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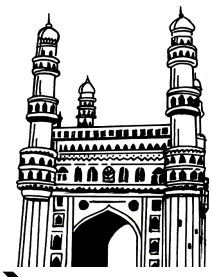

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PROJECT MANAGEMENT

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UNIT I

Introduction: Introduction to Project management –Project Characteristics- Project Life cycle – Project Identification, Formulation and Implementation- Project management in different sectors: Construction, Services Sector, Public sector and Government Projects. Systems approach to project management.

1.1 Introduction to Project management

Q1. Explain the meaning of project.

(OR)

Define project.

Ans : **(Imp.)**

Introduction

The project is an important groundwork of an enterprise and is also very crucial to the entrepreneur. Invariably, an entrepreneur cannot be succeeding in his venture and /or enterprise without a project. By and large, projects connotes program of action. A business functioning successfully one moment can be faced with insurmountable problems the next. Businesses can be viewed as 'temporary projects' with people working on them and earning money in them as long as possible until a more attractive 'project' appears.

In more economically stable countries, the continuity of the business, spanning many generations, can be of primary importance to the entrepreneur and the motivation is not just aimed at earning a living. Therefore it is argued that the concept of entrepreneurship acquires an entirely different meaning. The term "business" must, under these conditions be interpreted as a 'project', and 'entrepreneur' must be seen as someone who, perhaps temporarily or part-time, provides leadership for a project. For example there are agricultural projects with sub projects relating to land development, irrigation, soil-conservation, fertilizer, seeds, etc. There are also research projects and so on. The concept of projects is intrinsically woven with all socio-economic and cultural activities.

The dictionary meaning of project is speculative imagination; a scheme of something to be done; a proposal for an undertaking. In this case, two important aspects have to be borne in mind, viz., a scheme and speculative imagination. In other words, innovation and vision form an integral aspect of a project program. Inter alia, these are also interwoven with the basic characteristics of an entrepreneur.

Meaning of Project

A project is a group of unique, interrelated activities that are planned and executed in a certain sequence to create a unique product and/or service, within a specific time frame, budget and the client's specifications.

The Project Management Institute's (PMI) Publication, in 'A Guide to the Project Management Body of Knowledge' (PMBOK) defined, "Project is a temporary endeavor undertaken to create a unique product or service".

According to Neivma, "A project is typically has a distinct mission that it is designed to achieve and a clear termination point, the achievement of the mission".

According to Gillinger, "A project is the whole complex of activities involved in using resources to gain benefits".

According to F.L.Harrison, "A project can be defined as a non-repetitive, one-off undertaking, normally with discrete time, financial and technical performance goals".

According to the British Standard, "A project is a unique set of coordinated activities, with definite starting and finishing points, undertaken by

an individual or organization to meet specific objectives within defined schedule, cost and Performance perfonnance parameters".

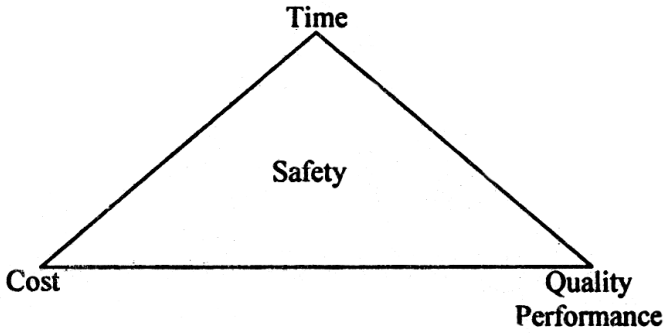


Fig. Project Triangle

As stated in the definition, a project has a definite starting and finishing point and must meet certain specified objectives.

Broadly these objectives, which are usually defined as part of the business case and set out in the project brief, must meet three fundamental criteria:

1) The project must be completed on time;

2) The project must be accomplished within the budgeted cost;

3) The project must fneet the prescribed quality requirements.

These criteria can be graphically represented by the well known project triangle

Q2. Explain the various Parameters of Project.

Ans :

The primary aim of a project is to deliver a product and/or service to a client within the specified time, budget (resources and cost) and according to the quality and performance specifications. Usually, the clients ask for too much to be delivered within limited resources. Therefore, it is important for the project manager to make the clients aware of the limitations pertaining to time, budget, technicalities, etc., that he/she is working under. The success of a project depends on the project manager's ability to strike a balance between these interrelated variables or constraints. Some common constraints the influences a project are:

1. Scope

Scope is a brief and accurate description of the end-products or deliverables to be expected from the project that meet the requirements. Scope describes all the activities that are to be performed, resources that will be consumed and the end-products from the successful completion of the project, including the quality standards. The scope also includes the target outcomes, prospective customers, outputs, work, financial and human resources required to complete the project.

2. Quality

Every project has to satisfy the quality requirements at two levels – products quality and process quality. The first quality requirement relates to products resulting from the project and the second relates to die management processes that have to be in place to implement the project. A comprehensive quality management system ensures effective utilization of scarce resources to achieve the project objective of delivering products and/or services to the client's satisfaction.

3. Time

Time is one of the important resources available to a project manager. At the same time it is one of the major constraints within which a project has to be completed. Generally, the client or the sponsor of the project specifies the time limit for the completion of the project. The time required to complete a project is inversely related to the cost of the project. Therefore, the cost of a project increases as the time available for its completion decreases. Since time cannot be stored as an inventory, it is the duty of project manager to manage time by carefully scheduling the various activities on time.

4. Cost

Cost plays a major role in various stages of project life cycle. Project costs include the monetary resources required to complete the activities mentioned in the scope of the project. Project costs are costs associated with all the activities in the planning and implementation phases. The client or the sponsor of the project prepares a budget based on the estimated costs of various project activities, within which the project manager has to deliver the product.

5. Resources

Resources includes the people, finances and the physical and information resources required to perform the project activities.

Q3. Define Project Management. What are the objectives of project management.

Ans :

Meaning

Project Management is a process that determines how work for an assignment is to be distributed. For some assignments much of the work must be done before a few final projects can be completed; in other situations work might need to be distributed so that the majority of the work is completed at the end of the project.

Project Management Institute (PMI) defines **Project Management** as" the application of knowledge, skills, tools and techniques to abroad range of activities in order to meet the requirements of a particular project".

Project management is the discipline of initiating, planning, executing, controlling, and closing the work of a team to achieve specific goals and meet specific success criteria.

Project Management a project consists of a temporary endeavor undertaken to create a unique product, service or result.

Project Management is a management environment that is created for the purpose of delivering one or more business products according to a specified business case.

Objectives of Project Management

The main objectives and principles behind good project management are as follows:

1. Agree exactly what a project is meant to do and what it is meant to deliver

- Understand the business requirements of a project.
- Understand the benefits of delivering a project in terms of possible future profits, risk reduction or process improvement.
- Establish and agree exactly what a project is going to accomplish.
- Get sign-off from the business and other key stakeholders on what the project is going to do.

2. Agree the scope, timescales, cost and quality of a project

- Establish exactly what is and is not in scope of the project.
- Agree up-front and ongoing resource costs and budgets.
- Understand exactly when the project is going to deliver its key milestones.
- Measure how the project is going to achieve quality by meeting business requirements.
- Achieve sign-off of cost, scope, budget and quality from the business and other key stakeholders.

3. Maintain a schedule and project plan

- Establish and agree a detailed project plan of the tasks, actions and other activities required to deliver the project.
- Get realistic milestones in place to track delivery of the project to desired outcomes.
- Track ongoing progress against the project plan and schedule.

4. Deliver the agreed outcomes of the project to the right scope, timescales, cost and quality

- Allocate and track tasks, actions and activities from inception through to completion.
- Manage any risks or issues with scope, cost, quality or timescales and reduce the impact of any problems.
- Manage relationships to ensure that all individuals, teams and areas know what they need to do, when they need to do it and expected outcomes.

5. Provide communications, reports and progress updates throughout the lifecycle of the project

- Create and distribute reports on project performance to all relevant parties.
- Establish audiences, communications channels and messages to keep relevant areas informed of what the project is doing.
- Track and manage progress of the project against the scope, cost, quality and timescales previously agreed and alert relevant areas if these are likely to be breached.

6. Manage risks, issues and dependencies

- Create and maintain a risks, issues and dependencies log that tracks the likelihood, impact and mitigating actions of risks, issues or dependencies.
- Put plans and mitigating actions in place to reduce or prevent any adverse impact on the project.
- Report on any risks, issues or dependencies that threaten the successful completion of the project.

7. Make sure that the business gets the outcome that it wants from the project

- Track project delivery and benefits against the original business case.
- Get sign-off from business and other stakeholders at the key stages of the project.
- Ensure that the project delivers to business needs.

8. Manage policies, processes, tools, frameworks, techniques, people and relationships to a successful project outcome

- Establish and manage effective project policies and processes.
- Use the right frameworks, tools and techniques to deliver on time, on budget and on scope.
- Manage relationships, individuals and teams to get support for project delivery.

9. Minimize any impact on normal business operations

- Deliver the project without impacting on 'business-as-usual' operations.
- Provide training and support as necessary for the project to deliver successfully.

Q4. Explain the Importance of Project Management.

Ans :

These are the reasons and many other factors are why companies employ people with project management skills.

1. Defines a plan and organizes chaos

Projects are naturally chaotic. The primary business function of project management is organizing and planning projects to tame this chaos. A clear path mapped out from start to finish ensures the outcome meets the goals of your project.

2. Establishes a schedule and plan

Without a schedule, a project has a higher probability of delays and cost overruns. A sound schedule is key to a successful project.

3. Enforces and encourages teamwork

A project brings people together to share ideas and provide inspiration. Collaboration is the cornerstone to effective project planning and management.

4. Maximizes resources

Resources, whether financial or human, are expensive. By enforcing project management disciplines such as project tracking and risk management, all resources are used efficiently and economically.

5. Manages Integration

Projects don't happen in a vacuum. They need to be integrated with business processes, systems and organizations.

You can't build a sales system that doesn't integrate with your sales process and sales organization. It wouldn't add much value. Integration is often key to project value.

Project management identifies and manages integration.

6. Controls cost

Some projects can cost a significant amount of money so on budget performance is essential. Using project management strategies greatly reduces the risk of budget overruns.

7. Manages change

Projects always happen in an environment in which nothing is constant except change. Managing change is a complex and daunting task. It is not optional. Project management manages change.

8. Managing quality

Quality is the value of what you produce. Project management identifies, manages and controls quality. This results in a high quality product or service and a happy client.

9. Retain and use knowledge

Projects generate knowledge or at least they should. Knowledge represents a significant asset for most businesses. Left unmanaged knowledge tends to quickly fade. Project management ensures that knowledge is captured and managed.

10. Learning from failure

Projects do fail. When they do, it is important to learn from the process. Project management ensures that lessons are learned from project success and failure.

Q5. Explain the various phases of project management.

Ans :

The project management process constitutes the following phases.

i) Concept phase

The point at which the customer, i.e., the individual or the organization is willing to provide funds, identifies a need that is to be met. It may be a new product or service, a move from one location to another, a new information system, an advertising campaign, and so on.

ii) Definition phase

Before starting the complex task of planning and executing a project, it is necessary to be clear about what is to be done to fulfil the need, i.e., what exactly is required to be done. Basically, three different elements are needed to define a project: objective, scope, and strategy.

iii) Planning phase

After the project is properly defined, the planning phase starts. The planning process involves these crucial steps identification of project activities, estimation of time and resources, identification of relationships and dependencies, and identification of constraints.

iv) Scheduling phase

Project scheduling involves preparation of a project-based plan. The plan must specify the sequence of activities, feasible start and completion dates, amount of various resource types required during each time period, and budget for every activity.

v) Control phase

Once a baseline plan is established, it is required to be implemented. As the project starts, the progress must be monitored. This involves measuring actual progress and comparing it with planned progress.

vi) Termination phase

This is the last stage of the project and it is as important as the initial phase. The ultimate aim of project management and project scheduling in particular is to have a satisfied customer.

1.2 PROJECT CHARACTERISTICS

Q6. Explain the Characteristics of Project.

(or)

What are the Characteristics of Project.

Ans :

Some characteristics of projects are as follows:

1) Focus

A project has a fixed set of objectives/mission/ goals. Once these objectives, goals, or mission targets have been achieved, the project will become extinct from the organizational pyramid.

2) Life-Span

A project cannot continue indefinitely. It is executed, terminated or dead. Every project is invariably time bound. The time limits are well defined through schedules.

3) Team Spirit

Every project encourages team spirit among the group of people who participate in it and are instrumental in achieving its goal. This team consists of different individuals from varied disciplines who give their knowledge, experience, and credence towards a total performance.

4) Lifecycle

Like any other product, a project is also reflected and influenced by the lifecycle phases and to which the success or failure of the project can be ascribed. Unswervingly, from conception to commission, a project has to run through six phases that are intertwined with various stages.

5) Unique Activities

Every project has a set of activities that are unique, which means it is the first time that an organization handles that type of activity. These activities do not repeat in the project under similar circumstances, i.e., there will be something different in every activity or even if the activity is repeated, the variables influencing it change every time. For example, consider a ship building yard that builds ships for international clients. Even though the organization builds many ships, each time there will be a difference in some variable such as the vessel's design, time allowed for construction, etc.

6) Attainment of Specific Goal

Organizations take up projects to perform a particular task or attain a specific goal. These tasks differ from project to project. The projects in an organization could be constructing a new facility, computerizing the accounts department or studying the demand for a new product that the organization plans to launch in the market. All these projects have a specific goal or result to attain and hence it can be said that every project is goal-oriented.

7) Sequence of Activities

A project consists of various activities that are to be performed in a particular sequence to deliver the end-product. This sequence depends on the technical requirements and interdependency of each of the activities.

