



Planning and decentralizing:

The different way of allocating the activities of a project are important means of delineating various degrees of decentralization. These are three main ways in which project planning can be decentralized into manageable divisions viz.,

Project planning by subject

Project Planning by type of plan and

Planning in phases.

Planning by subject is a simplest way of dividing the powers of planning. The planner takes decision on related operation and planning by subject. He plans, decides and directs the part of a plan. He is the sole incharge of the plan from beginning to final completion.

Planning to type of plan broadly define premises and assumptions leaving the detailing to be done by persons at the grass root level of planning. Generally such cases involve decisions which are rather routine and involve a lower degree of professional and financial risk.

Planning in phases are designed to several individuals who participate at the formulation stage. The level of people involved is directly related to the phase and the degree of risk involved.

AREAS OF PROJECT PLANNING

Comprehensive project planning covers the following: Planning the project work: the activities relating to the project must be spelt out in detail. They should be properly scheduled and sequenced.

Planning the manpower and organizations: The manpower required for the project must be estimated and the responsibility for carrying out the project work must be allocated.

Planning the money; the expenditure of money in a time-phased manner must be budgeted.

Planning the information system. The information required for monitoring the project must be defined.

TYPES OF PROJECT PLAN

The routinisation of planning is done by types of planning decisions. They are as follows:

- a) One shot or Single use plans and
- b) Standing or Standard use plans.

Single use Plans : It includes programmes schedules and special ways of operating under particular circumstances. Single Plans are meant as objectives which centre on focused and desired results. It can also be known as short term plans to deal with the specific problem for specific place with prescribed time limit.

Standing Plans: Standing plans are those plans which include policies, standard methods and standard operation, procedures. They are designed to deal with recurring problems. It may be treated as standard document to be used in different plans to deal with a set of problems. The design procedure and steps are already described. It may require adjustments considering the unit of operation.

PROJECT OBJECTIVES AND POLICIES

Project Planning begins with the end result, the goal and works backward. Often the focus of project planning is on questions like who does what and when before such operational planning is done, the objectives and policies guiding the project planning exercising must be articulated.

If the project team lacks a clear goal, even excellent skills and the best equipment will not enable the team to do a good job. Well defined objectives and policies serve as the framework for the decisions to be made by the project manager. Throughout the life of the project, he has to seek a compromise between the conflicting goals of technical performance, cost standard and time target. A clean articulation of the priorities of management will enable the project manager to take expeditious actions.

An effective project goal has the following characteristics. These characteristics are captured in the term SMART, an acronym for the aspects of a goal commitment. These characteristics of a project goal are specific, measurable, agreed upon, realistic and time framed.

The objectives of a project may be technical objectives.

Performance objectives

Time and cost goals

Policies are the general guide for decision making on individual actions. Some of the policies of a project are

Extent of work given to outside contractors

Number of contracts to be employed

Terms of the contract etc.

PROJECT POLICIES MUST BE FORMULATED ON THE BASIS OF FOLLOWING PRINCIPLES:

It must be based upon the known principles in the operating areas.

It should be complementary for co-ordination.

It should be definite, understandable and preferably in writing.

It should be flexible and stable.

It should be reasonably comprehensive in scope.

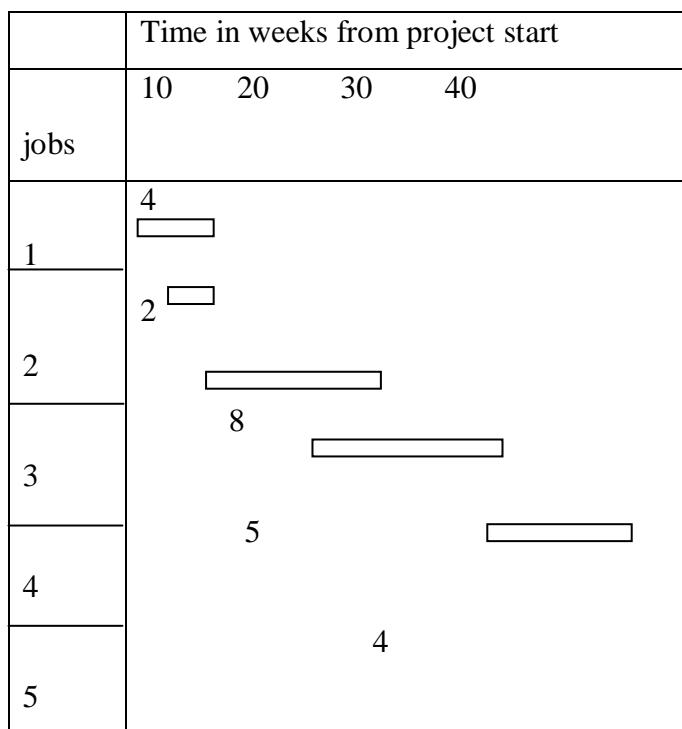
TOOLS OF PROJECT PLANNING

There are different tools available for drawing the project plain in a formal. They may be grouped into two categories. Traditional tools and network analysis.

The Gantt Chart

Gantt Chart: It is the oldest formal planning tool designed by Henry Gantt in 1903. Under this, the activities of project are broken down into a series of well-defined jobs of short duration whose cost and time can be estimated. It is a pictorial device in which the activities/jobs are represented by horizontal bars on the time axis. The length of the bar indicates the estimated time for the job. The left hand end of the bar shows the beginning time, the right hand end shows the ending time. The manpower required for the activity is shown by a number on the bar. An illustrative bar chart is shown as follows.

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The project review dates are indicated by a vertical dotted line and at this time a horizontal line is drawn beneath each bar to indicate the progress actually made upto that date. The length of the progress line is then drawn to represent the percentage of the job that has been completed at the review date. The merits and demerits of Gantt Chart are below:

- MERITS:**
1. It is simple to understand
 2. It can be used to show progress
 3. It can be used for manpower planning
- DEMERITS:**
1. It cannot show inter-relationship among activities on large complete projects.
 2. There may be physical limit to the size of the bar chart.
 3. It cannot easily cope with frequent changes or updating.

5.3 PROJECT IMPLEMENTATION

It is common belief that if we have the chance to peep into the debates and discussions of Legislatures, reports of Commissions and Committees, the various policy documents etc., we generally come across a very distinct and popular term known as ‘implementation’. This term is prefixed by a galaxy of words like policy, plan, programme, project and the like. Simply stated, it conveys such meanings as to carry out, accomplish, fulfil, or to give practical effect and to ensure actual fulfilment by concrete measures.

In the context of project management cycle, implementation involves allocation of tasks to groups within the project organisation. This stage has to be given utmost importance by the planners and decision-makers to derive the intended objectives. To quote the Planning Commission, “The success of the Plans will rest very largely on the efficiency—with which it is implemented.

Deficiencies in implementation are also found due to inadequate planning of projects at the initial stage causing slippages in schedules, cost over-runs and poor performance. The Approach Paper to the Seventh Plan document has also pointedly referred to the reduction of project implementation delays through better project management. Thus, when one talks of the failure of implementation, one has to look upon planning, implementation and evaluation as an integral process, each deriving strength from the other.

A cursory glance at the plan documents reveals that successive Five Year Plans have laid stress on the importance of strengthening the implementation machinery so that programmes and projects could be completed according to time schedules and targets. The Sixth Plan document rightly observed

“Attention to detail in project formulation and implementation and promotion of a work culture where there is pride in performance, are the twin instruments of achieving efficiency. This is the task to which everyone involved in implementation should give utmost attention.”

Inspite of the fact that the Administration Reforms Commission, National Commission on Agriculture, Irrigation Commission, and a large number of Special Committees, Task Forces, Evaluation Studies, etc., have identified in detail about the structural, procedural and institutional weaknesses in the process of implementation and suggested specific remedies, the problem still persist. In fact, the root cause of implementation arises out of the weaknesses at all levels of implementing machinery starting with Government Departments at Centre and the States, through to the various non-secretariat organizations, autonomous corporations, Boards, and other authorities down to the organizations in the field at the project, district or village level. However, in recent years, with the creation of Public Investment Board, Project Appraisal Division, Monitoring and Evaluation Organisation; restructuring and strengthening of Department of Public Enterprises; induction of specialists, internal finance advisers and identifying the project manager much before the actual approval of the project, and taking the expert services from the renowned consultancy houses, there have been some rays of hopes in the effective implementation of the programmes/projects.

PROJECT IMPLEMENTATION STAGES

The purpose of any successful project implementation is to ensure that the project activities are completed within the schedule, and within the budgeted provisions, leading to desired quantum of benefits flowing therefrom. Project

implementation steps are repetitive and each manager has to adopt procedures according to his own requirement depending on the nature of the project and the organisation structure. The implementation of the project shall now be examined under the following seven heads.

1. Initiating the project
2. Specifying and scheduling the work.
3. Clarifying authority, responsibility and relationships.
4. Obtaining resources.
5. Establishing control system.
6. Directing and controlling.
7. Terminating the project.