8) Specified Time

Every project has a specified start date and completion date. This time limit is either self-imposed or it is specified by the client. The life span of a project can run from a few hours to a few yearn. A project comes to a close when it delivers the product and/or service as per the client's requirements or when it is confirmed that it is no longer possible for the project to deliver the final product and/or service as required by the client.

9) Interrelated Activities

Projects consist of various technically interrelated activities. These activities are considered interrelated as the deliverable (output) of one activity becomes the input for another activity of the project. For example, the project of building a multi-storied luxury hotel. This project consists of various activities such as making a building plan, landscaping, constructing the building, designing the interiors, furnishing the rooms, etc. All these activities are interrelated and are equally important for the completion of the project .

10) Transience Creates Urgency

To be worthwhile and to repay the investment the development objectives must be achieved by a certain time. Sometimes those time constraints are very tight; there is a very narrow market window for the output from the project. If the market window is missed, the project has no value. However, more often, the market window is broader and though the project will be worth less if it is late, the loss in value from later delivery has to be balanced against a potential greater value if more time is spent developing the project's output. Unfortunately, the timescale often receives undue emphasis. There are time pressures in routine operations. However, because they are routine, it is known how much can be done in a given time, and so there is less likelihood of committing to impossibly tight timescales.

11) Uniqueness Create Risk and Uncertainty

The project must have a plan, As the work is unique, it will only be done once; the planning effort will only be recovered once. It is essential to coordinate the input of resources and ensure that the product is delivered at such a time and cost as to make a profit. However, the plan needs to be more strategic, focusing on the coordination and integration. The detail levels of the plan need to be almost flexibly defined as the project progresses. And necessarily, the uncertainty and the risk must be overtly managed as part of the complete project management process.

The features of transience, uniqueness, and the stresses they create, urgency, integration and uncertainty, define projects and project management Project and project management are not defined by the so called 'triple constraint' of time, cost and functionality, all managers have to manage those, from both projects and operations.

12) Subcontracting:

This is not a frill in the life of a project. Subcontracting is a subset of every project and without which no project can be completed unless it is of proprietary form or tiny in nature. Subcontracting is an inescapable fact of projects and is one of the healthy antidotes for fruitful completion of the project, if dosage appropriately, well in time. For example, DDA, HUDA, etc., undertake to construct housing colonies for the general public.

1.3 PROJECT LIFE CYCLE

Q7. Explain the stages of project life cycle.

(OR)

Elucidate the various stages of Project Life Cycle.

Ans :

The project life cycle is a collection of generally sequential project phases. The number of project phases is determined by the control needs of the

project organization. The project life cycle represents the linear progression of a project, from defining the project, through developing a plan, implementing the plan and closing the project.

A project life cycle usually specifies:

1) The technical work that must be carried out in various phases of the project.

2) The list of individuals and their roles in each phase of the project.

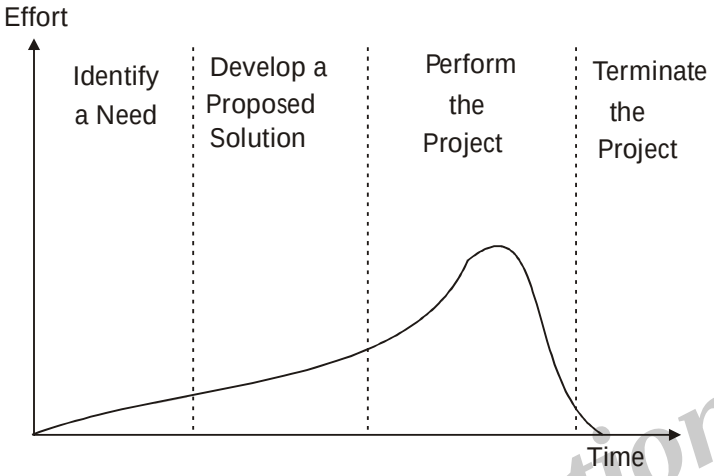


Fig. Project Life Cycle

Projects are "born" when a need is identified by the customer - the people or the organization willing to provide funds to have the need satisfied.

The customer must first identify the need or problem. Sometimes the problem is identified quickly, as in the case of a disaster such as an earthquake or explosion. In other situations, it may take months for a customer to clearly identify a need, gather data on the problem and define certain requirements that must be met by the person, project team or contractor who will solve the problem.

Phases of Project Life Cycle

There are four phases of project life cycle:

1) First Phase

In this phase project life cycle involves the identification of a need, problem or opportunity and can result in the customer's requesting proposals from individuals, a project team or organizations (contractors) to address the identified need or solve the problem. The need and requirements are usually written up by the customer in a document called a Request for Proposal (RFP). Through the RFP, the customer asks individuals or contractors to submit proposals on how they might solve the problem, along with the associated cost and schedule.

Not all situations involve a formal RFP, however. Needs often are defined informally during a meeting or discussion among a group of individuals. Some of the individuals may then volunteer or be asked to prepare a proposal to determine whether a project should be undertaken to address the need. It is important to define the right need.

2) Second Phase

The second phase of the project life cycle is the development of a proposed solution to the need or problem. This phase results in the submission of a proposal to the customer by one or more individuals or organizations (contractors) who would like to have the customer pay them to implement the

proposed solution. In this phase, the contractor effort is dominant. Contractors interested in responding to the RFP may spend several weeks developing approaches to solving the problem, estimating the types and amounts of resources that would be needed as well as the time it would take to design and implement the proposed solution. In many situations, a request for proposal may not involve soliciting competitive proposals from external contractors. A company's own internal project team may develop a proposal in response to a management-defined need or request. In this case, the project would be performed by the company's own employees rather than by an external contractor.

3) Third Phase

The third phase of the project life cycle is the implementation of the proposed solution. This phase begins after the customer decides which of the proposed solutions will best fulfill the need and an agreement is reached between the customer and the individual or contractor who submitted the proposal. This phase, referred to as performing the project, involves doing the detailed planning for the project and then implementing that plan to accomplish the project objective.

4) Fourth and Final Phase

The final phase of the project life cycle is terminating the project. When a project is completed, certain close-out activities need to be performed, such as confirming that all deliverables have been provided to and accepted by the customer, that all payments have been collected and that all invoices have been paid. An important task during this phase is evaluating performance of the project in order to learn what could be improved, if a similar project were to be carried out in the future. This phase should include obtaining feedback from the customer to determine the level of the customer's satisfaction and whether the project met the customer's expectations. Also, feedback should be obtained from the project team in the form of recommendations for improving performance of projects in the future.

1.4 PROJECT IDENTIFICATION

Q8. What is Project Identification? Explain the various stages of Project Identification.

Ans : **(Oct.-22, Imp.)**

Project identification results from issues emerging from the external environment. You might pick up on these issues in the environment by reading reports on trends in the geographical area where you work and speaking to stakeholders (including users) about the local issues arising.

Examples of new issues that might be relevant to organization:

- A new user group
- Changes in government policy that affect your user group
- A new event – e.g. Olympics
- A new advocacy theme – i.e. lobbying the council for increased fitness services for Muslim women
- A new problem/issue that affects user group

Key Steps in Identification

There are three steps in the identification process:

1. Scanning the external environment for issues
2. Undertaking preliminary research on an issue
3. Making a decision

1. Scanning the external environment for issues

Scanning is a key part to planning projects since it can help to identify areas where your organization is best placed to work. Scanning is like skim reading. You are on the lookout for new issues, but at this stage do not yet need to research deeply about the issues. Scanning can be done by internal or external stakeholders. Scanning can occur through such examples as:

- Stakeholder discussion groups with partner organizations, users, funders
- Project design, evaluation and learning exercises

- Inter-organization forums e.g. Westminster Community Network
- Conducting contextual analyses including political, economic, social and historical factors E.g.: PESTLE1
- Analysis of major government policies that make an impact on an issue
- Lobbying by external stakeholders
- Lobbying by internal stakeholders such as staff, volunteers or supporters interested in health or fitness schemes for Muslim Women
- Sudden or unexpected changes in the external environment affecting your organization – for example changes in the funding environment as a result of the recession.

2. Undertaking preliminary research on an issue

The purpose of research at the identification stage is to help organization decide whether or not to begin to work on an issue (i.e. whether to move from the identification stage to the design stage of the project cycle). Preliminary research should not aim to be comprehensive in breadth or depth because further research will be undertaken during the design stage.

- Exploring a new geographical area of work or a new user group
- A review of current literature/information of the specific group/issue/region – this might be, for example, a report from Westminster City Council on fitness/health in Westminster
- Consultation with relevant external stakeholders - individuals and organizations - who have experience working on the issue or in a particular area.

This information should be summarized so that an informed decision can be made by your organization to move to the next stage.

3. Making a decision

Relevant staff or volunteers in your organization (perhaps they are the trustees?) will use this summarized information to decide whether the project should go to the next stage.

1.5 PROJECT FORMULATION

Q9. What is Project Formulation?

Ans :

Project formulation is the systematic development of a project idea for arriving at an investment decision. It has the built-in mechanism of ringing the danger bell at the earliest possible stage of resource utilization. Project formulation is a process involving the joint efforts of a team of experts. Each member of the team should be familiar with the broad strategy, objectives & other ingredients of the project.

It aims at a systematic analysis of project potential with the ultimate objective of arriving at an investment decision. In this process it makes an objective assessment from all possible angles starting from project identification upto its appraisal stage. Thus, project formulation is the process of examining technical, economic, financial & commercial aspects of a project. It refers to a preliminary project analysis covering all aspects such as technical, financial, commercial, economic & managerial to find out whether it is worthwhile to take project for detailed investigation & evaluation.

Q10. Explain the various steps involved in project formulation.

Ans :

Stages of Project Formulation

1. Feasibility analysis
2. Techno-Economic Analysis
3. Project Design and network analysis
4. Input analysis
5. Financial analysis
6. Cost-benefit analysis
7. Pre-investment analysis

1. Feasibility Analysis

- First stage in project formulation
- Examination to see whether to go in for a detailed investment proposal or not
- Screening for internal and external constraints

Conclusion could be

- The project idea seems to be feasible
- The project idea is not a feasible one
- Unable to arrive at a conclusion for want of adequate data

2. Techno-Economic Analysis

- Screens the idea to
- Estimate of potential of the demand of goods/ services choice of optimal technology
- This analysis gives the project a platform for preparation of detailed project design

3. Project Design and Network Analysis

- It is the heart of the project entity
- It defines the sequences of events of the project
- Time is allocated for each activity
- It is presented in a form of a network drawing
- It helps to identify project inputs, finance needed and cost benefit profile of the project

4. Input Analysis

- It's assesses the input requirement during the construction and operation of the project
- It defines the inputs required for each activity
- Inputs include materials, human resources
- It evaluates the feasibility of the project from the point of view the availability of necessary resources
- This aids in assessing the project cost

5. Financial Analysis

- It involves estimating the project costs, operating cost and fund requirements
- It helps in comparing various project proposals on a common scale
- Analytical tools used are discounted cash flow, cost-volume-profit relationship and ratio analysis
- Investment decision involve commitment of resources in future, with a long horizon
- It needs caution and foresight in developing financial forecasts Cost

6. Benefit analysis

- The overall worth of a project is considered
- The project design forms the basis of evaluation
- It considers costs that all entities have to bear and the benefit connected to it

7. Pre-investment Analysis

- The results obtained in previous stages are consolidated to arrive at clear conclusions.
- Helps the project-sponsoring body, the project implementing body and the external consulting agencies to accept or reject the proposal.

1.6 PROJECT IMPLEMENTATION

Q11. What is Project Implementation? Explain the methodology of Implementation process.

Ans :

The project takes shape during the implementation phase. This phase involves the construction of the actual project result. Programmers are occupied with encoding, designers are involved in developing graphic material, contractors are building, the actual reorganization takes place. It is during this phase that the project becomes visible to outsiders, to whom it may appear that the project has just begun. The implementation phase is the doing phase, and it is important to maintain the momentum.

In one project, it had escaped the project teams' attention that one of the most important team members was expecting to become a father at any moment and would thereafter be completely unavailable for about a month. When the time came, an external specialist was brought in to take

over his work, in order to keep the team from grinding to a halt. Although the team was able to proceed, the external expertise put a considerable dent in the budget.

At the end of the implementation phase, the result is evaluated according to the list of requirements that was created in the definition phase. It is also evaluated according to the designs. For example, tests may be conducted to determine whether the web application does indeed support Explorer 5 and Firefox 1.0 and higher. It may be determined whether the trim on the building has been made according to the agreement, or whether the materials that were used were indeed those that had been specified in the definition phase. This phase is complete when all of the requirements have been met and when the result corresponds to the design.

Those who are involved in a project should keep in mind that it is hardly ever possible to achieve a project result that precisely meets all of the requirements that were originally specified in the definition phase. Unexpected events or advancing insight sometimes require a project team to deviate from the original list of requirements or other design documents during the implementation of the project. This is a potential source of conflict, particularly if an external customer has ordered the project result. In such cases, the customer can appeal to the agreements that were made during the definition phase.

As a rule, the requirements cannot be changed after the end of the definition phase. This also applies to designs: the design may not be changed after the design phase has been completed. Should this nonetheless be necessary (which does sometimes occur), the project leader should ensure that the changes are discussed with those involved (particularly the decision-makers or customers) as soon as possible. It is also important that the changes that have been chosen are well documented, in order to prevent later misunderstandings.

The project execution phase comprises the implementation of the items detailed under planning above. This is when design, engineering, testing and commissioning activities are executed.

The following items are addressed in the execution phase:

- Project plan execution
- Project schedule execution
- Activity execution
- Quality assurance
- Project communications

Project Management Methodology implementation Process

After completing a brief requirements analysis and a successful negotiation with the client, we decided to create a team of two experienced consultants to start. Our client chose to divide the project into three stages:

Stage 1: Maturity assessment

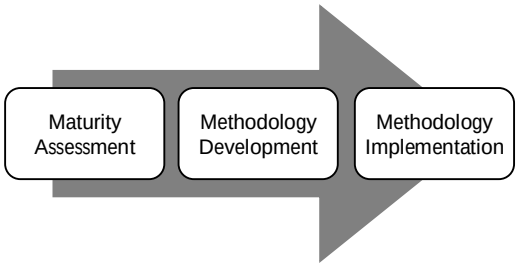
A formal audit of the organization focused on exploring the strengths and weaknesses of their current project management practices. Our assumption was that, since the organization has been one of the leaders at the Polish market, and they were growing fast, their project management approach couldn't be that bad, that there must be a lot of things they were doing effectively.

Stage 2 : Methodology development

Based on this positive evaluation of the current project management practice and with PMBOK as the global project management standard, we wanted to build a project management methodology that was tailored to the organization and that the client could implement step by step. An initial decision was that we didn't want to give them a ready-to-implement solution but wanted instead to secure a buy-in from the management representatives and get them involved in the building process.

Stage 3 : Methodology implementation

Based on our previous experience with the project management methodology implementation projects, we convinced the client that this phase of implementation is a crucial element of the whole process, and we would like to be involved in it.



Project Management Methodology Implementation Process

Of the three stages of the process, we guaranteed two in the contract; the third stage was an option for the client. At the beginning of the project they were not sure whether they would like to implement the methodology with us or whether they would rather try doing that on their own.

It was a project and to show them how a mature project could be effectively led, we wanted to run this one properly for the client. We knew, that if somewhere along the way we lost the support of the executives, the project would be in trouble. It was also clear to us from the initiation phase of this project that if they decided to implement the methodology without our support, they might lose patience and not reach their goals. So from our site we started with a formal project charter and stakeholder analysis. Risk analysis was another, very important part of the preparation.

1. Maturity Assessment

The first step was to assess where the organization really was when it came to everyday project management practices. We had already conducted a series of interviews with representatives of their project management environment, including the owner of the organization (to have his buy-in guaranteed from the very beginning), members of the board, top-level management, and people who currently played the role of a project manager in the company.

There is no such thing as a standard approach to project management. When we began asking about the organization's project management practices, some people questioned the very presence of projects in the company. People responsible for marketing and administration responded, "What projects? We don't have any projects here. All we have is work that needs to be done." Other people were coming back to us with all different comments regarding our potential participation. Some were very happy, waiting for an improvement of the project environment and looking forward to working in the predictable environment. Some took this common opportunity as a threat. They wanted to keep the status-quo and stay in the old, muddy waters with projects beyond the control of their managers. So it was also a kind of political challenge for us to get the most important stakeholders involved and keep their minds open to what was coming.

Our findings show that there is now a common project management approach in the organization. When we began, there was a substantial load of work we recognized as projects, but these were not formal projects, and therefore no one was controlling them; scope was crawling, deadlines were not fixed. There was no common project management toolkit available either. Some people were using tools like MS Project and Open Project by default, but they were not pushing these as standards for the organization, and they had no project management process in which to apply those tools.

We presented these finding in an formal report and a summary presentation for the board of directors. In our documents we highlighted the strengths of the company's project management practice and clearly defined where there was room for improvement. As a result of this phase, we were able to agree on a roadmap for further project management function improvement.

2. Methodology Development

After gathering requirements during the workshop, we came back to our office and started analysis of what we have found. It took two consultants to 10 working days to prepare a preliminary version of the project management methodology, both a process, and supporting documentation templates. We knew we could use only MS Office documentation, and there was no budget for any project management information system (PMIS) to be implemented right away. So the

tactic we used was to take it slow and try to organize project lifecycles based on simple MS Office tools instead of moving from a no-tools environment directly to PMIS.

Methodology included creating two project management processes

1. One for strategic projects—those that have higher risk, higher budgets, more complex, long-term, cross-functional, involving a number of outside providers;.
2. One for improvement projects—those that are short-term, low-priority, low-risk, low-budget, mostly done by internal resources.

3. Methodology Implementation

After an official presentation of the methodology and subtle refinements, the results were officially approved, and the methodology was ready for implementation. But then, as it happens with almost every project, change had occurred. The client decided to implement the methodology without our support. Their strategy and development office consisted of three people. There was a high level of confidence, that from now on they could be self-sufficient in implementing the methodology.

a) First Approach - We Will Do It on Our Own

One of the major threats to the project materialized. The main stakeholder of the project, the same person who contacted us for the first time three months earlier, decided not to extend their contract with us. It wasn't due to the outcomes of our joint effort. As we found out later, this move had been planned months before and was connected to some of the stakeholder's personal affairs.

So the situation was difficult-our main supporter in the organization was moving out, and there was no one to cover his slot. We knew that the client was in the process of recruiting a new person who would replace him, but we realized that would impact our project negatively in many ways. That new person was coming from a completely different environment, was not involved in the design of the project management methodology process, and was not a natural supporter of this change. Moreover, he was coming to a completely new environment with an ambition to prove that he was experienced and he didn't need any support in making his projects work. And last, but not least, he did not understand the methodology developed by the company, and he would never openly say that. As we found out later, he had no experience with structured, mature project management at all.

b) Second Approach - Come and See What We Did

After six months we were contacted by the company and asked for a quick audit of the implementation process. They were not happy with the results of the implementation. Basically, things were not moving forward, and the results were not what they expected. It took us a week to go through the organization, look at the projects documents, interview people (including the new director of the strategy and development office), and work out the diagnosis. It looked like most of our efforts had been wasted. Methodology was not implemented, people were tired of trying without any internal support, and the board of directors was pushing for results. We presented our diagnosis to the board of directors, and they asked us if we would be available in a short time to give them a hand in the proper implementation process.

c) Third Approach - Come and Do It with Us

The presentation of the audit results left no doubt with the board of directors. They were nowhere near where they initially wanted to be in six months. We had to gather again and prepare another implementation plan. The final document was based on an assumption

that one of our consultants would be assigned as the board of director's adviser on project management and report directly to the board. This would secure the required formal authority in the implementation process. Additionally, he was assigned a strategic program consisting of 11 projects leading to important, and expected, changes in the organization. Both sides decided to start work immediately.

1.7 PROJECT MANAGEMENT IN DIFFERENT SECTORS

1.7.1 Construction Sector

Q12. Explain the role of project in construction sector.

Ans : **(Oct.-22, May-19, Imp.)**

Project management is used in every organization across every industry. The construction industry is no different. Construction management combines the responsibilities of an everyday project manager with the experience of someone part of the construction industry.

Construction project management, often referred to as CM, is a professional service. It uses specific project management techniques that oversee the planning, design, and of course, the construction of a project from start to finish. The most important aspects to control in construction our time, cost and quality.

Construction project managers are the people that oversee building project management and will be discussed later in the article. Construction projects are usually high budget undertakings and are often involved in real estate, transportation infrastructure, industrial facilities and even military infrastructure. These types of construction projects are known as capital projects.

Construction Project Phases

The stages of construction project work include the following:

1. Design

The design stage mirrors closely the planning stage of a traditional project. A construction design can be seen as a construction project plan.In construction management, programming and feasibility, schematic design, design development and contract documents are involved in the design stage of the construction project. A design team is allocated to this stage and it is their responsibility that the design is aligned with all building codes and regulations. Normally, a bidding process takes place during the design stage.

2. Pre-construction

If the client gives notice to the contractor that they have been chosen to the bidding process the construction project work can begin. A project team will be allocated and will include a project manager, construction project coordinator, contract administrator and construction project engineer.

During this stage of the project a site investigation must be carried out. This will allow the project team to discover if any specific steps need to be included on the job site. It is important to prepare the site before actual construction is begun. Unforeseen conditions are dealt with at this stage along with a soil test which is used to determine if the soil is in good enough condition in order to be built upon.

3. Procurement

The procurement stage of a construction project is when the labour, equipment and materials needed to complete the project successfully are purchased. The construction company can do this themselves or this work can be subcontracted.

4. Construction

During the construction stage, a pre-construction meeting is held. This meeting decides on aspects of the project such as work hours, quality control, site access and material storage. After everything involved in the project is moved on to the construction site and set up construction can begin. A schedule known as a contract your progress payment schedule specifies at which project milestones contractors and suppliers will be paid.

5. Owner-occupancy

After construction is completed, the owner can move into the building. This is when the warranty period begins. During this period, it is insured that all the equipment, materials and quality meet the expectations agreed upon during the design and pre-construction phases of the project and that are outlined in the contract between the project team and client.

1.7.2 Services Sector

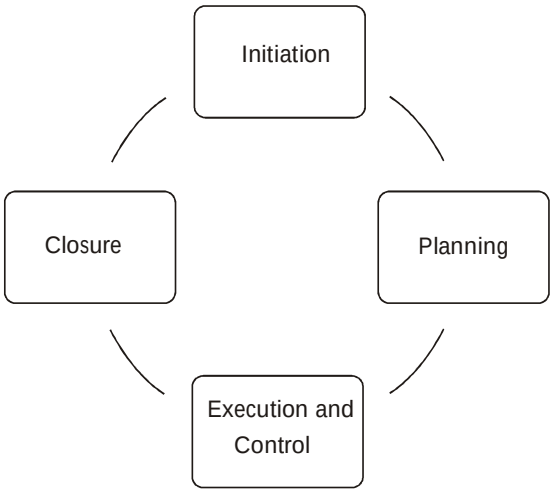
Q13. Explain the role of project in service sector.

Ans : **(Oct.-22, May-19, Imp.)**

Project management services specialize in planning, coordinating, and executing projects according to specific requirements and constraints. They perform some or all of the activities related to project work, from conceptualization to completion. Emphasis is placed on creating and maintaining project milestones and the project schedule. The end goal is to complete the project on time and within budget.

Project management services help organizations achieve project goals and objectives within scope, time, and budgetary constraints. They can also help optimize the allocation of resources and integrate the inputs that will drive the completion of the project's objectives. The development of a project plan is critical, as this document defines and confirms broader goals and specific objectives. The project plan also identifies tasks, describes how goals will be achieved, and quantifies the resources that are needed.

Project managers can help define the overall project budget and specific timelines for task completion. While managing the plan, project management services must operate within a recognized framework that ensures accurate and objective reporting. If a milestone is missed, then project planners and managers must take corrective action.



Some criteria to consider when selecting project management services include:

The type of project and deadline are vital to kicking off the project management process.

The organization's industry or the product can help determine the best project management methodology.

The ability of the project manager is an important consideration since he or she drives project management process.

1.7.3 Public Sector

Q14. Explain the role of project in public sector.

Ans : **(Aug.-21, Imp.)**

In the public sector there is a vast number and diverse range of potential uses of resources and the efficient use of resources has a significant impact on the welfare of citizens. There are always alternatives that need comparison even if the choice is between 'doing something' and 'doing nothing or the minimum'. In considering a spending proposal, decision makers need to be assured that the overall welfare of society is raised as a result of the proposed action.

1. Define the goals, purpose, application and everything else of significance for the project. Cost-effectiveness analysis will find the best possible way for their achievement.

2. List the conditions necessary for the achievement of goals. This means to first present the basic prerequisite for the achievement of the goal, followed by the others.
3. Develop alternatives for achieving the goals. At least two possible ways to achieve a goal must exist.
4. Determine verification measures that are acceptable for the proposed alternatives. A possible list of valuation criteria would be: feasibility, availability, reliability, sustainability, etc.
5. Choose an approach for determining fixed successes and fixed costs. In using fixed success criteria, the most favourable alternative is the one with the minimum price of achieving separate goals or degrees of success. The options that cannot achieve goals at that price are either excluded or penalized. In 4 using fixed cost criteria, the amount of achieved results at a given price is taken, where the "price" is usually the present value of annual costs during the project life cycle, encompassing research and development, engineering, construction, project implementation, maintenance, protection and other costs incurred by the project during its life cycle.
6. Determine the advantages of an alternative expressed in established valuation measures.
7. Express alternatives and their advantages in an acceptable way.
8. Analyze different alternatives on the basis of success criteria and cost consideration.
9. Analyze the sensitivity of alternatives, in order to see how small changes in assumptions or conditions cause changes in alternatives.
10. Submit in writing all considerations, analyses and conclusions from the previous nine steps.

1.7.4 Government Projects

Q15. Explain the role of project in Government sector.

Ans : **(Aug.-21, Imp.)**

Project management is at the heart of nearly every government business performance improvement initiative. The reason is clear. Scrutiny for government project management extends far beyond a government organization's internal customers to its citizens, its political appointees, and even to the United States Congress.

In addition there are several trends in the business of government that are contributing to the public sector movement toward a project orientation.

- A significant portion of the government's work is being outsourced to commercial entities. Therefore, government workers must transition from functional management responsibilities to project management. Project management is important to ensure that work under a contract is on time, within budget, and to the government's specifications.
- Government organizations are using project management to enhance efficiency and demonstrate their own viability. Good government project management means that work cannot necessarily be done better by a commercial entity.
- Competition exists for work between government organizations.

  For example, a government organization is no longer obligated to use its own Facilities Management group; they could go, and have gone, to another Facilities Management organization with their requirements. Project management provides a framework for better and consistent customer service.
- Government organizations are being called upon to provide 24-hour, secure, access for citizens. This has resulted in a dramatic increase in highly visible, complex information technology projects.

- Effective project management is the key to maximizing any organization's business opportunities and in meeting its challenges. It will enable the government workforce to meet time, cost, and performance constraints, while focusing on its customers' satisfaction.

1.8 Systems Approach to Project Management

Q16. Define system approach. Explain the features of Systems Approach to Project Management.