1. *Initiating the Project*

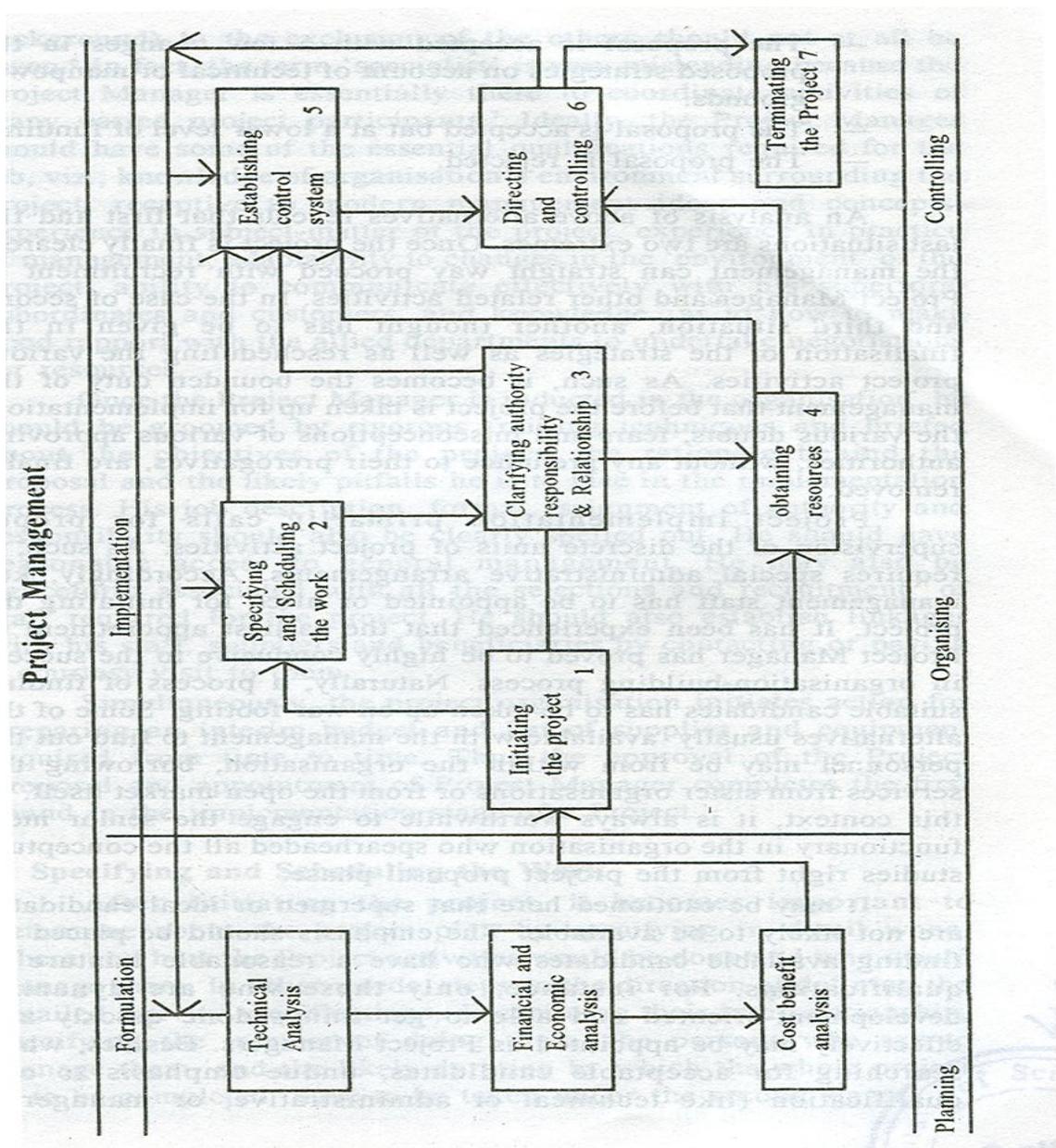
Project initiation is the first step which is similar in many ways to the preparatory stage of project formulation. It involves obtaining approval of the proposed strategies, project plan, relevant budgets and selection of the Project Manager/other major functionaries.

The section of a project for implementation invariably requires a formal approval from a competent authority(s), such as legislative organs, executive organs like Cabinet, administrative department, functional department, planning agency, funding agency professional organisation, as also other contributing agencies especially in those cases where the project involves investment of capital, allocation of foreign exchange, and use of scarce resources (World Bank, IMF, UNDP, etc.). Sometimes the technical, administrative financial and legal aspects of a project have to be approved by the respective agencies jointly

as well as separately. This requires finalization of agreements, contract documents, funding proposals, and the appropriate rules and regulations.

Experience indicates that it takes considerable long time in obtaining the approval of the project proposal from the various agencies. Generally, this stage can take one of the following consequences:

- The proposal is accepted in *to* by all the concerned agencies.



- The proposal is accepted with a few changes in the proposed strategies on account of technical or manpower grounds.
- The proposal is accepted but at a lower level of funding.

- The proposal is rejected.

An analysis of above alternative reveals that first and the last Situations are two extremes. Once the projects is finally cleared the management can straight way proceed with recruitment of Project Management and other related activities. In the case of second and third situation, another thought has to be given in the finalization of the strategies as well as rescheduling the various project activities. As such, it becomes the bounden duty of the management that before the project is taken up for implementation, the various doubts, fears and misconceptions of various approving authorities, without any prejudice to their prerogatives, are finally removed.

Project implementation primarily calls for proper supervision of the discrete units of project activities. As such, it requires special administrative arrangements. Accordingly, key management staff has to be appointed or hired for initiating the project. It has been experienced that the earliest appointment of Project Manager has proved to be highly conducive to the success in organisation-building process. Naturally, a process of finding suitable candidates has to be taken up on war-footing. Some of the alternatives usually available with the management to find out the personnel may be from within the organisation, borrowing the services from sister organisations or from the open market itself. In this context, it is always worthwhile to engage the senior most functionary in the organisation who spearheaded all the conceptual studies right from the project proposal phase.

It may be cautioned here that supermen or ideal candidates are not likely to be available. The emphasis should be placed on finding available candidates who have a reasonable mixture of qualifications. For instance, only those who

are dynamic, development-oriented and able to get things done quickly and effectively may be appointed as Project Managers. Besides, while searching for acceptable candidates, undue emphasis to one qualification (like technical or administrative, or managerial background) to the exclusion of the others should not at all be given. In fact, the term ‘specialist’ is very misleading because the project Manager is essentially there to coordinate activities of many varied project participants. Ideally, the Project Manager should have some of the essential qualifications required for the job, viz., knowledge of organisation’s environment surrounding the project, receptive to modern management ideas and concepts, experience in subject-matter of the project, experience in practice of management, adaptability to changes in the ‘environment’ of the project, ability to communicate effectively with his superiors, subordinates and customers, and knowledge as to how to make good rapport with the allied departments to undertake negotiations for resources.

Once the Project Manager is inducted in the organisation, he should be groomed by rigorous training techniques and briefed about the objectives of the project, the rationale behind the proposal and the likely pitfalls he is to face in the implementation process. His job description, formal assignment of authority and responsibility should also be clearly spelled out. He should have reasonable access to general management. He may also be henceforth associated with all the selections and recruitment of staff required for the project. He should also establish linkages with his staff, suppliers and the beneficiaries by contacting or paying a courtesy visit to them.

Simultaneously, the project organisation initiates action for preparing an interim budget and list of supplies and equipment required from time to time.

Thus the approval of the “Project Proposal and appointment of Project Manager completes the first round in the implementation stage of a project.

2. Specifying the Scheduling the Work

After initiating the project, it becomes important to determine about the project plan by specifying in detail when, where and how the project activities would be done and who would manage them. In other words, steps in the direction of defining the detailed activity specifications, determining their interrelationship, specifying the manner of doing them, the persons who are to manage them, and the likely duration by which the whole project is to be completed, have to be taken under the second stage.

At the very outset of a project, a detailed programme network identifying as many activities as possible have to be drawn. This in turn is known as work breakdown structure. It aims at dividing the total project work into major groups, tasks, sub-tasks and so on, with the sole aim that the work at the lowest rung facilitates to permit adequate control and visibility without creating any unwieldy administrative problems. A properly designed work breakdown structure can also be used as a basis for several activities such as describing the total effort of the project, issuing work authorizations, budgeting, scheduling, status reporting and tracking performance.

Following are some of the activities which are basically termed as important during course of project implementation.

- Finalization of technological parameters.
- Selection of equipment.

- Preparation of layouts.
- Identifications of infrastructure.
- Preparation of specifications for equipment, buildings, auxiliaries, utilities and services.
- Tendering and placement of orders.
- Execution of civil works structures, procurement of supplies, erection of equipment, commissioning.
- Training of manpower.

Such a classification is quite useful in establishing the sequence of operations i.e., in deciding how each activity is linked with its preceding or succeeding activities, what are their interrelationships; and by what time each activity is required to be completed.

In order to determine the inter-relationships among various activities and estimating project activity times durations, one has to take the assistance of modern management techniques, like Gantt Charts, Milestone Charts, Bar Charts, Network Analysis and its variations, etc. These techniques have found widespread use in scheduling and administering the projects both in developed and developing countries. These are described as ‘The blueprints’ for the management of a project. Network analysis in simple words involves breaking up the project in terms of activities and functions to be performed, studying the interrelationships among them, bringing out causality of each activity and function, and fixing a time-schedule for each to complete the project by the target date. One of the distinct features of these techniques is that these can be applied even without the aid of computers. Besides, size of the project—simple or complex—in no way stands as a barrier for bypassing the application of modern management tools. Although using management techniques means

spending more time prior to implementation, it is time well spent. These techniques not only ensure internal coherence in the project, but also save implementation time by isolating any problem to the appropriate project component.

It may, however, be stated that in the finalization of an overall schedule for the project, a lot of consultations have necessarily to be made with the various suppliers, contractors, consultants, experts, officers and other operating staff to solicit their wholehearted cooperation in the venture. Otherwise the whole exercise remains a wishful planning. In this context, Prof.M.Thiyagarajan, an expert in the field of Project Management, narrating his woeful experience of implementation planning of public sector projects, rightly observed that :

“Adhocism prevails from the outset and unrealistic assumptions are made. Still there is a practice to draw out conventional Gantt Charts. Systematic and integrated ‘time-planning’, ‘materials-planning’, ‘manpower planning’. ‘Cost-planning’ are not made in a meticulous and rational manner. “Contract planning” is absent. ‘Coordination’ needed among the contractors incharge of different areas is not considered and included in the plans.”

It is high time that in the smooth implementation of the projects, such serious lapses would not be repeated. Rather, our planners and administrators should seek the assistance from the United Nations Industrial Development Organisation which has done yeo-man service in this area. UNIDO, of late, has been providing developing countries with reference to implementation programming parameters such as time durations, resources and costs required to execute the various major activities of industrial projects that have recently been

implemented, with special emphasis on the delays occurred and their economic impact on the net value of investments etc.

3. Clarifying Authority, Responsibility and Relationships

In the third stage of project implementation, when the project has already been approved, the key functionaries appointed, the work schedules prepared, major orders placed for machinery and equipment, and contracts finalized for civil works, etc., it becomes necessary that the various members of the project teams vis-à-vis the sponsoring organisation are made aware of their relationships between authority and responsibility lest the various functionaries may not be misunderstood with one another thereby inviting a lot of trouble for the project itself.

Accordingly, the Chief Executive of the sponsoring organisation is duty bound to settle the following issues relating to authority and responsibility among the various functionaries in close consultation with his staff aided at the headquarters and the Project Manager responsible for the implementation of the project.