Ans : **(Aug.-21, Imp.)**

The system approach principle, is one of several principles used in project management practice. Its recommendations and guidelines underly the structure of research methodologies, specific methods and techniques, which are used in the design process.

Features of system approach to project management

1. It is the realization of the holistic approach to project preparation and implementation, because project is treated as a product of multidimensional determinants (technolo- gical, financial, ergonomic),
2. Project is characterized in following dimensions: structural determinants, economic factors, marketing and ecological issues, temporal factors, stakeholders needs and values, etc.,
3. System approach principle aims to achieve and maintain the integrity of all components of the project needed to achieve its objectives.
4. Proper use of system approach allows managers to gain the maximum synergistic effect of project implementation.

In systems approach, important is not only the profitability of individual products, but also the interrelation of departments, branches, organizational units, teams forming together coherent entity.

Q17. Explain briefly about system approach to project management.

Ans :

A project can be viewed as a total system which transforms input into output, and has a feedback mechanism to assure that the output meets the goals and objectives set for the project . This approach allows the evaluation and study of various elements of the project while maintaining a view of the unified whole.

The elements of the project, as a total system, need to be evaluated at various phases during the project life cycle. These four elements are input, process, output, and feedback. They will be discussed from the following figure:

1. Input

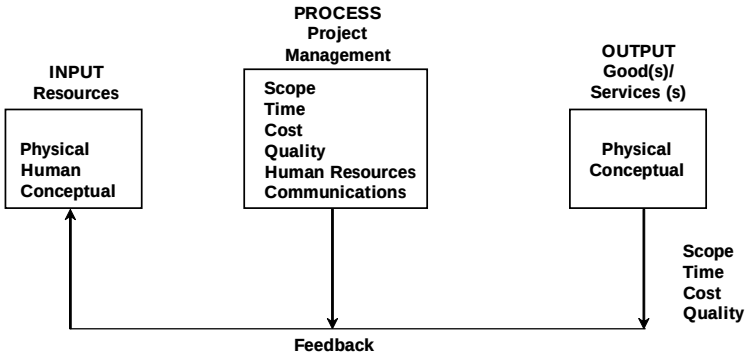
The input of physical, human, and conceptual resources must be selected in such a way that it can be managed effectively and efficiently.

Physical resources include the required material, equipment, land, and capital. Each of these items must be carefully evaluated to assure its suitability to project needs.

Human resources include various levels of management and labor. The selection of these resources is critical to the success of the project. Their skills should be evaluated in light of the accomplishments envisioned for the project. The project manager does not always have complete freedom in choosing

the project team. This can compound the challenges faced by that individual in combining the resources to achieve project goals.

Conceptual resources include management methods, external and internal information, and objectives set for the project. The methods must be compatible with project needs. The information concerning the project itself and the environment surrounding it must be clear and timely. The objectives of the project must be realistic in view of the constraints provided by the input of all other resources.



Systems Approach to Project Management

2. Process

The project management process consists of the management of scope, time, cost, quality, human resources and communications. This process must be monitored continuously to insure that it is executed properly. Each of the six elements of this process can be thought of as a subsystem with its own input, process, output, and feedback mechanism. These elements will be discussed in the following paragraphs:

The scope management process involves the planning and control of project scope consistent with the objectives of the project. This process can be considered to be a subsystem consisting of the following elements (Figure 3):

- **Input:** Covering the goal setting and scope definition as supported by scope description, documents, and a reasonable work breakdown structure.
- **Process:** Encompassing the ongoing effort in change control and all necessary supporting documentation.
- **Output:** Including the final closeout and acceptance of the project.
- **Feedback:** Including periodic evaluation and reporting of scope modifications and closeout status.

3. Output

The output of the project is a specific product(s) or service(s) that needs to be evaluated in terms of satisfying scope, completion time, cost, and quality objectives.

The product might be a constructed residential or commercial facility, a manufacturing or process plant, a rehabilitated railroad line, or a new drug.

The service might be a new computer application that performs to the satisfaction of the user, a defense presented by an attorney on a client's behalf, or a fund raising campaign for a certain university.

Trade-offs and synergies among project objectives of scope, time, cost and quality are always present. The overall success of the project must be evaluated in terms of the attainment of the most satisfactory feasible mix of these objectives.

Short Question & Answers

1. Explain the meaning of project.

Ans :

Meaning of Project

A project is a group of unique, interrelated activities that are planned and executed in a certain sequence to create a unique product and/or service, within a specific time frame, budget and the client's specifications.

The Project Management Institute's (PMI) Publication, in 'A Guide to the Project Management Body of Knowledge' (PMBOK) defined, "Project is a temporary endeavor undertaken to create a unique product or service".

According to Neivma, "A project is typically has a distinct mission that it is designed to achieve and a clear termination point, the achievement of the mission".

According to Gillinger, "A project is the whole complex of activities involved in using resources to gain benefits".

According to F.L.Harrison, "A project can be defined as a non-repetitive, one-off undertaking, normally with discrete time, financial and technical performance goals".

According to the British Standard, "A project is a unique set of coordinated activities, with definite starting and finishing points, undertaken by an individual or organization to meet specific objectives within defined schedule, cost and Performance perfonnance parameters".

2. Define Project Management.

Ans :

Project Management is a process that determines how work for an assignment is to be distributed. For some assignments much of the work must be done before a few final projects can be completed; in other situations work might need to be distributed so that the majority of the work is completed at the end of the project.

Project Management Institute (PMI) defines **Project Management** as" the application of knowledge, skills, tools and techniques to abroad range of activities in order to meet the requirements of a particular project".

Project management is the discipline of initiating, planning, executing, controlling, and closing the work of a team to achieve specific goals and meet specific success criteria.

Project Management a project consists of a temporary endeavor undertaken to create a unique product, service or result.

Project Management is a management environment that is created for the purpose of delivering one or more business products according to a specified business case.

3. Objectives of Project Management.

Ans :

i) Agree exactly what a project is meant to do and what it is meant to deliver

- Understand the business requirements of a project.
- Understand the benefits of delivering a project in terms of possible future profits, risk reduction or process improvement.
- Establish and agree exactly what a project is going to accomplish.
- Get sign-off from the business and other key stakeholders on what the project is going to do.

ii) Agree the scope, timescales, cost and quality of a project

- Establish exactly what is and is not in scope of the project.
- Agree up-front and ongoing resource costs and budgets.
- Understand exactly when the project is going to deliver its key milestones.

- Measure how the project is going to achieve quality by meeting business requirements.
- Achieve sign-off of cost, scope, budget and quality from the business and other key stakeholders.

iii) Maintain a schedule and project plan

- Establish and agree a detailed project plan of the tasks, actions and other activities required to deliver the project.
- Get realistic milestones in place to track delivery of the project to desired outcomes.
- Track ongoing progress against the project plan and schedule.

iv) Deliver the agreed outcomes of the project to the right scope, timescales, cost and quality

- Allocate and track tasks, actions and activities from inception through to completion.
- Manage any risks or issues with scope, cost, quality or timescales and reduce the impact of any problems.
- Manage relationships to ensure that all individuals, teams and areas know what they need to do, when they need to do it and expected outcomes.

4. What is Project Identification?

Ans :

Project identification results from issues emerging from the external environment. You might pick up on these issues in the environment by reading reports on trends in the geographical area where you work and speaking to stakeholders (including users) about the local issues arising.

Examples of new issues that might be relevant to organization:

- A new user group
- Changes in government policy that affect your user group
- A new event – e.g. Olympics
- A new advocacy theme – i.e. lobbying the council for increased fitness services for Muslim women
- A new problem/issue that affects user group

5. What is Project Formulation?

Ans :

Project formulation is the systematic development of a project idea for arriving at an investment decision. It has the built-in mechanism of ringing the danger bell at the earliest possible stage of resource utilization. Project formulation is a process involving the joint efforts of a team of experts. Each member of the team should be familiar with the broad strategy, objectives & other ingredients of the project.

It aims at a systematic analysis of project potential with the ultimate objective of arriving at an investment decision. In this process it makes an objective assessment from all possible angles starting from project identification upto its appraisal stage. Thus, project formulation is the process of examining technical, economic, financial & commercial aspects of a project. It refers to a preliminary project analysis covering all aspects such as technical, financial, commercial, economic & managerial to find out whether it is worthwhile to take project for detailed investigation & evaluation.

6. Stages of Project Formulation.

Ans :

1. Feasibility analysis
2. Techno-Economic Analysis
3. Project Design and network analysis
4. Input analysis
5. Financial analysis
6. Cost-benefit analysis
7. Pre-investment analysis

7. Explain the stages of construction project.

Ans :

1. Design

The design stage mirrors closely the planning stage of a traditional project. A construction design can be seen as a construction project plan.In construction management,

programming and feasibility, schematic design, design development and contract documents are involved in the design stage of the construction project. A design team is allocated to this stage and it is their responsibility that the design is aligned with all building codes and regulations. Normally, a bidding process takes place during the design stage.

2. Pre-construction

If the client gives notice to the contractor that they have been chosen to the bidding process the construction project work can begin. A project team will be allocated and will include a project manager, construction project coordinator, contract administrator and construction project engineer.

During this stage of the project a site investigation must be carried out. This will allow the project team to discover if any specific steps need to be included on the job site. It is important to prepare the site before actual construction is begun. Unforeseen conditions are dealt with at this stage along with a soil test which is used to determine if the soil is in good enough condition in order to be built upon.

3. Procurement

The procurement stage of a construction project is when the labour, equipment and materials needed to complete the project successfully are purchased. The construction company can do this themselves or this work can be subcontracted.

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8. Features of system approach to project management.

Ans :

1. It is the realization of the holistic approach to project preparation and implementation, because project is treated as a product of multidimensional determinants (technolo- gical, financial, ergonomic),

2. Project is characterized in following dimensions: structural determinants, economic factors, marketing and ecological issues, temporal factors, stakeholders needs and values, etc.,

3. System approach principle aims to achieve and maintain the integrity of all components of the project needed to achieve its objectives.

4. Proper use of system approach allows managers to gain the maximum synergistic effect of project implementation.

In systems approach, important is not only the profitability of individual products, but also the interrelation of departments, branches, organizational units, teams forming together coherent entity.

UNIT II

Project Appraisal: Project Planning – Steps in Project Planning - Scheduling - Project Appraisal- Feasibility study- Technical, Commercial, Economic, Financial, Management, Social Cost Benefit Analysis-Project Risk Analysis.

2.1 PROJECT PLANNING

Q1. Explain briefly about Project Planning.

Ans : **(Oct.-22, Imp.)**

Planning is a process of deciding in advance about tasks and activities to be undertaken in future. Planning in business is the function of selecting enterprise objectives and establishing policies, procedures and programmes necessary for achieving them. Likewise, project planning may be described as the establishment of course of action for the project, within the forecasted environment. Main objective of 'project planning' is to define the work required to be done, so that each participant will be able to understand and carry out the role and work expected from him.

The projects generally are based upon inter-departmental and inter-functional cooperation. Project planning therefore, requires a deliberate effort to determine the job to be done, results expected, and the method to achieve the same. Thus, if a project is not planned properly it may face difficulties in implementation and this may result in time over-run and cost over-run.

Project planning is a common thread that intertwines all the activities from conception to commissioning and handing over the clockwork to clients. Project planning encompasses the essential activities such as work breakdown structure, statement of work and accurate time estimates and schedules which help further in anticipating snags in a project and overcome them. A plan is the first step in providing the means to satisfy the needs of a project sponsor and help in paving the way to reach desired goal. It is a beginning of the project manager's input to ensure that potential problems are identified timely and can easily be assessed on the basis of which further estimating and resource allocation may be comfortably done.

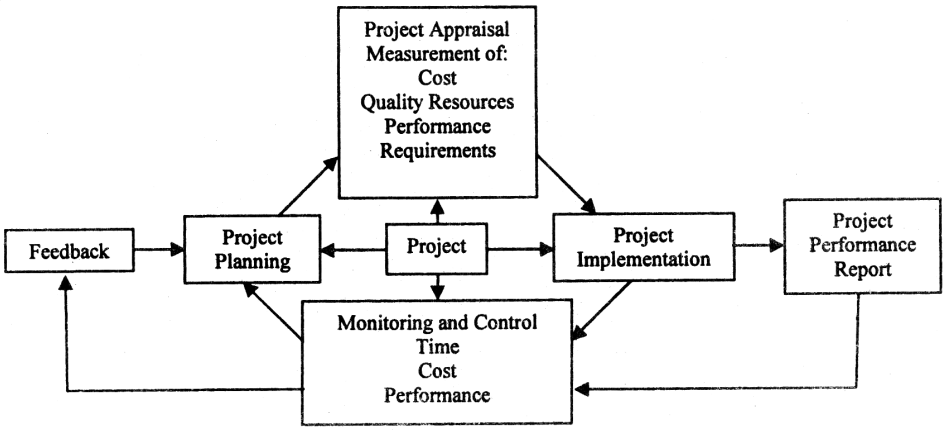


Fig . Project Planning

Hence, considering project planning from its initiation as a crucial function, though spasmodic it may be, planners have to be committed to the satisfactory performance. Consequently, such a well planned approach grazes through even dwarfed tasks and seeks a fruitful symbiosis to reach the goal. It is essential to give a careful thought to establish a strategic framework before starting on the planning in detail. All these above factors focus on the fundamental objectives of planning in projects.

Planning is the first step in a continuous chain of project activities - planning, appraisal, implementation, monitoring and control, review, feedback and planning.

Q2. What are the Objectives of Project Planning?

Ans :

Clear objectives lead to a higher rate of project success. By taking the time to properly plan your project's objectives, the tasks leading toward these objectives are easily created. If a sailor knows where the fish are, he can direct his boat to the proper spot. Project planning is no different.

Effective objectives in project management are specific. A specific objective increases the chances of leading to a specific outcome. Therefore objectives shouldn't be vague, such as "to improve customer relations," because they are not measurable. Objectives should show how successful a project has been, for example "to reduce customer complaints by 50%" would be a good objective. The measure can be, in some cases, a simple yes or no answer, for example, "did we reduce the number of customer complaints by 50%?"

While there may be one major project objective, in pursuing it there may be interim project objectives. In lots of instances, project teams are tasked with achieving a series of objectives in pursuit of the final objective. In many cases, teams can only proceed in a stair step fashion to achieve the desired outcome. If they were to proceed in any other manner, they may not be able to develop the skills or insights along the way that will enable them to progress in a productive manner.

Objectives can often be set under three headings:

1. Performance and Quality

The end result of a project must fit the purpose for which it was intended. At one time, quality was seen as the responsibility of the quality control department. In more recent years the concept of total quality management has come to the fore, with the responsibility for quality shared by all staff from top management downwards.

2. Budget

The project must be completed without exceeding the authorized expenditure. Financial sources are not always inexhaustible and a project might be abandoned altogether if funds run out before completion. If that was to happen, the money and effort invested in the project would be forfeited and written off. In extreme cases the project contractor could face ruin. There are many projects where there is no direct profit motive, however it is still important to pay proper attention to the cost budgets, and financial management remains essential.

3. Time to Completion

Actual progress has to match or beat planned progress. All significant stages of the project must take place no later than their specified dates, to result in total completion on or before the planned finish date. The time scale objective is extremely important because late completion of a project is not very likely to please the project purchaser or the sponsor.

Q3. Explain the Importance of Project Planning.

Ans :

As a business owner, you will run across a new idea or technology that excites you. Excitement can lead you to push for immediate implementation, particularly if you want to capitalize on a hot trend. Even with time-sensitive ideas, you should not ignore the project-planning phase. Rushed implementation often leads to unnecessary financial costs and wasted man hours.

1. Reality Check

A project plan functions, at the outset, as a firm reality check. For example, maybe you want to change operating systems on every computer in your business because the switch will provide better program integration. If the business rushes into the switch, you might discover higher than expected licensing fees or crippled data transfer between computers running different operating systems. Project planning will alert you to issues like total cost and potential pitfalls before you commit the business.

2. Scheduling

A project plan should include a fairly accurate project schedule. This schedule allows you to understand the true time commitment a project requires. If you anticipate project completion within two months and the project team delivers a schedule that calls for a minimum of four months, you may need to reassess whether you want to move forward. On the other hand, if the team delivers a six-week schedule, you may decide to start the project immediately.

3. Resource Requirements

Projects typically call for financial, material and human resources. In most cases, financial and material resources boil down to a simple yes (or) no. Either the company can supply the resources or the company cannot supply them. Human resources represent a more complex problem. Even appropriately staffed project teams often need to borrow human resources throughout the life of the project. Borrowing these human resources may set back other projects or call for hiring additional staff for periods of time. Understanding these resource requirements better equips you to make a final decision about when or if to move forward.

4. Coherence

A project plan keeps all the players on the same page. Without a project plan in place, the project team members may misinterpret the overall goals of the project. This can lead them to purchase inappropriate equipment, hire unnecessary consultants or deliver a useless final product. The absence of a clear project plan also puts you in the position of not understanding the activities of your employees. With the plan in place, everyone remains clear on the goals and the expected path to the goals. Employees can identify what they're working on and why, while you can reference the plan to measure progress.

2.1.1 Steps in Project Planning

Q4. Outline the steps involved in project planning.

Ans : **(Oct.-22, May-19, Imp.)**

1) Project Identification

Project identification is concerned with the collection, compilation and analysis of economic data for the eventual purpose of locating possible opportunities for investment and with the development of the characteristics of such opportunities.

2) Project Formulation

Project formulation is a process in which an entrepreneur is required to undertake an objective assessment of different dimensions of an investment proposition of project idea The basic purpose of this process is to determine the total impact of the proposed project. Project formulation is an important strategy of pre-investment phase where product idea is to be converted into a project idea. It helps in achieving the objectives of the project - maximum benefits at minimum cost in a particular period of time.

"Project formulation is the systematic development of a project idea by evaluating its various components to take an Investment decision".

Project formulation is defined as taking a first a look carefully and critically at a project idea by an

entrepreneur to build up an all-round beneficial to project after carefully weighing its various components. It is formulated by the entrepreneur with the assistance of specialists or consultants.

The project planning comprises of the following steps :

Fig. Process of Project Planning

3) Project Appraisal

Project appraisal means the assessment of a project. Project appraisal is made for both proposed and executed projects. In case of former, project appraisal is called 'exante analysis' and in case of latter 'post-ante analysis'. Here, project appraisal relates to a proposed project.

Project appraisal is the analysis of costs and benefits of a proposed project with the goal of assuring a rational allocation of limited funds among alternative investment opportunities in view of achieving certain specified goals. Project appraisal is necessary as the number of projects to satisfy the identified needs ways exceeds the availability of resources and a choice among alternative objects is to be made.

4) Project Selection

After appraising the project, the most beneficial project idea is selected which is implemented by the authority to achieve the project objective.

Q5. Explain the various components of project planning.

Ans :

For a successful project plan, a project manager requires certain information. This is mainly of two types customer and environmental input.

i) Customer input

It consists of work schedules, i.e., a listing of activities, the possible interrelationships between activities, activity time estimates, activity cost estimates, project specifications, and appropriate project schedules (bar charts, milestone charts, PERT/CPM network, etc.).

ii) Environmental input

It consists of the following appraisals from various departments.

iii) Legal appraisal

This is to check whether the proposed project is being execute : within the specified legal conditions. It is the first prerequisite input for preparing a project plan.

iv) Social appraisal

This is a social cost-benefit analysis which is concerned with judging a project from a larger social point of view. In such an evaluation, the focus is on the social cost and benefit of a project, which may often be different from its monetary costs and benefits.

v) Technological appraisal

This reviews the technological aspects of projects, such as location, size processes, site selection, etc. It also screens the incorporation of ah factors responsible for effective formulation of a given project.

vi) Economical appraisal

It reviews the economic sustainability of a given project along with its market value. A project involves several economic processes, such as the loan value, the expected returns, and so on. These processes must be resolved in favour of the project for it to become successful.

vii) Political appraisal

The influence and impact of political power cannot be ignore: during project planning. It is important to position the project in such a manner that it does not suffer from any political hindrance during its term of execution or later.

viii) Ecological appraisal

Today, environmental issues are of paramount importance An ecological appraisal looks into the feasibility of certain kinds of projects, such as irrigation set ups, power plants, chemical industries, leather processing, etc., which pose significant threat to the environment.

Q6. Explain the tools and techniques involved in project planning.

Ans :

A) Tools of Project Planning

The various tools available for project planning are:

1) Multi-Level Scheduling:

When schedules are prepared at multiple levels it is called multi-level scheduling. Three to four level schedules can be prepared depending upon the requirement.

For example:

i) Master Project Schedule:

It is prepared for the top manage- ment. This is essentially the milestone chart, which gives picture of the total activities at a glance. The details are excluded from the master project schedule for convenience.

ii) Functional Area Schedules:

These are prepared for the activities of each functional department. This is essentially the projected picture of each activity mentioned in the master project schedule.

iii) Schedules of Work Packages:

These are the detailed schedules for all work packages, which form part of the functional area schedule. This essentially serves the purpose of sub-contractors or those who are executing the activities.

2) Multi-Project Scheduling

Resource allocation generally occurs in a multi-project environment where the demands of one project have to be reconciled with the needs of other projects. Organizations must develop and manage systems for efficiently allocating and scheduling resources across several projects with different priorities, resource requirements, sets of activities and risks. The system must be dynamic and capable of accommo-dating new projects as well as reallocating resources once project work is completed. While the same resource issues and principles that apply to a single project also apply to this multi-project environment, application and solutions are more complex, given the interdependency among projects.

3) Material Requirements Planning (MRP)

MRP constitutes a set of techniques that use bill of material, inventory data, and the master production schedule to calculate the requirements for materials. MRP is probably the most compre-hensive approach to manufacturing inventory and other dependents which demand an efficient inventory manage-ment system.

In the process of planning, MRP system allocates existing inventories on hand to the items to be manufactured. And based on the gross requirements, it re-evaluates the validity of the timing of any outstanding orders. The system establishes a schedule of planned orders for each item, including orders, if any, to be released immediately plus orders

scheduled for release at specific future dates. MRP helps in reduction in production and delivery lead times MRP identifies materials and components quantities, timings, availabilities, and procurement and production actions required to meet delivery deadlines By coordinating inventories, procurement, and production decisions, MRP helps in avoiding delays in production

4) Cats And Rats

i) The various approaches for time scheduling are normally branded as CAT schedule and RAT schedule

ii) CAT schedule stands for 'Committed Activity Target Schedule'. RAT schedule stands for 'Reserved Activity Target Schedule'.

iii) The CAT schedule is used for progressing of the executing agencies whereas the RAT' schedules are those that are to be achieved. The project management will try to maintain a distance between two schedules so that CAT schedule does not swallow the RAT schedule.

iv) A CAT schedule is detailed and developed in squared network form and RAT schedule is maintained in S curve form.

v) The RAT schedule will contain only the key milestones whereas the CAT schedule will have all important activities and all milestones.

vi) The RAT schedule is based on some inbuilt allowances for delays. This allowance is not to be disclosed to execution agencies. The cushion is kept in RAT schedule for taking care of all uncertainties in execution of projects.

vii) If the achievement of key milestones is delayed beyond the RAT schedule, then only slippage will be accepted for reporting to the financial institutions and the general public.

viii) The CAT and RAT schedules should be revised every time the cost estimates are revised to keep the gap of allowance.

5) **Network Analysis:**

Network analysis plays an important role in project management By analysis a network, which is a graphic depiction of 'activities' and 'events', the planning, scheduling and control of a project becomes much easier. Programme Evaluation and Review Technique (PERT), and Critical Path Method (CPM) represent the two well-known network analysis techniques used to assist the managers in planning and controlling large scale construction projects, research and development, and so forth. Often, these projects are very large and complex involving performance of a host of tasks or jobs by several departments.

Examples of such projects are construction of a residential complex; a shopping center, ships or aircraft repair projects; development of a new drag ; implementation of a computer system from ordering and site preparation through installation and checkout, satellite mission development and countdown procedures; installation of a pipeline project; designing and laying of a new manufacturing plant, and the like. While working on such projects, large amounts of money, manpower and other equipment are involved.

The techniques of PERT and CPM prove extremely valuable in assisting the managers in handling such projects and the us discharging their project management responsibilities.

B) Techniques of Project Planning

1) Resource allocation

2) Resource leveling

3) Work Breakdown Structure (WBS)

4) Work Packages

5) Bar-Chart

6) Line of balance

7) Linear Programming

1) Resource Allocation:

One of the main problems faced by a project manager is resource allocation. With the help of the network techniques the project manager can identify the critical activities. For completing the project in time, he must have the required resources at his disposal.

A project manager frequently comes across resource constraints. There may be delay in the arrival of building materials. The available personnel may fall short of the requirement on some days and there may be excess personnel available on some other days. The job of the project manager is to plan and allocate the resources for the different activities so that the resource utilization is optimized.

2) Resource Leveling:

There are situations demanding that the project should be completed by a specified due-date. The due-date for project completion is decided by the management for various reasons. For example, a canal lining project might be required to be completed before the monsoon sets on; a school building might be required to be completed before the school re-opens after vacation. Under such situations, project completion time is the constraint, i.e., the project is to be completed at any cost by the due-date. A project manager often comes across mismatch between the availability of resources and the requirement of resources. This means that there are surplus resources available on some days and there is shortage of resources on some other days.

Since the personnel requirement varies from day to day, the project manager should plan properly in such a way that optimum utilization of available personnel is achieved.

Thus, the objective of the project manager in such a situation is to level as far as possible the demand for resources throughout the project execution time, keeping in view the constraint that the “specified” project completion time should not be exceeded. The “specified” project completion time may be the minimum possible time by which the project can be completed as ascertained by identifying the critical path or even a shorter duration than this as decided by the management to meet other requirements.

3) Work Breakdown Structure (WBS):

The procedure for dividing the overall project into subelements is called work breakdown structure. The Project Management Body of Knowledge (PMBOK) defines Work Breakdown Structure (WBS) as a deliverable-oriented grouping of project activities that organizes and defines the total scope of the project. A deliverable is any measurable, tangible, verifiable outcome or result that must be produced to complete a project or part of a project.

The breaking down of work into hierarchy of activities and tasks is called decomposition. The project goal statement is shown at the top of the WBS as a Level 0 activity. This Level 0 activity is decomposed into Level 1 activities. The completion of all Level 1 activities means completion of Level 0 activity. Similarly an activity at level in is said to be completed when its decomposed activities at Level n + 1 are completed.