- (a) Who has the authority to change the project schedule?
- (b) Who has the authority to decide substitutes of project resources?
- (c) Who can terminate the project prematurely?
- (d) Who has authority over contingency funds?
- (e) Who can change the project objectives?
- (f) Who is responsible for obtaining resources? and
- (g) What reports are required and who is responsible for taking these?

In fact, the answer to the aforesaid questions is, by and large, dependent on the size, complexity and importance of the project concerned. For instance, in the case of a project which hardly employs large staff, is located in a particular area, is sufficient itself in obtaining the required resources, and does not involve too much technology, it is quite possible to decide the various issues threadbare even in an informal meeting convened by the sponsoring organisation. On the other hand, such issues cannot be easily resolved especially in the case of a complex project. In such a situation, it becomes imperative that the authority and responsibility relationships of all the key functionaries at different levels is abundantly made known to them in writing. For example, sponsoring organization would be responsible for all the policy matters related to the project; the project Manager has to see that project objectives are economically and efficiently accomplished; the activity manager has to ensure that a group of activities assigned to him are completed within no time by consuming minimum resources; and the Liaison Officer assists the Project Manager as and when required.

A checklist showing the authority and responsibility of the above functionaries is given in Appendix II as a guide. It can be modified from time to time in the light of the experience gained. Moreso, such a checklist would facilitate in fixing pin-pointed responsibility for any negligence on the part of a particular officer/official.

4. Obtaining Resources

The discussion on resources would be taken up under the following three headings: Personnel, Finance, Materials and Equipment.

(a) Personnel

Personnel in any project or an organisation is the most scarce and critical resource. The successful implementation of the Plan/Programme/Project depends on the efficiency and effectiveness with which personnel engaged at various levels undertake their tasks and achieve results. Inevitably, manpower is required for use on some or all the activities of every project. In order to keep a track of the large variety of human resources required in the project, it is always advisable to make some codification/classification. For instance, I.L.O. has prescribed an International Standard Classification of Occupations (Following Table).

Accordingly, the personnel requirements for a variety of positions can easily be identified through the code numbers as given on next page.

Manpower requirements are usually determined separately for each activity and each phase keeping in view the existing availability. If an organisation engages an outside agency for

Major Group Generalized Code

Code	Description of Type of Manpower
0.	Professional, Technical and Related Workers
1.	Administrative, Executive and Management Workers
2.	Clerical Workers
3.	Sales Workers
4.	Farmers, Fishermen, Hunters, Loggers and Related Workers.
5.	Mines, Quarrymen and Related Workers
6.	Workers in Transport and Communications

- | |
|--|
| 7,8. Craftsmen, Production Process Workers and Labourers not Elsewhere |
| 9. Service, Sport and Recreation Workers |
| 10. Workers not Classifiable by Occupation. |

Project planning, then the manpower requirements for the first phase are itself assessed by it. During the implementation stage, the manpower mainly comprise the construction teams and the other supervisory staff. The exact number of the staff, with certain qualifications and experience and the salary/grades to be given to them is determined with the aid of network techniques. As regards the manpower for the last phase, it mainly consists of operative and supervisory staff.

Over and above the direct manpower requirements of the 3 phases; personnel are also required to man the project organization. Manpower costs generally form a sizeable percentage of production or project costs. The total cost of any individual employee do not merely comprise his salary, but also include overhead expenses in the shape of statutory payments, discretionary payments, pensions and other family benefits. To these have to be added the recruitment costs, training costs and the cost of wastage. Manpower costs so computed are known as placement costs. Project cost estimates have to take into account not only the direct manpower costs, but, also the placement costs in respect to each person in the project area.

Since the manpower requirements vary from activity to activity, therefore, in manpower planning and optimization, the following two considerations should be given due weightage:

- (i) Optimum number of persons to be employed for each activity depending upon the time-cost trade off.
- (ii) Manpower loading or leveling so as to employ uniform labour force and scheduling of activities on that basis. It will prove to be cheaper in the long-run to plan the project work in such a manner that a steady or almost even demand is placed on as much resources as possible.

Once the manpower needs are assessed, early steps have to be taken for the recruitment, selection and placement of the right people, with right qualifications and experience, at the right jobs, at the right time. In this context, the general tendency of appointing, selecting and placing unwanted, mediocre, inefficient and superannuated personnel needs to be strictly curbed by all means if we really want to cherish the results of our projects. The Vice-President stressing the urgency for a “gigantic effort” for developing human resources, rightly felt that a country cannot make rapid economic and social progress unless there are people who are enterprising and have developed the necessary skills and attitudes.

(b) Finances

One of the acid tests of a Project Manager’s patience and ingenuity towards implementation is his concerted efforts to manipulate a firm financial commitment in a bureaucratic environment. This can ensure timely availability of the funds at the start and throughout the schedule and phased life of a project. The flow of resources has to be so planned that activities of the project do not slow down or suffer a set back.

We are well aware that resource consumption takes place during all the 3 phases of the project cycle. During the first phase (pre-investment), resources are required for investigating various aspects of project idea and for developing the project design. In the second phase (construction), resources are needed in providing the basic edifice of the project. During the last phase (normalization), project requires raw materials and other consumables. The nature and magnitude of resource requirements thus differs from phase to phase. So far as finances are concerned, the first phase hardly consumes much. It is in the second phase that maximum amount of funds are required which are usually of a non-recurring nature. The last phase also involves consumption of funds on a recurring basis. As such, funds requirements have to be planned in an integrated manner.

In view of the imperative need for financial requirements, the Project Manager should not take this aspect in a casual manner. Sometimes, it is generally assumed that once the proposal has been accepted, budget prepared and submitted to the funding agency, there would be automatic flow of the funds as and when needed. It is an ill-notion. A number of arguments can be advanced on this account. Firstly, there may be a change in financial picture of the funding agency. Secondly, inflationary effects may be so high that the original budget submission no longer covers the amount required. Lastly, several contingencies (internal as well as external) may also come in the way of the smooth flow of the funds.

The internal reasons are basically controllable (over spendings in travel, entertainment, non-productive activities, excessive expenditure on foreign technicians, under-estimating the project to keep the promoters' contribution to the minimum possible, additions/alterations in the project concept during the implementation stage etc.) for optimum utilization of funds. On the other hand, the external factors which are quite uncontrollable (delays in

sanctions/disbursements of funds, changes in government fiscal policies and market conditions, foreign currency fluctuations, unforeseen political developments, etc.) have an adverse effect on the financial administration.

The net result is that due to improper financial planning, the following consequences are inevitable.

- Increase in pre-operative expenses, mainly interest during construction,
- Enterprise's inability to repay principal and interest as per the amortization schedule,
- Adverse impact on viability of the project,
- Loss on account of lost market opportunities, and
- Sickness at birth and a host of other unsavoury consequences associated with industrial sickness.

In this context, the technique of performance budgeting can be very useful which forms a complement to network analysis. It seeks to bring out what an organisation intends to do, how much of it, at what cost and with what results. It ensures that resources available as compared with resources required are applied in the most efficient and economical manner. In other words, it aims at to avoid a situation where there is heavy demand on resources at one time and idle resources at another.

(c) Materials and Equipment

During the implementation stage, a project for its smooth progress requires machinery, plant, equipment and other materials like cement, bricks, steel, etc. It is possible to determine the exact requirements and time schedule of a particular activity from the network chart and aggregate the resource requirement profile for the total project life span. It may be clarified that the

requirements of suppliers and equipment during implementation stage are quite different from that of operation stage.

Generally, the Purchase Department of the project is made responsible to ensure procurement of supplies and equipment at the stipulated schedules in accordance with the drawing and specifications provided by the functional departments. Though the exercise for procurement starts simultaneously with initiating the project, as already explained, the deliveries are to be ensured at the appropriate time under this stage.

Accordingly, management techniques like network analysis, Scheduling and Economic Order Quantity which are traditionally popular for operational situations, are adopted. With the help of network analysis decisions, highest priority is laid for those resources which fall under the critical activities and *vice versa*. Speculations of price changes, discounts, etc., can also be availed of provided the slacks/floats of events and activities have not exceeded as yet. However, contingency/emergency purchases have to be resorted to in case of critical areas.

It is through E.O.Q. that materials are made available just when and where these are required for various activities. Before the supplies are actually received at the project site, those must be inspected possibly in the suppliers premises itself with regard to their quality, specifications and workmanship. All out efforts should also be made at the project site so that there is no pilferage and loss of materials except due to natural calamities. Besides, there need not be either excessive pre-stocking nor shortage of materials which have a direct bearing both on the project cost and its completion time.

5. Establishing Control System

This stage primarily aims at designing and establishing a control system so that management at different levels is not only able to direct and control the project (a succeeding stage) from three parameters, i.e., time, cost and performance (quantitative as well as qualitative) but, also take corrective measures.

Generally, there are three main indicators, viz., project proposal, project schedule and activity descriptions, with the help of which respective managers are in a position to compare what actually takes place with what was expected. In order to decentralise the control system to the subordinates, every effort is made by the Project Manager to ensure that he keeps with himself minimum number of indicators. For instance, he relies on such indicators that have a bearing with public response and inter/interagency coordination.

Once the indicators are selected for decision-making purposes, the control system is designed specifying who reports what to whom and when. It is here that the Project Manager makes use of various techniques like Activity follow-up (to watch the general progress of various activities), Resource follow-up (comparing actual expenditure with the planned ones), and Schedule follow-up (completion of various activities in the desired time) for the reporting purposes. But, before the control system is actually put into action, it is always advisable to test the system on an experimental basis and modifications made in the light of experience gained.

6. Directing and Controlling

Once the control system has been designed and established, as explained in the preceding stage, the decks are cleared for the management not only to motivate the staff for hard work, but also to monitor and control the project

functioning by taking immediate remedial measures (wherever needed) based on an effective communication and decision-making system.

In this context, the management must take into consideration the various motivational theories propounded by a number of sociologists, psychologists and management thinkers like Taylor, Maslow, Herzberg, McGregor, Argyris, Likert, etc. It must aim at avoiding any chances of hostility, resentment, and apathy among the staff due to its coercive policies. On the contrary, it must rely on the established methods such as economic considerations, pride, work satisfaction, team spirit, social status, etc., of the project staff.