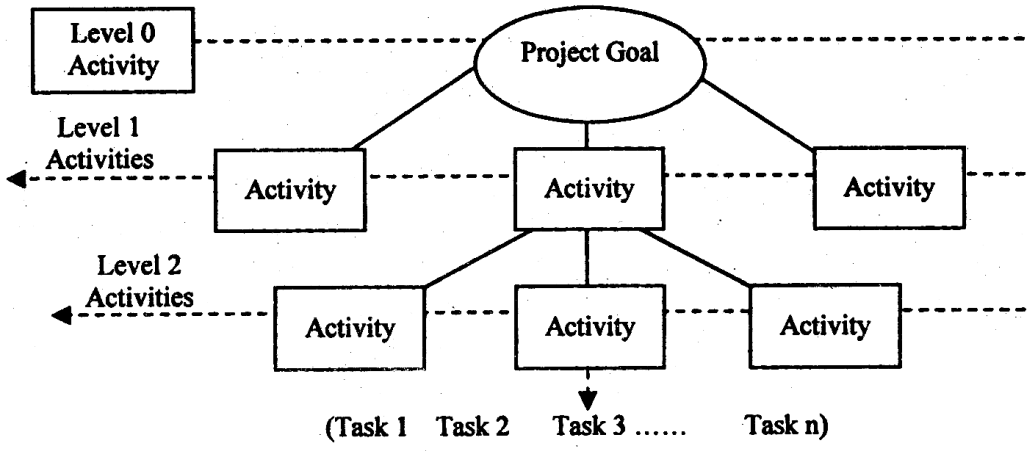


Fig. Model Work Breakdown Structure

The decomposition process makes it easy for the project manager to estimate tne auranon ox me wuvny, the resources required and the costs incurred. The decomposition is done to such an extent that each lower activity should satisfy the test of completeness.

4) Work Packages:

The purpose of WBS is to divide the project into small pieces is called as work packages. How far down does the breakdown go? Simply, as far as needed to completely define all work necessary for the project. Sometimes a Level 2 breakdown will be adequate, though usually a Level 3 or higher-level breakdown will be necessary. The work in each "box" of the WBS must be "well defined"; if it is not, then the box must be subdivided into smaller boxes. What is necessary for a box to be "well defined?" The box should include the following:

i) **Clear, Comprehensive SAW:**

The work task defined well enough so the parties responsible know exactly what they must do.

ii) **Resource Requirements:**

The labor, skills, equipment, facilities and materials for the task.

iii) **Time:**

Estimated time necessary to perform the task.

iv) **Costs:**

Estimated costs for the required resources, management and related expenses for the task.

v) **Responsibility:**

The parties, individuals and job titles responsible for performing the task and approving it.

vi) **Outcomes:**

The deliverables, end-items or end-results and associated requirements and specifications for the task.

vii) **Inputs :**

The preconditions or predecessors necessary to begin the task.

viii) **Quality Assurance**

The entry, process and exit conditions to which the task must confirm; these are specified in the quality plan.

ix) **Risk**

Uncertainty about time, cost and resources, identified as high, medium or low risk, with migration and contingencies measures for high risks.

x) **Other**

Additional information as necessary.

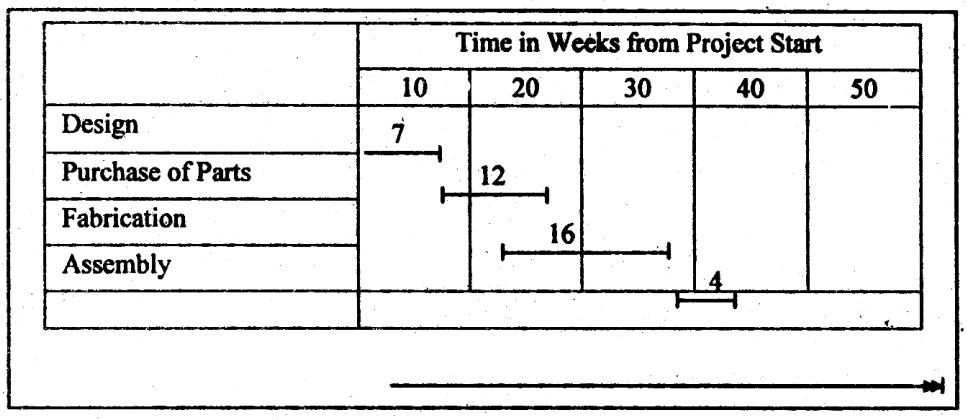
If any of the properties listed cannot be defined, the task in the box is too broad and must be broken down further. In most cases, all or most of these properties can be eventually determined by breaking tasks down into small-enough pieces.

Table : Properties of a Work Package

Inputs	Task	Outcomes
Predecessors	Statement of work	Deliverables
Preconditions	Time	Results
Resources	Cost	
Requirements/specifications	Responsibility	
	Quality assurance Risk	

5) Bar-Chart:

The oldest formal planning tool is the bar chart, also referred to as the Gantt chart or the multiple activity charts. The Gantt chart shows a plan of action and how well progress is going hand-in- hand with the plan. It is easy to draw, easy to understand and not too searching of managerial skill; it is best used for straightforward, well-understood construction work, with simple relationships between the activities. This graphical technique still forms the basis for most resource scheduling. This is a pictorial device in which the activities are represented by horizontal bars on the time axis. The left-hand end of the bar shows the beginning time, the right-hand end the ending time. The duration of the activity is indicated by the length of the bar. The manpower required for the activity is shown by a number on the bar. A bar chart is shown in following figure.



6) Line-of-Balance

Line-of-Balance (LOB) is a specialized technique for repetitive tasks. This technique was developed to handle bulk activities in reasonably sized batches of a similar task-group. In the construction world it has an application in the building of a housing estate where several houses are being worked on simultaneously or in the finishing off of a multi-storey building. It was derived from manufacturing industry and has been found quite effective in planning truly repetitive tasks. The basis of this technique is a 'setback chart' or family tree showing the make-up of the product. This is merely a modified form of milestone chart. LOB has been found to be difficult to use on projects which require a large number of trades or operations to construct each identical unit. The problems arise not from the technique itself, but from the difficulty of showing all the information on one chart, especially when using the technique to monitor progress. When used to plan, it can be an excellent means of relating resources, activity durations and the general pace of work on site. Other than simplicity and easy to understand the demerits dominate this technique especially for complex projects.

7) Linear Programming (Time - Chainage Chart)

Linear programming is a specialized technique for linear work. This is a special tool for me road contractors. This has been in use successfully in the construction of large canals and drainages in underdeveloped regions and especially useful in tunneling for industrial effluvium. Similar to that of LOB, this is a simple two dimensional graphical technique and can show dearly the quantum of information and relationship between the jobs to a limited scale and degree of complexity.

2.2 PROJECT SCHEDULING

Q7. What is Project Scheduling? Explain the tools used in Project Scheduling.

Ans :

The project schedule is the tool that communicates what work needs to be performed, which resources of the organization will perform the work and the timeframes in which that work needs to be performed. The project schedule should reflect all of the work associated with delivering the project on time. Without a full and complete schedule, the project manager will be unable to communicate the complete effort, in terms of cost and resources, necessary to deliver the project.

Online project management software allows project managers to track project schedules, resources, budgets and project related assets in real time. The project schedule can be viewed and updated by team members associated with the project, keeping everyone well informed on the overall project status.

Best Practices for Project Scheduling

Effective project scheduling is one of the primary pillars behind project scheduling. This paper discusses secrets behind effective project scheduling. Topics discussed include:

- Creating Deliverables-Based Project Schedules
- Determine the Appropriate Level of Detail for Each Project Schedule
- Building a Deliverables-Based WBS
- Establishing lower limit on the number of work hours
- Using a Project Scheduling Standard

Scheduling Tools

Here are some tools and techniques for combining these inputs to develop the schedule:

- **Schedule Network Analysis**

  This is a graphic representation of the project's activities, the time it takes to complete them, and the sequence in which they must be done. Project management

software is typically used to create these analyses Gantt charts and PERT Charts are common formats.

- **Critical Path Analysis**

  This is the process of looking at all of the activities that must be completed, and calculating the 'best line' or critical path to take so that you'll complete the project in the minimum amount of time. The method calculates the earliest and latest possible start and finish times for project activities, and it estimates the dependencies among them to create a schedule of critical activities and dates. Learn more about Critical Path Analysis.

- **Schedule Compression**

  This tool helps shorten the total duration of a project by decreasing the time allotted for certain activities. It's done so that you can meet time constraints, and still keep the original scope of the project. You can use two methods here:

- **Crashing**

  This is where you assign more resources to an activity, thus decreasing the time it takes to complete it. This is based on the assumption that the time you save will offset the added resource costs.

- **Fast-Tracking**

  This involves rearranging activities to allow more parallel work. This means that things you would normally do one after another are now done at the same time. However, do bear in mind that this approach increases the risk that you'll miss things, or fail to address changes.

2.3 PROJECT APPRAISAL

Q8. What is Project Appraisal? Explain importance of Project Appraisal.

Ans :

Introduction

Project appraisal is the process of assessing and questioning proposals before resources are committed. It is an essential tool for effective action in community renewal. It's a means by which partnerships can choose the best projects to help them achieve what they want for their community.

But appraisal has been a source of confusion and difficulty for projects in the past. Audits of the operation of Single Project Budget schemes have highlighted concerns about the design and operation of project appraisal systems, including:

- Mechanistic, inflexible systems
- A lack of independence and objectivity
- A lack of clear definition of the stages of appraisal and of responsibility for these stages
- A lack of documentary evidence after carrying out the appraisal

It's no surprise that audits or inspections aren't impressed with the quality of appraisals, and are specifically found with problems like;

- Individual appraisals which do not cover the necessary information or provide only a superficial analysis of the project
- Particular problems in dealing with risks, options and value for money
- Appraisals which are considered too onerous/ burdensome for smaller projects
- Rushed appraisals

Project appraisal is a requirement before funding of programs is done. But tackling problems like those outlined above is about more than getting the systems right on paper. Experience in projects emphasizes the importance of developing an 'appraisal culture' which involves developing the right system for local circumstances and ensuring that everyone involved recognizes the value of project appraisal and has the knowledge and skills necessary to play their part in it.

Importance of Project Appraisal

Project appraisal helps project initiators and designers to;

- Be consistent and objective in choosing projects

- Make sure their program benefits all sections of the community, including those from ethnic groups who have been left out in the past
- Provide documentation to meet financial and audit requirements and to explain decisions to local people.

1. Appraisal justifies spending money on a project.

Appraisal asks fundamental questions about whether funding is required and whether a project offers good value for money. It can give confidence that public money is being put to good use, and help identify other funding to support a project. Getting it right may help a community make its resources go further in meeting local need

2. Appraisal is an important decision making tool

Appraisal involves the comprehensive analysis of a wide range of data, judgments and assumptions, all of which need adequate evidence. This helps ensure that projects selected for funding:

- Will help a partnership achieve its objectives for its area
- Are deliverable
- Involve local people and take proper account of the needs of people from ethnic minorities and other minority groups
- Are sustainable
- Have sensible ways of managing risk.
- Appraisal lays the foundations for delivery.

Appraisal helps ensure that projects will be properly managed, by ensuring appropriate financial and monitoring systems are in place, that there are contingency plans to deal with risks and setting milestones against which progress can be judged.

3. Getting the system right

The process of project development, appraisal and delivery is complex and partnerships need systems, which suit local circumstances and organization. Good appraisal systems should ensure that:

4. Project application, appraisal and approval functions are separate

All the necessary information is gathered for appraisal, often as part of project development in which projects will need support

- Race/tribal equality and other equality issues are given proper consideration
- Those involved in appraisal have appropriate information and training and make appropriate use of technical and other expertise
- There are realistic allowances for time involved in project development and appraisal
- Decisions are within a implementers' powers
- There are appropriate arrangements for very small projects
- There are appropriate arrangements for dealing with novel, contentious or particularly risky projects.

2.3.1 Technical, Commercial, Economic, Financial, Management

Q9. Explain the techniques of project appraisal.

Ans : **(Oct.-22, Aug.-21, Imp.)**

1. Technical Appraisal

Technical analyses of a project are aimed at ensuring the following:

- To confirm the source of the project proposal, nature of the studies – including feasibility studies undertaken before the proposal, and the nature of decisions taken by all relevant authorities involved

- That the problem or the need to be resolved by the project has been clearly stated
- That the project has been clearly spelled out with the correct technical design details (such as size, location, timing, and technology)
- That the required materials have been correctly determined and their source identified
- That the costs of the project have been clearly established, expected product prices projected, and payment modalities and schedules agreed to.

2. Commercial Appraisal

For Commercial appraisal to obtain financing for the purchase or refinance of a commercial property, then this is most likely the report for you. The Appraisal Report format is by far the most widely used of all the available commercial appraisal report formats. The report summarizes all conclusions for the client to understand the appraiser's rationale. The appraiser must determine if additional detail or explanation is required. Additionally, the report may contain external material references found in company files. From a legal standpoint, it can be depended upon by additional intended users, and for real estate related purposes, this format blends itself as the most applicable in this area.

- Arrangements for supply of inputs and marketing the projects output.
- Effective demand at a reasonable price.
- Where will the products be sold?
- Is the market large enough to absorb the new production without affecting the price?
- If the price is likely to be affected, by how much? Will the project still be financially viable at the new price?
- Is the product for domestic consumption or for export?

3. Economic Appraisal

The need for economic analysis arises out of the fact that Higher Local Governments (HLGs) operate within limited resources. As a result, some difficult choices of where to commit limited resources from a large pool of deserving and competing priorities and needs must be made by HLG officials. The economic costs and benefits of a project are estimated through the application of a cost-benefit analysis, i.e. evaluating both the implicit and social cost-benefits of a project. For profit making projects, profitability tools like Net Present Value, Internal financial rate of return, Pay Back Period and Incremental Profit are used to estimate the viability of the project.

HLGs do not generally operate on profit motivation when considering projects; therefore, social cost-benefit analysis is most applicable for HLGs. In a cost benefit analysis, one must ask basic questions as to what costs and benefits should directly and indirectly accrue to the target beneficiaries in terms of poverty reductions, enhanced savings, improved medical care, educational, water and health services.

The figure below illustrates the participatory process including especially the beneficiaries of medical, water and sanitation in the design and discussion of project formulation. The participatory process allows for more ideas to be incorporated into the project, and often increases the success of the project.