Again, planning of any type including project planning cannot be a foolproof system. Changes have to be made according to the exigencies. It is especially in such eventualities, that monitoring and controlling techniques, collect the facts about the present status and expected progress of the project. It also suggests corrective measures, which have to be transmitted to the various levels for follow-up with the aid of an effective communications system. Such a system facilities in providing following six types of information to the management and it is up to the latter to take some decision and implement the same in the interest of the successful project implementation :

- No action required when any deviation is not found in the project.
- Project Manager may have to make necessary changes in the schedule, budget and staff, which is within his competency.
- The sponsoring organization like the Project Manager may have to bring about changes in the project, which are reserved with it.
- Sponsoring organization may be called upon to reformulate the project strategies, objectives, designs, and targets.
- The project may be terminated earlier.
- Modifying the control system itself to extract more relevant information for effective monitoring and control.

7. Terminating the Project

The project management implementation cycle is treated as completed with the termination of the project. Though it is one of the most important and crucial stage, experience has shown that management generally takes it every easy and lightly about the future repercussions which follow from it.

Literally termination means ‘ending’ and in the context of project implementation, it spells out one of the four meanings, i.e. (1) normal termination, (2) non-termination, (3) early termination, and (4) late termination. When a project is completed within the stipulated resources and time, it is called a normal termination. In the Indian situation, there are very rare examples of this type so far as public enterprises are concerned. A corollary of normal terminal is called as non-termination. In this case, the project becomes a normal functioning unit of the existing organisation on its completion. Negatively, there is every likelihood of the project being terminated earlier on account of a number of factors such as change in policies and programmes of the organisation concerned, availability of more prospective proposals, *vis-à-vis* the existing one, unforeseen and environmental factors, etc. In other words, this stage virtually deals with the abandonment of the existing project.

As regards late termination of the project, it is generally the case on account of time and cost overruns. This recurrent phenomenon has been responsible for adversely affecting the economy of the developing countries. The only exception for late termination may be on account of development of a new feature, a new product as an extension to the existing project, which can be regarded as a healthy sign for its successful growth and survival. As such, one of the first and foremost duty of the Project Manager and his team is to ensure that project achieves the intended objectives within the specified time and given resources. It also becomes the bounden duty of the Project Manager to initiate steps well in advance to ensure that the existing staff is repatriated as soon as the

project is nearing completion. This in turn would ensure optimum utilization of the human resources as well.

This stage also deals with the preparation of a balance sheet regarding the stresses and strains experienced right from the formulation of the project till its completion. There is no denial of the fact that some mistakes are bound to be committed hither and thither on every project. There is also a general belief that we learn by hit and trial, i.e., experience. But as soon as the work is over, we don't try to learn from those unpleasant moments, which acted as a stumbling block in its smooth progress. Such an action is detrimental to our future performance because we repeat the same mistakes and so is the case with the projects. Thus, looking back on a project without a thorough post-completion evaluation (by an insider or an outsider), it is quite easy to come to a general conclusion that 'well, it did not really go too badly, after all.'

The management, as such, must get a summary report prepared which can serve, as guidelines for future projects. The report may narrate the experiences as to where things went right/wrong with detailed explanations; *vis-à-vis* to what extent objectives could be achieved, and may suggest some dos' and don'ts for undertaking similar projects in the future. Normally, such a managerial experience is hardly passed on and the net result is that the future projects also become victims of the recurrent mistakes. Thus, termination of project stage must not be neglected at any cost in the project cycle.

BOTTLENECKS IN PROJECT IMPLEMENTATION

There are numerous common factors responsible for the ineffective implementation of the projects in the developing countries like ours :

1. Lack of perspective project planning.

2. Delays in obtaining approval on various aspects of project from the concerned agencies.
3. Political expediency and vested interests.
4. Wrong assignment of Project Manager.
5. Delays in getting foreign technical assistance (men, money, materials, and know-how).
6. Frequent transfers and heavy turnover.
7. Under staffing and over-staffing.
8. Diffusion of implementation responsibilities across the various agencies.
9. No clarity about authority and responsibility relationships.
10. No mechanism for cooperation and co-ordination of the activities of all connected agencies.
11. Non-availability of materials.
12. Non-commitment to financial resources.
13. Changes in Government fiscal and licensing policies.
14. Integrated cost planning, budgeting and accounting missing.
15. Unrealistic scheduling.
16. No emphasis for monitoring implementation process.
17. No parameters for direction and control.
18. Lack of integrated management information and reporting system.
19. Poor quality control.
20. Frequent changes in the designs, drawings and specifications.
21. Various contractual problems.
22. Accidents during execution.
23. General apathy to application of modern management techniques.
24. No liaison between projects, academics and research laboratories.
25. Changing project priorities.
26. Too many similar projects under way at a time.

27. No consideration to experiences gained from similar projects.
28. Natural calamities.
29. No efforts to promote and maintain interest in individual projects resulting in less enthusiasm, initiative, attention, and follow-through.

GUIDELINES FOR EFFECTIVE IMPLEMENTATION

In order to ensure speedy implementation of projects and to achieve optimum results out of investment, the Planning Commission has framed the Guidelines, which must be adhered to in all earnestness:

- Once a project is approved, no new project may be introduced except in compelling circumstances so that on-going project is completed expeditiously and resources earmarked for it are not diverted elsewhere.
- a firm time schedule regarding formulation and implementation of projects needs to be invariably drawn.
- With a view that the schedule is strictly taken care of, reforms in existing procedures may be made to facilitate quick results, e.g., decentralization of powers, delegation of authority, etc.
- Before a project is finally undertaken for implementation, technology etc., must be made.
- The final data regarding the completion of the projects may be determined by making use of scientific management techniques like PERT/CPM, etc.
- The project (at least in critical sectors) may be funded on a long-term basis as against the existing practice of annual funding.
- The persons responsible for implementation should be made to feel a sense of involvement in fulfillment of targets.
- Expanding the projects need not be taken up unless the original one completed, is fully established, both in regard to physical and fiscal performance.
- Project consultancy and design organizations may be developed and financed in the initial stages by the Government.
- The implementation efforts may be geared by constant monitoring and current and post-evaluation of projects so that lessons of experience enable improvements in the design for future projects.
- At every stage of planning and implementation, it should be necessary to involve the administration at the local level as well as the representative of people particularly the beneficiary groups.

- Involvement in turn can be achieved by persuasion, mass education, consultation, and demonstration and by assisting people's own organizations for development.

The plan document in the context of implementation of large Investment projects has also observed that there is a trend towards acquiring capital assets in increasing quantities, without regard to the availability of funds and the economic and commercial benefits to be derived from such investments. In some sectors, the existence of too many unfinished projects in the pipeline also leads to a rise in capital-output ratio. The document citing the examples of power, railways and irrigation projects feared that based on 1984-85 rate of project completion, these were likely to take another 11 years 3 years and 19 years respectively. In order to curb this trend, the strategy in the plan would be of concentrating on completion of projects as the first priority and strict criteria for new investments. Besides, a six-members Advisory Council consisting of eminent industrialists and experts in business management was constituted to put forward suggestions for the removal of constraints in speedy implementation of the projects undertaken by the Government.

It is hoped that in the interest of utilization of scarce resources in the country, the executives would ponder over the above Guidelines and would firmly ensure its implementation in letter and spirit.

5.4 PROJECT CONTROL

Once the project has been launched, it is essential to control the projects to achieve the desired results. In this process the control becomes closely intertwined in an integrated managerial process. Project control involves a regular comparison of performance against targets, a search for the causes of deviation and a commitment to check adverse variances.

Project control serves two major functions:

- a. It ensures regular monitoring of performance
- b. It motivates project Personnel to strive for achieving projects

Objectives Steps in Projects Control.

There are two important steps in the project control viz;

- 1. Establishment of controls.
- 2. On-going controlling activities using above controls.

It is nothing but controlling a project when it enters the production period using the controls established during the initiation period. Control during the production period involves four steps. There are

- 1. Setting targets for what should be achieved.
- 2. Measurement of what is happening including anticipation of what may happen.
- 3. Comparison between what should happen and what is happening or likely to happen.
- 4. Taking corrective actions to make things happen, as they should. These four steps should follow each other till the work is completed.

Projected Control Purposes:

The project control can be exercised on different aspects. Such as:

- 1. On the progress of the activities.
- 2. On the performance of project activities.
- 3. On project schedule.
- 4. On project cost.

Problems of Project Control:

Effective control is critical for the realization of project objectives. Control of projects in practice tends to be ineffective. There are three main reasons for poor control of projects. Viz.,

1. Characteristics of the project Largeness and complexities Maintenance of non-routine activities Co-ordination and communication problem.
2. People problems.
Managers do not have required experience & training Lack of competence and inclination to control projects.
3. Poor control and information system: Delay in reporting performance. Inappropriate level of detail unrealible information.

GANIT CHARTS

In dealing with complex projects a pictorial representation showing the various jobs to be done, and the time and money they involve is generally helpful. One such pictorial charts, also known is the bar chart, was developed by Henry Ganft around 1900. It consists of two coordinate axes, one representing the time elapsed and the other, jobs or activities performed. The jobs are represented in the form of bars as shown in Previous Fig.

The length of a bar indicates the duration the job or activity take for completion. Generally, in any project some jobs can be taken up concurrently and some will have to be completed before others can begin. Hence, in a bar chart representing a projects, some of the bars run parallel or overlap each other

times-wise (these correspond to concurrent jobs) and some run serially with one bar beginning after another bar ends (corresponding to an activity that succeeds a preceding activity). In Previous Fig. For example activities A, B and C can start at the same time and proceed concurrently or in parallel, though they take different time intervals for their completion. Activity D, however, cannot begin until activity A is over. The bars representing A and D therefore run serially.

Let us consider a specific example. A piece of equipment is made of two parts A and B, which are to be assembled together before they are dispatched. Part A is of cast steel, which requires a pattern and a mould. Part B is a machined item made on special machine M that needs to be purchased and installed. Parts A require special heat-treatment before assembly. The assembly needs to be tested with a specially constructed rig before dispatch.

The time-scale for each activity is as follows:

Preparing a pattern for casting	4 weeks
Preparing a mould	2 weeks
Costing the cleaning operation of A	1 weeks
Heat-treatment of A	2 weeks
Obtaining and installing machine M	7 weeks
Machining part B	5 weeks

Assembling part A and B	3 weeks
Preparing the test rig	4 weeks
Testing the assembly	2 weeks
Packing for dispatch	1 week

The bar chart for this project is shown in Previous Fig. The various activities are shown along the ordinate or the vertical axis and the time elapsed along the horizontal axis.