4. Ecological or Environmental Appraisal

Depending on the nature of the project, it is important that the project is seen to comply with the various environmental requirements as administered by the National Environmental Management Authority (NEMA). Specifically, the project should comply with the provisions of the National Environment Statute (1995) and the Environmental Impact Assessment (1998). Environmental aspects that projects would have to address include;

- Public health and occupational safety
- Control of air, water and land pollution
- Management of renewable natural resources (plants and animals)
- Efficient use of natural resources through multiple use, recycling and erosion control
- Conservation of unique habits (forests, game reserves) for rare species and cultural preservation

5. Financial Appraisal

Finance is one of the most important prerequisites to establish an enterprise. It is finance only that facilitates an entrepreneur to bring together the labour, machines and raw materials to combine them to produce goods. In order to adjudge the financial viability of the project, the following aspects need to be carefully analyzed :

- Cost of capital
- Means of finance
- Estimates of sales and production
- Cost of production
- Working capital requirement and its financing
- Estimates of working results
- Break-even point
- Projected cash flow
- Projected balance sheet.

The activity level of an enterprise expressed as capacity utilization needs to be well spelled out. However the enterprise sometimes fails to achieve the targeted level of capacity due to various business vicissitudes like unforeseen shortage of raw material, unexpected disruption in power supply, instability to penetrate the market mechanism etc.

6. Management Appraisal

Management ability or competence plays an important role in making an enterprise a success or otherwise. Strictly speaking, in the absence of managerial competence, the projects which are otherwise feasible may fail.

On the contrary, even a poor project may become a successful one with good managerial ability. Hence, while doing project appraisal, the managerial competence or talent of the promoter should be taken into consideration.

Research studies report that most of the enterprises fall sick because of lack of managerial competence or mismanagement. This is more so in case of small-scale enterprises where the proprietor is all in all, i.e., owner as well as manager. Due to his one-man show, he may be jack of all but master of none.

7. Social Appraisal

The validity of the planners' assumptions about the social conditions are tested through social analysis. Where necessary, adjustments should be made so that the project goals are expressed in terms that have more meaning for both the project population and the implementing agencies. Social analysis focuses on four areas indicated below;

- The social-cultural and demographic characteristics of the project population – its size and social structure, including ethnic, tribal and class composition
- How the project population has organized itself to carry out productive activities, including the structure of households and families, availability of labor, ownership of land, and access to and control of resources
- The project's cultural acceptability; in other words, its capacity both for adapting to and for bringing about desirable changes in people's behavior and in how they perceive their needs
- The strategy necessary to elicit commitment from the project population and to ensure their sustained participation from design through to successful implementation, operation and maintenance

8. Market Appraisal

Before the production actually starts, the entrepreneur needs to anticipate the possible market for the product. He has to anticipate who will be the possible customer for his product and where his product will be sold. This is because production has no value for the producer unless it is sold. In fact, the potential of the market constitutes the determinant of possible reward from entrepreneurial career.

Thus knowing the anticipated market for the product to be produced become an important element in business plan. The commonly used methods to estimate the demand for a product are as follows. :

- **Opinion polling method**

  In this method, the opinion of the ultimate users. This may be attempted with the help of either a complete survey of all customers or by selecting a few consuming units out of the relevant population.

- **Life Cycle Segmentation Analysis**

  It is well established that like a man, every product has its own life span. In practice, a product sells slowly in the beginning. Barked by sales promotion strategies over period its sales pick up. In the due course of time the peak sale is reached. After that point the sales begins to decline. After sometime, the product loses its demand and dies. This is natural death of a product. Thus, every product passes through its life cycle. The product life cycle has been divided into the following five stage : Introduction, Growth, Maturity, Saturation and Decline.

  The sales of the product varies from stage to stage as shown in figure

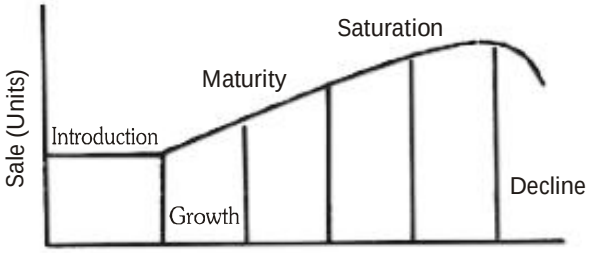


Fig. : Product Life Cycle

Considering the above five stages of a product life cycle, the sale at different stages can be anticipated.

2.4 PROJECT FEASIBILITY STUDY

Q10. What is Project Feasibility? Explain the content of Project Feasibility Study.

Ans :

Feasibility literally means whether some idea will work or not. It knows beforehand whether there exists a sizeable market for the proposed product/ service, what would be the investment requirements and where to get the funding from, whether and where from the necessary technical know-how to convert the idea into a tangible product may be available, and so on. In other words, feasibility study involves an examination of the operations, financial, HR and marketing aspects of a business on *ex ante* (before the venture comes into existence) basis.

Project feasibility analysis results in a reasonably adequate formulation of the project in terms of location, production technology, production capacity, material inputs, etc., and contains fairly specific estimates of project cost, means of financing, sales revenues, production costs, financial profitability and social benefits.

Various dimensions of project feasibility study are analyzed throughout different stages of feasibility study in varying degrees of detail, both separately and in relation to others. Thus, a multi-dimensional feasibility analysis is a vital exercise.

If a project is seen to be feasible from the results of the study, the next logical step is to proceed with it. The research and information uncovered in the feasibility study will support the detailed planning and reduce the research time.

Content of Feasibility Analysis

The sources for content in a feasibility analysis come through extensive research, discussion and assessment and may incorporate the use of advanced computer modeling to determine the long-term impact of a project on the environment around it. Other feasibility analyses may be rooted only in anecdotal evidence as provided by those who have worked on similar efforts or those who will ultimately be affected by the project's outcome.

A basic pre-project feasibility analysis might include the following:

1) Executive Summary/Project Goal

Overview or description of the impact of the project on its environment and the potential for success (or failure) based on the analysis. This may also include brief mention of the alternatives considered and their relative viability.

2) Project Description

i) Anticipated As-Built Condition

This section is a description of the project as envisioned, including magnitude, location, community impact and market change.

ii) Anticipated Outputs

In this section, both intended and consequential outputs of the project should be incorporated, without comment as to their relative benefit or detriment to the world around them.

3) Project Environment

i) Financial

This section describes the financial climate in which the project will be developed and implemented. This may include assessments of the relative magnitude of the project within the overall organizational budget and the potential drain on available resources.

ii) Physical Environment: A feasibility analysis should include a description of the environment surrounding the project, including the physical locations for development and implementation.

iii) Societal/Cultural Environment:

Descriptions of the culture and society in and around the project community are another aspect to a feasibility analysis. This may include an emphasis on those social and cultural issues that will be directly affected by project development and implementation.

4) Similar Efforts

i) Scenarios

The section provides an outline of similar efforts and a synopsis of their effects on the finances and physical and social environments of their project organizations and communities.

ii) Similarities and Implications :

Determination of the degree of similarity between the scenarios outline and the project(s) under scrutiny in the feasibility analysis is covered.

5) Sensitivity Analyses

i) **Financial**

A "what-if' analysis of finances to determine if the project is deemed viable is an important aspect of a feasibility analysis. An assessment of other organizational areas affected is included. This analysis may also examine the potential range of financial possibilities if the project fares extremely well or poor.

ii) **Physical Environment**

It involves a "what-if' analysis of the physical environment if the project is deemed viable. It includes an assessment of physical effects to the organization and the areas around the project. This

analysis may also examine the potential range of physical manifestations if the project fares extremely well or poor.

iii) **Social/Cultural Environment**

It is a "what-if' analysis of the social and cultural environment if the project is deemed viable. It includes an assessment of the effects to local, regional, national and international societies. This analysis may also address the potential range of social and cultural implications if the project fares extremely well or poor.

6) **Marketing/Public Relations**

i) **Market Analysis**

The market analysis includes an assessment of the potential market for the project or its outputs, including (but not limited to) the financial buying power of the market, interest in or demand for the project and the life span of the market's potential members.

ii) **Forecasts**

Predictions regarding sales, returns and buying trends related to the project and its outputs are included in the forecasting section. Ideally, the forecast includes the timing of the market entry and the relative impact of early or late entry into die marketplace.

iii) **Competitive Environment**

The competitive environment section contains information on other organizations capable of conducting the project and/or producing its deliverables (or their equivalent). This may also incorporate some assessment of how potentially fickle the market may be about the project or its deliverables.

iv) **Risk**

Major risks should be considered in any feasibility analysis. They include those that could radically alter any or all of the assumptions on which the feasibility assessment is based and the potential market impact if those risks come to pass.

7) **Conclusions and Recommendations**

Based on the information from the analysis, it explains the conclusions that can be drawn regarding the viability (or non-viability) of the project, given the environment in which it will be developed arul implemented. This normally includes a go/no-go decision and the implications of both of those decisions.

Q11. Explain the dimensions of Project Feasibility Study.

Ans : **(May-19, Imp.)**

In general terms, the elements of a feasibility analysis for a STEP should cover the following items:

1) Need Analysis

This indicates the recognition of a need for the project The need may affect the organization itself, another organization, the public, or the government. A preliminary study should be conducted to confirm and evaluate the need. A proposal of how the need may be satisfied is then developed.

Pertinent questions that should be asked include:

i) Is the need significant enough to justify the proposed project?

ii) Will the need still exist by the time the project is completed?

iii) What are the alternate means of satisfying the need?

iv) What is the economic impact of the need?

2) Process Work

This is the preliminary analysis done to determine what will be required to satisfy the need. The work may be performed by a consultant who is a subject matter expert in the project field. The preliminary study often involves system models or prototypes. For STEPs, artist's conception and scaled- down models may be used for illustrating the general characteristics of a process.

3) Engineering and Design

This involves a detailed technical study of the proposed project. Written quotations are obtained from suppliers and sub-contractors as needed. Technology capabilities are evaluated as needed. Product design, if needed, should be done at this stage.

4) Cost Estimate

This involves estimating project cost to an acceptable level of accuracy. Levels of around - 5% to +15% are common at this level of a project plan.

Both the initial and operating costs are included in the cost estimation. Estimates of capital investment, recurring and non-recurring costs should also be contained in the cost estimate document.

5) Financial Analysis

This involves an analysis of the cashflow profile of the project. The analysis should consider re-capitalization requirements, return on investment, inflation, sources of capital, pay-back periods, break-even point, residual values, market volatility and sensitivity. This is a critical analysis since it determines whether or not and when funds will be available to the project. The project cashflow profile helps to support the economic and financial feasibility of the project.

6) Project impacts

This portion of scope feasibility analysis provides an assessment of the impact of the proposed project. Environmental, social, cultural and economic impacts may be some of the factors that will determine how a STEP is perceived by stakeholders. The value-added potential of the project should also be assessed.' A value-added tax may be assessed based on the price of a product and the cost of the raw %material used in making the product. The tax so collected may be viewed as a contribution to government coffers for re-investment in the science, technology and engineering infrastructure of the nation.

7) Conclusions and Recommendations

Scope feasibility analysis should end with the overall outcome of the project analysis. This may indicate an endorsement or disapproval of the project. If disapproved, potential remedies to make it right should be resented. Recommendations on what should be done should be included in the scope feasibility report.

Q12. What are the advantages of feasibility analysis.

Ans :

1) Understanding Demand

Feasibility studies always analyze whether a real demand exists for a product or a sen ice. This holds true for internal projects as well as for potential consumer offerings. For example, a project manager tasked with launching a customer relationship manage-ment system can examine the real demand for specific features, based oik feedback from customers and from staff. The resulting data can shape the priority list, which impacts both the budget and time line. This way, project managers can avoid spending resources on features or projects with low impact and low demand among end users.

2) Assessing Resources

Another advantage of feasibility studies is the opportunity to catalog the current resources available for a project and to estimate the need for additional resources. Feasibility studies that recommend against projects often cite a lack of human resources or financial capital. This kind of result gives a project manager the opportunity to reset expectations based on real budgets and headcount

3) Marketing Feasibility

Even for products and services with measurable demand, companies must examine their ability to spread the word about a new offering. During a feasibility study, project managers learn whether the market is already over saturated with stronger competitors. Company leaders can also

discover any potential legal roadblocks involving trademarks, patents, or other intellectual property rights.

4) Marking a Timeline

One of the biggest advantages of a feasibility study is the validation of a prospective timeline. When moving into a formal project planning phase, a project manager can use data generated by the study to help set milestones and deadlines. A quality feasibility study examines the timetable suggested by project sponsors for potential delays or breakdowns. When project managers use a study as the basis for making timeline decisions, they ran the least risk of being overruled by anxious stakeholders.

2.4.1 Types of Feasibility Analysis

2.4.1.1 Market Feasibility

Q13. Explain briefly about market feasibility. What are the factors affecting market feasibility.

Ans :

The first step in project feasibility analysis is to estimate potential size of the market and the market share that is Mikely to be captured by the product proposed to be manufactured or the service planned to be offered. Market analysis provides a detailed analysis of all market conditions. The market analysis estimates the size of the potential market, patterns of consumption, level of competition and market composition.

A project manager should carefully study the market potential for a given project idea. Conducting target surveys, collecting primary and secondary data, studying the characteristics of the market are some of the activities to test the market environment and see if the idea is feasible.

Market feasibility involves gathering market information to see, whether there are enough people in the market who are able and willing to buy the entrepreneur's product or service. Finding-out its marketability is important for judging the potential success of the new business. A group of potential consumers with unsatisfied needs and the purchasing power to satisfy their needs is known as the market for a product or service. The target market is the specific group of consumers at which the business aims its products. The target market should be analyzed in terms of the following:

1) How many potential customers are there in the market and what are their characteristics? The characteristics of the consumers would include their age, language, education level, sex, marital status, and size of family. The number of potential consumers for the entrepreneur's product and other similar products determine the size of the market.