The chart is self-explanatory.

WEAKNESSES IN BAR CHARTS

The example was deliberately chosen to show that the bar chart may appear to be an excellent pictorial representation of a project. However, in practice, bar charts have serious limitations. A few of these are:

Interdependent of activities:

In a programme where there are a large number of activities that can be started with a certain degree of concurrency, the bar chart cannot show clearly the interdependent among the various efforts or activities. This is a serious deficiency. The mere fact that two or more activities are scheduled for simultaneous or overlapping times does not necessarily make them related or interdependent, or completely independent. Consider, for example, the project represented in

Previous Fig. Such activities as preparing a pattern, preparing a mould, costing and cleaning, and heat-treating have to run sequentially, i.e., one activity must be completed before the other can begin. The bars representing these activities are not allowed to overlap. On the other hand, installing machine M and preparing the test rig can proceed simultaneously because they are completely independent activities and hence the bars representing them can run parallel to each other. However, this is exactly the weakness of the bar chart, because two parallel bars need not necessarily stand for independent activities, as the following example will show.

Suppose a project involves digging foundation, erecting sideboards or shuttering, and pouring concrete. The time consumed is shown against each activity:

Digging foundation 20 weeks

Erecting side boards 14 weeks

Pouring concrete 16 weeks

If the activities are not allowed to run in parallel but in strict sequence, the total time taken for the completion of the project is 50 weeks. As we can easily see, erection of the sideboards can start after the completion of, say, one-half of foundation digging. Similarly, pouring of concrete can start, say, 5 weeks after the erection of sideboards. The bar charts for these activities will as shown in Previous Fig. According to this plan, the sideboard erectors still have 4 weeks of work after the excavation is delayed by 1 or 2 weeks how will reflect on the sideboard erection or the concrete pouring job? This is not revealed by the bar chart.

Project progress:

A bar chart cannot be used as a control device since it does not show the progress of work. Knowledge of the amount of work in progress or jobs completed is absolutely necessary in a dynamic programme. Changes in plans are a necessary part of a large project and a bar does not offer much assistance under such circumstances.

However, a conventional bar chart can be modified to give this additional information as shown. Suppose 16 weeks have elapsed after the project started: be the progress made in the project can be depicted by partially filling in the blank bars. Foundation digging, according to weeks behind schedule.

Uncertainties:

One of the most important deficiencies of the bar chart is its inability to reflect the uncertainty or tolerances in the duration times estimated for various activities. The modern day space system programmes or other complex projects are largely characterized by extensive research, development and technological progress. The traditional knowledge or practices play a very insignificant role. In such situations, the completion of various stages or jobs cannot be forecast with exactness. Uncertainty about a test becoming successful, or a sudden break though in technology of know-how will always provide situations which will make rescheduling of various events a necessary part of the project and give it a dynamic character which is not reflected in a bar chart.

MILESTONE CHARTS

Because of the shortcomings or the inadequacies of the chart in meeting the requirements of the modern day management, efforts have been made to modify it by adding new elements. One such modification was discussed in Various Section. Another important modification, relatively successful, has formed a link in the evolution of the Gantt chart into the PERT or CPM network.

This modification is called the milestone system. Milestones are key events or point time, which can be identified when, completed as the project progresses. In the Gantt chart a bar, which represents a long-term job, is broken down to several pieces, each of which stands for an identifiable major event. Each event is numbered and an explanatory table given identifying the number with the event. These are specific events (point in time) which management has identified as important reference points during the completion of the project. This work breakdown increases the awareness of the interdependent between tasks.

Two important points to be noticed are that: (a) the long time jobs are identified in terms of specific events or milestone; and (b) these milestone or key events are plotted against the time scale indicating their achievements by specified dates.

While the milestone chart was definitely an improvement on the bar chart, it still had one great deficiency, i.e., it did not clearly show the interdependent between events. In a milestone chart the events are in chronological, but not logical, sequence. A natural extension of the milestone chart was the network where the events are connected by arrows in a logical sequence.

5.5 Network Techniques – PERT and CPM

Network analysis is one of the most popular techniques used for planning, scheduling monitoring and coordinating large and complex projects comprising a number of activities. It involves the development of a network to indicate logical sequence of work content elements of a complex situation. It involves three basic steps:

1. Defining the job to be done.
2. Integrating the elements of the job in a logical time sequence.
3. Controlling the progress of the project.

Network analysis is concerned with minimizing some measure of performance of the system such as the total completion time of the project, overall cost and so on. By preparing a network of the system, a decision maker can identify (i) the physical relationships (properties) of the system, and (ii) the inter-relationships of the system components. Network analysis is specially suited to projects which are not routine or repetitive and which will be conducted only once or a few times. Thus, network analysis is the organized application of systematic reasoning for planning, scheduling and monitoring large and complex projects.

Objectives of Network Analysis

Network analysis can be used to serve the following objectives:

Minimization of total time. Network analysis is useful in completing a project in the minimum possible time. A good example of this objective is the maintenance of production line machinery in a factory. If the cost of downtime is very high, it is economically desirable to minimize the maintenance time despite high resource costs.

Minimization of total cost. Where the cost of delay in the completion of a project exceeds cost of extra effort, it is desirable to complete the project in time so as to minimize total cost.

Minimization of time for a given cost. When a fixed sum is available to cover costs, it may be preferable to arrange the existing resources so as to reduce the total time for the project instead of reducing total cost.

Minimization of cost for a given total time. When no particular benefit will be gained from completing the project early, it may be desirable to arrange resources in such way as to give the minimum cost of the project in the set time.

Minimization of idle resources. The schedule should be devised to minimize large fluctuations in the use of limited resources. The cost of having men/machines idle should be compared with the cost of hiring resources on a temporary basis.

Network analysis can also be employed to minimize production delays, interruptions and conflicts.

Managerial Applications of Network Analysis.

Network analysis can be applied to a very wide range of situations involving the use of time, labour and physical resources. Some of the more common application of network analysis in project scheduling are as follows.

- Assembly line scheduling.
- Installation of a complex new equipment, e.g., computers, large machinery
- Research and Development.
- Maintenance and overhauling complicated equipment in chemical or power plants, steel and petroleum industries, etc.
- Inventory planning and control.

- Shifting of manufacturing plant from one site to another.
- Development and testing of missile system.
- Development and launching of new products and advertising campaigns.
- Control of traffic flow in metropolitan cities.
- Long range planning and developing staffing plans.
- Budget and audit procedures.
- Organization of international conferences.
- Launching space programmes, etc.

Advantages of Network Analysis

The network analysis offers the following benefits:

- Network analysis is simple and easy to apply even by people without advanced knowledge of mathematics.
- It is a powerful tool of planning, scheduling and control. In the planning stage, it helps to identify the tasks to be performed and the resources required. During scheduling, network analysis time and resources needed at each stage of activity can be calculated. In the monitoring phase, it is useful for measuring the actual against the planned performance.
- Network analysis shows in a simple way the inter-relationship of the various activities constituting a project or a programme. This helps in bringing out clearly the technological interdependence of the various activities and so in integrating the project plan.
- It helps the management to think through the project systematically ensuring that the sequence requirements are adequate and necessary. It also forces the management to prepare time estimates for individual portions of the total project. This in turn helps to identify possible improvements in these portions or in their relationship to the whole project.
- Network analysis reveals the critical path or the series of activities that require longest time. When it is necessary to reduce the project completion time, the network technique can identify those activities for which extra effort would not be beneficial. Extra time can be taken for some of these without lengthening the total project time.

- It develops a discipline and a systematic approach in planning and scheduling which is not accomplished to this extent by older and traditional methods.
- Network analysis identifies the earliest possible starting date and latest allowable completion date for each activity.
- It provides a comprehensive view of the project and brings about better communication and coordination between the concerned departments.
- Network analysis facilitates control by exception whereby management need act only when the situation is out of control.
- It focuses attention on the critical elements of the project and suggests areas for increasing efficiency and reducing costs.
- Network analysis provides up-to-date information on the progress of the project through frequent reporting and accurate analysis.
- It lends itself easily to computers. Several computer manufacturers provide standard packages of network analysis routines with their equipment.

Limitations of Network Techniques

Network techniques suffer from the following shortcomings.

- It is very often difficult, if not impossible, to construct an accurate network for complex projects. In real world projects interrelationships between activities and events are not clear cut and precise.
- Network analysis based on the assumption that all the resources required to perform any number of activities simultaneously are available. In reality, resources are very often limited and less than those needed for the network.

- What may appear to be a non-critical path in the network of a project may actually be a semi-critical path. In such cases it is quite easy for delays to occur causing the path to become truly critical even though network does not show it critical.
- Several complexities are involved in calculating the project duration in the form of alternative critical paths, compression and relaxation occurring simultaneously and critical activities changing to non-critical ones.
- Project networks involve a large number of activities and it is very difficult to calculate valid time estimates for them. This problem applies especially to PERT analysis where three time estimates are required for each and every activity.
- When the network has hundreds of activities use of computer becomes necessary. Network analysis becomes an expensive exercise.

Terminology of Network Analysis.

The basic concepts, symbols and conventions common used in network techniques are described below:

- **Activity.** An activity represents some action and as such it is a time consuming part of a project. It may be an operation, transportation or inspection. It consumes both time and resources. An activity is represented by an arrow. Each and every activity has a point of time where it begins and a point where it ends.
- **Event.** An event represents the start (beginning) or completion (end) of some activity and as such it consumes no time. It has no time duration and does not consume any resources. It is also known as a *node*. An event is represented by a circle. An event is not complete until all the activities flowing into it are completed.
- **Network Diagram.** It is a pictorial presentation of the various events and activities concerning a project. In a network diagram each arrow represents an activity and each circle an event. The event which is the ending point of two or more activities is called *node*.

- **Critical Path.** Critical path is the longest path in a network. It is the sequences of activities that requires the maximum time for completion. It is critical because its length determines the minimum time in which the project may be completed. If there is any delay in the critical path activities the project is also delayed. The critical path is denoted by darker or double lines to distinguish it from the other non-critical paths.
- **Critical Activities.** All the activities associated with the critical path are called critical or bottleneck activities. Such activities require special attention.
- **Slack.** Slack is the time period for which an activity can be delayed without causing delay in completion of the project. Slack may be positive or negative. Positive slack represents idle time and resources whereas negative slack occurs when the project requires more resources than are normally available.
- **Float.** While slack is used for events, float is applied for activities. There are various types of float, e.g., total float, free float, independent float.
- **Arrow Diagram.** An arrow diagram is a network in which arrow are used to represent activities.

Construction of Network Diagram

In order to construct a network diagram, the project is split into activities, then the starting and finishing events of the project are decided. Thirdly, the precedence order is decided. The activities are then put in logical sequence by using the graphical notations. The following rules should be observed while constructing a network diagram:

- A complete network diagram should have only one start point and one finish point.
- Each activity must have one arrow only. No single activity should be represented twice in the network.
- The flow of the diagram should be from left to right.
- Arrows should not be crossed unless it is absolutely essential.

- Arrows should be kept straight and not curved or bent.
- Arrows pointing in opposite direction must be avoided.
- There must be no loops in the network.
- Angle between arrows should be as large as possible.
- Dummy activities should be used only when completely unavoidable.
- Once the diagram is complete, the modes (events) should be numbered from left to right.

Critical Path Method (CPM)

Critical path method was developed by M.R. Walker of E.T. (Deemed University) Pont de Nemours & Co. of USA in 1956. It is used for optimizing resource allocation and minimizing overall cost for a given project. CPM was developed to help scheduling of routine plant overhaul and maintenance, building of a pilot model plant, etc. CPM uses two time estimates for each activity one for the normal situation and other for the crash situation. It is based on the assumption that the time which each activity in the project will take is precise and known. The relation between the amount of resources employed and the time needed to complete the project is also assumed to be known.

The iterative procedure of determining the critical path involves the following steps:

- Break down the project into various activities systematically. Arrange all activities in logical sequence and label them. Construct the arrow diagram.
- Number all the events and activities. Find the time for each activity considering it to be deterministic. Indicate the activity times on the arrow diagram.
- Calculate the earliest start time, earlier finish time, latest start time and latest finish time. Construct a table showing earliest times, latest times and normal times.
- Determine the total float for each activity on the basis of difference between the earliest time and latest time.

- Identify the critical activities and connect them with double line arrow. This gives the critical path.
- Calculate the total duration of the project.
- If it is intended to reduce the total duration, crash the critical activities.
- Optimize the cost by shifting resources
- Update the network and smooth the network resources.

Illustration

Consider the following schedule of activities and related information for the construction of a new plant:

Activity	Expected Time		Expected cost Rs. 1000
	Months	Variance	
1-2	4	1	5
2-3	2	1	3
3-6	3	1	4
2-4	6	2	9
1-5	2	1	2
5-6	5	1	12
4-6	9	5	20
5-7	7	8	7
7-8	10	16	14
6-8	1	1	4

Construct a network diagram and calculate:

- The critical path
- expected cost of construction of the project
- Expected time required to build the plant.

Solution

(a) From the above diagram, the critical path is: 1—2—4—6—8

(b) The expected cost is:

$$5+3+4+9+2+12+20+7+14+4=\text{Rs.}8,00,000.$$

(c) The expected time of completion of the project will be the expected time of the critical path.

Activity	Expected time
1-2	4
2-4	6
4-6	9
6-8	1

Thus, the expected time to build the plant is $4+6+9+1=20$ months.

Advantage of CPM

- CPM highlights the critical activities on which management should focus attention to reduce project completion time.
- It helps management in diverting resources from non-critical to critical activities. In other words, it facilitates optimum allocation of resources.
- It provides a technique of planning and scheduling a project. Scheduling helps to determine completion date and to evaluate progress towards the completion of the project.
- It gives complete information about the significance, size, duration and performance of an activity.
- It helps to identify potential bottlenecks and to avoid unnecessary pressure on the paths that will not result in earlier completion of the project.
- CPM helps to identify the sequence of jobs that determine the earliest completion date for the project.

Limitations of CPM

- CPM operates on the assumption that there is a precise known time that each activity in the project will take. But this may not be true in real life situations.
- CPM does not incorporate statistical analysis in determining time estimates.
- Each time changes are introduced into the network the entire evaluation of the project has to be repeated and a new critical path has to be determined.

- CPM is not suitable for a situation which does not have a definite start and definite finish.
- It tends to produce exceptionally good results on the “CPM planned job” which is not possible to reproduce on later jobs.
- CPM is not a panacea for all ills. It cannot by itself solve a problem. It only facilitates a thorough examination of the problem and alternative solutions for it.

Programme Evaluation and Review Technique (PERT)

PERT was developed in 1958 by a Navy-sponsored Research Team in USA. It was initially developed for use in defence projects like Polaris fleet ballistic missile programme. But now it has become a very popular management technique for planning and controlling projects. Under PERT the completion time is assumed to be uncertain and unknown. Therefore, the probability of activity completion time is estimated. Three time estimates are made for each activity—optimistic time, pessimistic time and normal time. Optimistic time is the best time that could be expected if everything went exceptionally well. Pessimistic time is the worst time that could be expected if everything went wrong.

Methodology of PERT

The steps involved in PERT are:

• **Preparation of the network.** First of all a list of activities that constitute the project is prepared. The predecessor and successor activities are determined. A network diagram is prepared on the basis of dependence between different activities and events. This is project planning phase of PERT. Events are numbered in ascending order from left to right.

• **Network analysis.** Estimates of the time required to perform each activity are made. These estimates are based upon manpower and equipment availability. At this stage the probability of completing the project or a part of it by a specified time can be computed.

• **Scheduling.** Expected time for each activity is computed from the three time estimates. Earliest and latest start time and finish time for each activity are determined. Then the critical path through the network is determined. The slack time associated with the non-critical activities is also computed.

•**Time cost trade-off.** If management wants to reduce the project completion time, crashing or compressing of the project is done. The cost of reducing the project completion time is computed. Time cost trade-offs for the critical path are considered.

•**Resource allocation.** The feasibility of each schedule is checked with respect to manpower and equipment requirements. Replanning and rescheduling may be necessary if the resources are limited.

•**Project Control.** Once the network plan and schedule are developed to satisfactory level, they are finalized. The project is controlled by checking progress against the schedule, assigning and scheduling man-power and equipment and analyzing the effects of delay. Whenever major changes are made in the schedule, the network is revised accordingly and a new schedule is prepared. Thus, monitoring of progress may require periodic updating of the project and rescheduling to ensure completion of the project in time.

Illustration

Present the following activities in the form of a PERT network and determine:

- (a) Critical path,
- (b) Earliest and latest expected time, and
- (c) Probability of completing the project within schedule completion of 48 days:

Activity	Completion time		Most expected (tm)
	Optimistic (te)	Pessimistic (tp)	
1-2	4	12	8
2-3	1	7	4
2-4	8	16	12
3-5	3	7	5
4-5	0	0	0
4-6	3	9	6
5-7	3	9	6
5-8	4	8	6
7-9	4	12	8
8-9	2	8	5
9-10	4	16	10
6-10	4	8	6

Solution

The expected time (t_e) and the variance a^2 for the various activities are given in the following table :

Activity	Optimistic (t_o)	Most Expected (t_m)	Pessimistic (t_p)	Expected Time $t = [(t_o + 4t_m + t_p)/6]$	Variance $a^2 = [(t_v - t_o)/6]^2$
1-2	4	8	12	8	$(8/6)^2 = 1.78$
2-3	1	4	7	4	$(6/6)^2 = 1.00$
2-4	8	12	16	12	$(8/6)^2 = 1.78$
3-5	3	5	7	5	$(4/6)^2 = 0.44$
4-5	0	0	0	0	$0 = 0.00$
4-6	3	6	9	6	$(6/6)^2 = 1.00$
5-7	3	6	9	6	$(6/6)^2 = 1.00$
5-8	4	6	8	6	$(4/6)^2 = 0.44$
7-9	4	8	12	8	$(8/6)^2 = 1.78$
8-9	2	5	8	5	$(6/6)^2 = 1.00$
9-10	4	10	16	10	$(12/6)^2 = 4.00$
6-10	4	6	8	6	$(4/6)^2 = 0.44$

The earliest expected times are :

$$E(\mu_1) = 0, E(\mu_2) = 0 + 8 = 8, E(\mu_3) = 8+4 = 12$$

$$E(\mu_4) = 8+12 = 20, E(\mu_5) = \max. (12+5, 20+0) = 20$$

$$E(\mu_6) = 20+6 = 26, E(\mu_7) = 20+6 = 26$$

$$E(\mu_8) = 20+6 = 26, E(\mu_9) = \max. (26+8, 26+5) = 340$$

$$E(\mu_{10}) = \max. (34+10, 26+6) = 44$$

The latest expected times are:

$$E(L_{10}) = 44, (L_9) = 44-10 = 34$$

$$E(L_8) = 34-5 = 29, E(L_7) = 34-8 = 26$$

$$E(L_6) = 44-6 = 38, E(L_5) = \min. (26-6, 29-6) = 20$$

$$E(L_4) = \min. (20-0, 36-6) = 20, E(L_3) = 20-5 = 15$$

$$E(L_2) = \min. (15-4, 20-12) = 8, E(L_1) = 8-8 = 0$$

The critical path as shown in the above network is

1-2-4-5-7-9-10

Expected project completion time is

$$= 8+12+0+6+8+10 = 44 \text{ days}$$

Project variance is :

$$GT^2 = 1.78 + 1.78 + 0 + 1 + 1.78 + 4 = 10.34$$

$$GT = \sqrt{10.34} = 3.216$$

If due date of completion of the project is 48 days then:

$$\frac{Z = 48-44}{3.216} = 1.24$$

From the standard normal table, the probability of meeting the due date is 0.3925.

Application of PERT

The major areas of application of PERT are given below:

- In construction industry, PERT is used in building large structures like factories, sky scrappers, flyovers, dams, etc.
- In installing plants, computers, offices and in reorganizing new systems.
- In overhaul, maintenance and major repairs like refitting ships, steel furnaces, scheduling aircrafts, etc.
- In general administration for long ranges planning, streamlining paper work, corporate profit planning, manpower planning, etc.
- In marketing, PERT is used for advertising campaigns, development and launching of new products, distribution network.
- In accounting, PERT is used in preparing accounts, budgets, etc.

Advantages of PERT

- PERT forces managers to plan carefully and study how the various parts fit into the whole project. It forces planning all down the line because each subordinate manager plans the event. It enables management to predict time and cost of a project in advance.
- It focuses attention on critical or bottleneck elements of the project so that a manager may either allocate more resources to them or keep a careful watch on them as the project progresses. It permits control by exception and better management of resources.
- PERT is a unique control technique as it assists management in controlling a project. Once the project begins, PERT calls attention as a result of constant review to delay in the project completion date. It allows a manager to calculate the expected total time for the completion of the project at the time of formulation and planning. Therefore, PERT provides a forward looking type of control or a feed forward control. It serves a readymade standard against which performance can be measured.
- PERT incorporates the statistical analysis in determining time estimates and enables determination of the probabilities concerning the time by which each activity as well as the entire project would be completed. As such it may be considered an advancement over CPM.
- PERT makes possible the pressure for action at the right spot and level in the organisation at the right time. It suggests areas for increasing efficiency and reducing cost.
- PERT is specially useful for planning and controlling one shot projects as it takes account of uncertain time factors.
- It provides up-to-date information on the progress of the project so that the necessary steps may be taken (e.g., rescheduling, reallocation of resources, etc.), to minimize delays and interruptions.
- PERT helps to coordinate different parts of the total project so as to achieve completion of the project in time.
- PERT focuses management attention on problems ahead, indicating relationships, and coordination required thereby providing a sound means of control.
- One of the major advantages of PERT is its comprehensiveness. It can be used by management from the inception of a project to its completion. It provides valuable tool for unified planning and control of complex projects.

Limitations of PERT

PERT suffers from the following drawbacks:

- PERT is based on time estimates rather than known time for each activity. There may be errors in time estimates due to human bias.
- It emphasizes only time and not costs.

- It is not practicable for routine planning of recurring activities. It is useful in complex projects consisting of numerous activities which are independent of each other and whose completion times are uncertain.
- Time estimates to perform activities constitute a major limitation of PERT.
- In PERT probabilities are calculated on the assumption that a large number of independent activities operate on critical path and as such the distribution of total time is normal. This assumption may not be true in real life situations.
- For active control of a project, PERT requires frequent updating and revising of the calculations. It becomes an expensive and time consuming exercise. It requires highly trained personnel.
- PERT is not a cure all. It does not make control automatic. It does not consider the resources required at various stages of the project. It is not universally applicable.

Distinction between PERT and CPM

Both PERT and CPM are managerial techniques for planning and control of large complex projects. Both are techniques of network analysis wherein a network is prepared to analyze interrelationships between different activities of a project. However, there are several differences between the two techniques:

- CPM is used for repetitive jobs like planning the construction of a house. On the other hand, PERT is used for non-repetitive jobs like planning the assembly of a space platform.
- PERT is a probabilistic model with uncertainty in activity duration. Multiple time estimates are made to calculate the probability of completing the project within scheduled time. On the contrary, CPM is a deterministic model with well-known activity (single) times based upon past experience. It therefore, does not deal with uncertainty in projection duration.
- PERT analysis does not usually consider costs in a direct manner. But CPM directly deals with cost of project schedules and their minimization. The concept of crashing is applied to CPM models. Thus, CPM is more explicit about cost-time relationship. In a CPM network cost is assigned to each activity.
- PERT incorporates statistical analysis and thereby enables the determination of probabilities concerning the time by which each activity and the entire project would be completed. On the other hand, CPM does not incorporate statistical analysis in determining time estimates because time is precise and known.

- In a PERT network, each event is represented by a circle and arrows are used to indicate activities. But in a CPM model, each activity is represented by a circle and arrows are used to indicate sequencing requirements.
- PERT serves as a useful control device as it assists the management in controlling a project by calling attention through constant review to such delays in activities which might lead to a delay in the project completion date. But it is difficult to use CPM as a controlling device for the simple reason that one must repeat the entire evaluation of the project each time the changes are introduced into the network.
- PERT is said to be event-oriented as the results of analysis are expressed in terms of events or distinct points in time indicative of progress. CPM is, on the other hand, activity-oriented as the results of calculations are considered in terms of activities or operations of the project.
- In PERT the use of dummy activities is required for representing the proper sequencing. But in CPM the use of dummy activities is not necessary.
- PERT is applied mainly for planning and scheduling research programmes. On the other hand, CPM is employed in construction and business problems.

PERT Cost Principles

Originally, PERT and CPM network techniques were developed essentially as time-oriented techniques. They have been used as planning tools to estimate time required for completing a project and to prepare time schedules. But in recent years, PERT has been applied in the area of cost control. PERT cost is an extension of basic PERT. It focuses attention upon costs as well as time. It is designed to develop a minimum cost schedule or assist in maintaining tight control over costs.

In many projects, the estimated project duration may exceed the target duration. It becomes necessary, therefore, to reduce (compress or crash) the critical path so as to complete the project by the target date. This requires use of more workers, better equipment overtime, etc. These in turn involve direct and indirect costs. A time-cost trade-off is involved. The length of the project should be shortened to the point where the savings in indirect project costs are equal to the cost of additional resources. The process of shortening a project is called crashing and it is usually achieved by adding extra resources to an activity. Project crashing requires the determination of optimum time-cost relationship which involves the following steps:

- Subdivide the network of activities into work packages of comparable length and cost.
- Find the normal critical path and identify the critical activities.
- Calculate the time and cost estimates for different activities.
- Calculate the cost slope which indicates the extra cost per unit of time required to expedite an activity.

$$\text{Cost slope} = \frac{\text{Crash cost} - \text{Normal cost}}{\text{Crash time} - \text{Normal time}}$$

- Rank the activities in the ascending order of importance.
- Crash the activities in the critical path as per the ranking, i.e., activity with lowest cost slope would be crashed first to the maximum possible extent.
- Calculate the new direct cost by cumulative adding the cost of crashing to the normal cost. In time cost analysis, the shortest possible activity times are referred to as ‘crash time’ and the costs associated with them are ‘crash costs’.
- When the critical path duration is reduced, the path also become critical. Therefore simultaneous crashing of the parallel critical paths is required.
- As the further reduction of durations is no longer economical, i.e., the minimum point on the total cost curve is reached (Fig. 35.5), the time cost relationship is optimized.

Illustration

A network has four activities the minimum feasible times and cost per day to achieve reductions in the activity times are given below :

Activity	Minimum time	Time reduction direct costs per day.
1-2	2	Rs.40
1-3	2	LRs.35 (first) Rs. 80(second)
2-4	4	None possible
3-4	3	Rs.45 (first), Rs.110 (others)

If fixed project costs are Rs.90 per day, give the optimal time cost relationship.

Solution

Project Duration (days)	Indirect Cost	Activity Reduced	Relevant Direct Cost	Relevant Total Cost
10	Rs.900	None	Rs.0	Rs.900
9	810	1-3	0+35=35	845
8	720	1-2, 3-4	35+85=120	840
7	630	1-2,1-3	120+120=240	870
6	540	1-3,3-4	240+150=390	930

As the project progresses, actual costs are compared with budgeted costs to determine which activities are under-running and which are over-running the budget. Steps are then taken to add or delete resources. Time and costs estimates for uncompleted work are revised. In this way PERT-cost provides systematic updating of the time and cost estimates. The project plan is reviewed and revised. An important feature of PERT-cost system is the preparation of time and cost reports. Such reports provide timely information to management indicating problem areas. Management can analyse such reports to decide the course of action.

Another significant feature of PERT-cost system is time-cost optimization through proper allocation of resources. Project is expedited by using additional resources. If the resources are limited appropriate rescheduling is done. PERT-cost has been used extensively in government contracts in order to develop accurate project-estimates and to limit the amount of cost overrun.

Advantages of PERT-Cost

- PERT-cost system measures and controls costs in terms of the activities. As a result it leads to considerable improvements in project cost control.
- Under PERT-cost system cost overruns are more easily detected and corrective action is taken more readily. In fact, this has been the main argument for introducing a project-oriented cost accounting system.
- PERT-cost system supplies relatively more and useful information to management than possible under conventional cost systems. This enables the management to do a

better job of planning and control. However, a project-oriented cost accounting cannot always replace the conventional costing systems. PERT-cost has considerably improved managerial planning and control because under it costs are categorized and reported in full details. It provides good control mechanism while the project is under way.

- PERT avoids frequent lengthy meeting needed for coordination. It cuts down on cross-checking of unrelated project. It provides progress check points.
- With the help of PERT-cost a supplier can tell the customer in advance what it would cost extra to execute a rush order.
- Another use of PERT-cost is in financial planning, i.e., in estimating the funds required and the point of time they will be needed so that advance steps may be taken to secure the necessary funds at the right time.
- PERT-cost also provides management with a yardstick to measure the performance of various departments and executives in meeting their cost and time schedules on the project. It also helps to find future manpower needs which can be met either through overtime or additional personnel.

Limitations of PERT-Cost

- The PERT approach assumes that significant manpower and equipment resources are available to keep a project on schedule. This may not always be true.
- The cost collection and reporting system required under PERT-cost can be quite complex. An accounting code structure (i.e., the framework of numbers) is required and it must be geared to project activities and events. In many situations new cost accounting systems must be devised for handling labour, material and various indirect costs on an activity basis.
- The PERT network must be complete enough to reflect any activity which incurs cost.
- The firm adopting PERT-cost for control should have good data processing capability and a thorough understanding of the impending accounting requirements before implementing the system.
- In a complex project the number of events is so large that it becomes difficult and expensive to establish job centre cost accounts for each activity.
- There may be several overhead costs which cannot directly be related to an activity.
- Sometimes, it may be very difficult to estimate changes in cost resulting from changes in duration time. Cost curves may not be linear and cost slopes may not be constant.

5.6 Crashing the Project

It is easy then to use the linear programming formulation to determine which projects to decrease the time for. Suppose we need to complete the house in 40 days, and we can decrease the excavation by at most 1 day at cost \$500/day, foundation by at most

2 days at cost \$600 per day, rough walling by at most 2 days at cost \$400 per day, and exterior siding by at most 4 days at cost \$300 per day decreased. How can we minimize cost so that the house is finished in 40 days?

If we let new variables z_1, z_2, z_3 , and z_4 represent the number of days we decrease the time needed for excavation, foundation, walling, and siding, respectively, then we get the L.P.:

$$\begin{aligned}
 & \text{Minimize} && 500z_1 + 600z_2 + 400z_3 + 300z_4 \\
 & \text{subject to} && z_2 \geq x_1 + 2 - z_1 \\
 & && z_3 \geq x_2 + 4 - z_2 \\
 & && z_4 \geq x_3 + 10 - z_3 \\
 & && z_5 \geq x_4 + 4 \\
 & && z_6 \geq x_4 + 6 \\
 & && z_7 \geq x_4 + 7 \\
 & && z_7 \geq x_5 + 5 \\
 & && z_8 \geq x_5 + 0 \\
 & && z_8 \geq x_6 + 7 - z_4 \\
 & && z_9 \geq x_7 + 8 \\
 & && z_{10} \geq x_8 + 9 \\
 & && z_{11} \geq x_9 + 4 \\
 & && z_{12} \geq x_9 + 5 \\
 & && z_{12} \geq z_{11} \\
 & && z_{13} \geq x_{10} + 2 \\
 & && z_{13} \geq x_{12} + 6 \\
 & && z_1 = 0 \\
 & && z_{13} - z_1 \leq 40 \\
 & && z_1 \leq 1 \\
 & && z_2 \leq 2 \\
 & && z_3 \leq 2 \\
 & && z_4 \leq 4
 \end{aligned}$$

PERT

So far we have assumed that reasonably accurate estimates can be made of the time required for each activity in the project network. In reality, there is frequently some uncertainty about the time an activity can take.

In a PERT network, this uncertainty is summed up in three numbers about each activity: the most likely value for the duration (**m**), a pessimistic value (**b**) and an optimistic value (**a**). PERT then fits a particular type of probability distribution to these values. This distribution (the *beta* distribution) assumes that the range from **a** and **b** encompasses 6 standard deviations (3 on either side of the mean). The mean itself is calculated as

$$\text{Mean} = \frac{a + 4m + b}{6}$$

and the variance:

$$\text{Variance} = \frac{(b - a)^2}{36}.$$

Based on these values, PERT will use an activity network to calculate a mean finishing time along with a variance about that finishing time. There are two critical assumptions: the times for the activities are *independent* of each other, and the critical path identified is always the longest path in the network, no matter how the activity lengths turn out.

With these assumptions, you can solve a PERT network as follows. Find a critical path using the CPM method with the mean activity times on the arcs. This gives the mean finishing time. The variance of the finishing time is simply the sum of the variances of the activities on the critical path. The overall finishing value is assumed to be normally distributed, so quintiles are based on the normal distribution.

PERT allows you to answer such questions as:

What is the probability the total time is less than 40 days?

What is the probability the total time is more than 50 days?

How much should the project budget be increased in order to ensure with 99% probability that the project will finish by December 10?

Unfortunately, the assumptions behind PERT are very stringent. Be careful when using any canned package for it hides the assumptions very well. Used correctly, both PERT and CPM greatly aid in the control and analysis of large projects.

Exercise 7 Consider the following project.

Activity	Duration	Predecessors
A	6	—
B	3	—
C	5	—
D	4	A
E	5	A
F	7	B
G	4	C
H	6	C
I	3	D
J	4	F,G
K	3	F,G
L	2	H
M	6	E,I,J
N	5	K,L

Find the early time and late time for each event as well as the total float for each activity. Also identify the critical path.

5.7 Project Abandonment

A project may have to be abandoned due to its becoming extremely non-viable. Such a situation may develop on account of one or more of the following factors:

- Change in the Government Policy;
- Change in the demand pattern due to long gestation period; and

- Obsolescence of the product.

When the prospect of a project turning unprofitable becomes fairly certain and there is little possibility of making the project profitable in future, the management should decide to abandon and salvage the investment to the maximum extent possible. However, such a decision should be taken after a careful consideration of all relevant factors affecting the goodwill, public image, Government's regulations, interest of the financial institutions and the shareholders, etc. The following two points need careful consideration:

- The present value of the after tax cash benefits, which will continue to accrue to the company if the project is not abandoned.
- The realizable value from the disposal of the assets in case the project is liquidated.

In case the present disposal value of the project, as discussed under the point (ii), is higher than the present value of the cash benefits, as discussed in point (i), it will be beneficial to liquidate the project.

The ascertainment of the values under both the above circumstances need careful working on the part of the Finance Manager. He has to look into the future to make his own estimates by taking into consideration all relevant factors affecting the cash flows and frame a proposal for consideration of the top management.

An existing concern may also become non-viable at a certain stage and it may be the victim of industrial sickness. In such a situation urgent steps are required for prevention of the sickness and the case may have to be referred to the Board for Financial and Industrial Reconstruction (BFIR), set up under the Sick Industrial Companies(Special Provisions) Act, 1985. The Board goes through the entire case of the company and recommends a suitable rehabilitation package or winding up of the company, As it deems fit.

In case a part of the total operation of the company becomes non-viable, the decision regarding its abandonment may be taken on the same lines as discussed above.

5.8 Resource Levelling

In PERT and CPM technique there is an implied assumption that required resources are always available. When resources are limited, two alternative courses of action are available. In the first alternative, the activities are critically sequenced and the minimum period of the project is redetermined. This process is called Resource Levelling. The problem here is to manipulate the activity slacks, schedules and resources requirements throughout the duration of the project.

In resource leveling two types of problems are involved:

- Levelling resource demands with constraint on the total project duration time.
- Minimization of the project duration time with a constraint on the total availability of certain key resources.

The first problem arises when resources are adequate but they are desired to be used at a relatively constant rate during the life of the project. The second problem occurs when the resources cannot be increased and the object is to minimize project duration with available resources.

Thus, resource leveling or lead leveling is required when the demands on specified resources are required not to exclude the specified level and the duration of the project is not invariant.

Resource Smoothing

When there is a constraint on the total project duration, resource scheduling smoothens the demand on resources so that the demand for any resource is as uniform as possible and the maximum demand on any resource does not exceed the prescribed limit. This process is known as resource smoothing or load smoothing.

For resource smoothing and allocation problems, the load is often described in terms of a ‘Resource Histograms’, which is compared with the available resources prior to smoothing out the load. A histogram converts the network into a basic diagram. When the cumulative resources requirements for each time unit below the time scaled network are plotted we get a histogram. The resource histogram is also known as ‘free curve’. It establishes the framework within which smoothing or leveling must occur.

5.9 Line Balancing

A production line is typically associated with continuous or flow production system. Production lines are particularly appropriate for high volume operations. In a production line work is divided into individual tasks and assigned to consecutive workstations on the line. In mass production on progressive assembly line the workload between various machines or workstations should be balanced. The need for balancing the line becomes obvious when it is considered that the output to be received from the line is determined by the maximum time involved in the performance of work at one particular workstation. The imbalances existing in the line would lead to wastage of time at all other work stations when one work station holds up the total output rate. Therefore, it is necessary to level out or balance the cycle times at each workstation.

Line balancing refers to the apportionment of sequential work activities into workstations in order to achieve maximum possible utilization of facilities and to minimize idle time. In case of wholly automated operations, line balancing is largely achieved through engineering design. In other cases balancing of equipment capacities poses a problem. If the time requirements at one workstation are very large in

comparison with other stations, the tasks at the station may have to be further subdivided or additional personnel may be added to the station. Alternatively, a parallel section may be provided so that two or more units may be worked on simultaneously. The speed of an assembly line is determined by the desired rate of output, spacing of products on the line, time requirements of workstations, and pace considerations appropriate to the workers.

Many simulation and heuristic models are used for balancing assuming that workers have constant operation times. These models do not necessarily result in mathematically provable optimal balances. But reasonably good solutions can be found. Let us describe certain terms used in these techniques.

Task: Task is the natural minimum element of work beyond which assembly work cannot be divided rationally without creating unnecessary work. The tasks are usually denoted as U_i .

Total work content: This is the aggregate amount of work of the total assembly. Thus if t_i denotes the performance time of the i th task, the sum of the performance times is the total work content if N represents the total number of tasks.

Station work content: This is the time required to perform the work content at the given station. This is also called operation time.

Cycle time: This is the maximum operation time and determines the rate of output.

Balance delay time: It is the amount of idle time on the line due to the imbalance, if any. Balance delay is the ratio between the total idle time and the total time spent by the product in moving from the beginning to the end of the line.

The balancing restrictions are constraints imposed on the order or time sequence in which work elements have to be performed and these arise from technological precedence relationships or zoning constraints or due to the nature of the tasks.

Balancing delay of a line (d) can be expressed mathematically as a ratio:

Where d is the balance delay ratio

N is the number of work stations

C is the maximum operation time, and

Is the total work content.

The aim of all line balancing techniques is to minimize the value of 'd'

which requires that nc must be equal to must be an integer and that all constraints are satisfied.

is a constant determined by the technology of the process the problem is reduced to minimizing 'nc' Nc may be minimized by (a) working from a given production rate and equivalently a cycle time 'c' to determine the lowest vale of 'n' of (b) working from a given number of work stations and equivalently by a given value of 'n' to determine the lowest value of 'c' the operation time to maximize production rate consistent with the time and ordering constraints.

Line balancing requires accounting for operator time variability and grouping work activities so that they most efficiently balance the production line. Simulation has proved to be a useful technique for studying the efforts of variable performance times. It reveals worker idle time, waiting time of parts, length of waiting line and average output. Heuristic methods are widely used for grouping assembly line activities into the optimum number of work stations. One heuristic method of balancing involves drawing a precedence diagram complete with activity times and then grouping the activities into work station zones that do not exceed the specified time availability per station. Assuming that activities may be combined within a given zone so long as precedence relationships are maintained, the work zones can be designated on the precedence diagram. Then appropriate components into preceding zones are moved until there is maximum possible use of the times.

In order to balance the production line grouping of work activities may become necessary. Line balancing activities are usually undertaken to meet a specified output. For example, if a conveyor speed is 4 feet per minute and units are placed at 4 feet intervals, the output rate will be one unit per minute. Each workstation will have one

minute of available time. If the output is to be two units per minute either the conveyor speed should be doubled or a 2 feet spacing should be used. In both the cases the time per unit available at each workstation would be reduced to half a minute. In order to produce at a specified rate the assembly sequence must be carefully delineated and the time requirements for each assembly task must be known. An efficient balance among the activities will complete the required work while maintaining the specified sequence and minimizing the idle time.