2) What is the purchasing power of the consumers? The purchasing power is represented by the consumers' personal disposable income. This is the spare cash they have available to buy consumer products and services.

3) What is the purchasing pattern and behavior of the consumers? This includes how and why consumers choose to buy and use certain products and services.

Factors Affecting Market Feasibility for Existing Product

1) General Economic Indicators

For ail practical purposes, a business firm may seek to estimate the demand function for its product. In the process an attempt is made to quantify the relationship between the demand for a product and its determinant variables, such as price, national income, i.e., Gross National Product (GNP) or Gross Domestic Product (GDP), advertising expenditure, price of substitute and complements, population, etc.

2) Demand Estimation:

The demand estimation is a first step to demand forecasting. Demand estimation can be useful in certain business decision making.

For example,

i) A computer dealer would like to know the implications of a reduction in excise duties, lower prices and rising GNP on the demand for personal computers.

ii) A cigarette manufacturer may be interested in knowing the impact of increase in excise duties on cigarettes on its sales.

iii) An electricity company (such as Dabbol Power Company) while planning to construct a new power station should know the likely growth of demand for electricity over the decade of time.

iv) An electronics manufacturer might be interested in estimating changing proportion of demand for domestic and imported electronic items when the import policy of the government is liberalized.

Points Considered for Demand Estimation

i) Different End Users/ Market Segmentation:

Market segmentation or market targeting studies determine how a market is segmented by product usage, demand, or customer profiles. These studies usually develop demographic, psychographic, product preference, and lifestyle profiles of key market segments.

ii) Influencing Factors:

Price and availability of related or substitute goods also impacts demand for a product. Some products, such as barbecue grills and charcoal, are complimentary. Consumers typically buy charcoal when they purchase a grill because they need both products to grill a steak. If the price of either charcoal or barbecue grills increases, a consumer's demand for both products may decrease.

iii) Market Potential:

Market potential refers to the estimated maximum total sales revenue of all suppliers of a product in a market during a certain period. It is the total level of sales achievable in a market assuming that every potential customer in that market is buying, that they are using the product on every possible occasion, and that they are using the full amount of product on each occasion.

iv) Demand Forecasting:

Forecasting of demand is the art of predicting demand for a product or a service at some future date on the basis of certain present and past behavior patterns of some related events. Accurate demand forecasting is essential for a firm to enable it to produce the required quantities at the right time and to arrange well in advance for various inputs. Forecasting helps a firm to assess the probable demand for its products and plan its production accordingly. Detail Below

3) Identification of Critical Success Factors:

The success factors for a project are resources, time, results, iaiu customer satisfaction. One cannot change any one of these factors without impacting the others. Examples of some critical project success factors are defining scope, understanding the business context and project objectives, setting vision and goals, recognizing and quantifying opportunities, testing re-designed products or options, managing change and planning for timely, practical and realistic implementation:

i) Active and committed top-management support.

ii) Full involvement of the end-users right through the project.

iii) Establishment of a business case for the project.

iv) Project team empowerment through management by exception.

v) A formal issue management process.

vi) A formal configuration management process.

4) Estimation of Demand Supply Gap

Supply and demand is a fundamental concept of all economic insights and the foundation of the majority of modem economics. For example, the gap between demand and supply which is likely to continue, cheaper edible oil should continue

to be imported, but apart from providing an input for the vanaspati industry, it should also be made available for direct consumption by the masses of people, through fair price shops.

2.4.1.2 Technical Feasibility

Q14. Explain briefly about Technical feasibility.

Ans : **(Aug.-21, Imp.)**

Technical appraisal of a project broadly involves a critical study of the following:

1) Appropriateness of the technology, the suitability of selected technical process under Indian conditions and arrangements made or proposed to be made therefore.

2) Scale of operations and whether the size of the unit would be adequate for economic and financial viability of the project.

3) Selection of the plant site in relation to load bearing capacity, flood and earthquake hazards, free access from public roads, satisfactory sources of raw materials, water, power and fuel as also transport facilities, availability of skilled labor, nearness to the market for finished products, etc.

4) Adequacy and suitability of the plant and equipment and their specifications, plant layout, reputation of machinery suppliers, balancing of different sections of the plant, proposed arrangements for procurement of plant and equipment, technical engineering services, etc.

5) Technical and executive management available during the implementation period and for operation of the project.

6) Arrangements for the disposal of factory effluents, prevention and control of pollution, maintenance of environmental and ecological balances, and utilization of by-products, if any.

7) Project Implementation Schedule - PERT or CPM Chart, if any, and monitoring arrangements for implementation of the project.

8) Technical collaboration arrangements, if any, terms of technology transfer, etc.

2.5 Social Cost Benefit Analysis (SCBA)

Q15. What is Social Cost Benefit Analysis ?

Ans : **(Oct.-22, Imp.)**

Social Cost Benefit Analysis (hereafter referred to as SCBA), called economic analysis, is a methodology developed for evaluating investment projects from the point of view of the society (or economy) as a whole. Used primarily for evaluating public investments (though it can be applied to both private and public investments), SCBA has received a lot of emphasis in the decades of 1960s and 1970s in view of the growing importance of public investments in many countries, particularly in developing countries, where governments have played a significant role in the economic development. SCBA is also relevant, to a certain extent, to private investments as these have now to be approved by various governmental and quasi-governmental agencies which bring to bear larger national considerations in their decisions.

In the context of planned economies, SCBA aids in evaluating individual projects within the planning framework which spells out national economic objectives and broad allocation of resources to various sectors. In other words, SCBA is concerned with tactical decision making within the framework of broad strategic choices defined by planning at the macro level. The perspectives and parameters provided by the macro level plans serve as the basis of SCBA which is a tool for analyzing and appraising individual projects.

Q16. Explain the rationale for Social Cost Benefit Analysis.

Ans :

In SCBA the focus is on the social costs and benefits of the project. These often tend to differ from the monetary costs and benefits of the project. The principal sources of discrepancy are:

1. Market imperfections
2. Externalities
3. Taxes and subsidies
4. Concern for savings

5. Concern for redistribution
6. Merit wants

1. Market Imperfections

Market prices, which form the basis for computing the monetary costs and benefits from the point of view of the project sponsor, reflect social values only under conditions of perfect competition, which are rarely, if ever, realized by developing countries. Where imperfections exist, market prices do not reflect social values.

The common market imperfections found in developing countries are: (i) rationing, (ii) prescription of minimum wage rates, and (iii) foreign exchange regulation. Rationing or a commodity means control over its price and distribution. The price paid by a consumer under rationing is often significantly less than the price that would prevail in a competitive market. When minimum wage rates are prescribed, the wages paid to labour are usually more than what the wages would be in a competitive labour market free from such wage legislations. The official rate of foreign exchange in most of the developing countries, which exercise close regulation over foreign exchange, is typically less than the rate that would prevail in the absence of foreign regulation. This is why foreign exchange usually commands a premium in unofficial transactions.

2. Externalities

A project may have beneficial external effects. For example, it may create certain infrastructural facilities like roads which benefit the neighbouring areas. Such benefits are considered in SCBA, though they are ignored in assessing the monetary benefits to the project sponsors because they do not receive any monetary compensation from those who enjoy this external benefit created by the project. Likewise, a project may have a harmful external effect like environmental pollution. In SCBA, the cost of such environmental pollution is relevant, though the project sponsors may not incur any monetary costs. It may be emphasised that externalities are relevant in SCBA because in such analysis all costs and benefits, irrespective to whom they accrue and whether they are paid for or not, are relevant.

3. Taxes and Subsidies

From the private point of view, taxes are definite monetary costs and subsidies are definite monetary gains. From the social point of view, however, taxes and subsidies are generally regarded as transfer payments and hence considered irrelevant.

4. Concern for Savings

Unconcerned about how its benefits are divided between consumption and savings, a private firm does not put differential valuation on savings and consumption. From a social point of view, however, the division of benefits between consumption and savings (which leads to investment) is relevant, particularly in the capital-scarce developing countries. A rupee of benefits saved is deemed more valuable than a rupee of benefits consumed. The concern of the society for savings and investment is duly reflected in SCBA wherein a higher valuation is placed on savings and a lower valuation is put on consumption.

5. Concern for Redistribution

A private firm does not bother how its benefits are distributed across various groups in the society. The society, however, is concerned about the distribution of benefits across different groups. A rupee of benefit going to an economically poor section is considered more valuable than a rupee of benefit going to an affluent section.

6. Merit Wants

Goals and preferences not expressed in the market place, but believed by policy makers to be in the larger interest, may be referred to as merit wants. For example, the government may prefer to promote an adult education programme or a balanced nutrition programme for school-going children even though these are not sought by consumers in the market place. While merit wants are

not relevant from the private point of view, they are important from the social point of view.

Q17. Explain the features of Social Cost Benefit Analysis.

Ans :

1. Assessing the desirability of projects in the public, as opposed to the private sector.
2. Identification of costs and benefits.
3. Measurement of costs and benefits.
4. The effect of (risk and uncertainty) time in investment appraisal.
5. Presentation of results– the investment criterion.

Q18. Explain the role of Social Cost Benefit Analysis in India.

Ans :

In India, SCBA of projects is carried out mainly by the Project Appraisal Division of Planning Commission and the Central financial institutions.

A) Project Appraisal Division

The Project Appraisal Division (PAD, hereafter) of the Planning Commission, set up in April 1972, was entrusted with the following functions:

1. To suggest standard formats for submission of projects and procedures for their techno-economic evaluation;
2. To conduct actual techno-economic evaluation of selected major projects and programmes posed to the Planning Commission;
3. To assist state government and central ministries in giving effect to standardized formats and procedures for project evaluation; and
4. To undertake and support research leading to progressive refinement of methodology and procedure of project evaluation.

The Project Appraisal Division follows a modified version of the L-M methodology. In order to eliminate the trade-offs between growth (efficiency) and equity, PAD divides investments into three categories:

(i) capital-intensive industrial projects,

(ii) infrastructural investments, and

(iii) agriculture, rural development and related projects. The procedure followed by PAD for evaluating capital intensive industrial projects is described briefly below:

Capital Intensive Industrial Projects

Efficiency is the key criterion in the evaluation of capital intensive industrial projects which represent about 20 per cent of the total projects appraised by PAD. The methodology followed for evaluating these projects is as follows:

1. All tradeable inputs and outputs are valued at border prices.
2. Transfer cost items (taxes, duties, etc.) are ignored.
3. All non-tradeable items, especially power and transport, are evaluated in terms of marginal cost.
4. Foreign exchange involved in the inputs and outputs are valued at specified premia.
5. Saving in domestic rupees rather than foreign exchange.

B) Central Financial Institution

The Central financial institutions ICICI, IFCI, and IDBI appraise investment proposals primarily from the financial point of view. However, in recent years they have recognized the need for scrutinizing projects from the larger social point of view. ICICI was perhaps the first financial institution to introduce a system of economic analysis as distinct from financial profitability analysis. IFCI adopted a system of economic appraisal in 1979. Finally, IDBI also introduced a system for economic appraisal of projects financed by them. Though there are some minor variations, the three institutions follow essentially a similar approach which is a simplified version of the L-M approach. The appraisal procedure followed by IDBI is described below:

IDBI, in its economic appraisal of industrial projects, considers three aspects:

(i) Economic rate of return

(ii) Effective rate of protection

(iii) Domestic resource cost

(i) Economic rate of return— The method followed by IDBI to calculate economic rate of return may be described as 'partial Little-Mirrlees' method because while international prices are used for valuation of tradeable inputs and outputs, L-M method is not followed in its entirety.

The significant elements of IDBI's method are described below:

(a) International prices are regarded as the relevant economic prices and, hence, it is necessary to substitute market prices with international prices for all non-labour inputs and outputs.

(b) For tradeable items, where international prices are directly available, CIF prices are used for inputs and FOB prices are used for outputs.

(c) For tradeable items where international prices are not directly available and for non-tradeable items (like electricity, transportation, etc.) social conversion factors are used to convert actual rupee cost into social cost. In some cases (like land) a social conversion factor is applied directly to the actual rupee cost. In other cases (like transport) the actual rupee cost is broken down into three components— tradeable component, labour component, and residual component— and these components are valued in social terms. Generally, the social cost of the tradeable component is obtained by multiplying it by a factor of 1/1.5; the social cost of labour component is obtained by multiplying it by a factor of 0.5 (shadow price of labour is considered to be 50 per cent of the actual); the social cost of the residual component is obtained by multiplying it by a factor of 0.5.

(ii) Effective rate of protection — The effective rate of protection (ERP) is calculated as follows:

$$\frac{\text{Value added at domestic prices - Value added at world prices}}{\text{Value added at world prices}} \times 100$$

(iii) Domestic resource cost — The domestic resource cost (DRC) is calculated as follows:

$$\frac{\text{Value added at domestic prices}}{\text{Value added at world prices}} \times \text{Exchange Rate}$$

Q19. What are the limitations of Social Cost Benefit Analysis.

Ans :

Limitation Of Social Cost-benefit Analysis

The nature of social benefits and costs are such that there cannot be any standard method or technique applicable to all types of investment projects. A bridge, a road, a housing colony, or an industrial project will each require a different approach while identifying and measuring its social benefits and costs. For one thing, 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 differ from case to case.

At another level too, 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. Even with honesty of purpose, assessment of social good and social evil is likely to be tained by the analyst's own ideas and subjective preferences and the resulting decision may not serve the socio-economic goals which might have been initially formulated.

Moreover, a successful application of the techniques of analysis depends upon the accuracy and reliability of forecasts. Even when 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. If all possible alternative investments are sought to be socially assessed, the costs would be prohibitive.

However, the limitations of analysis should not deter one from applying the techniques so far evolved. The element of subjectivity can be reduced by cross-checks. Even economic assessments suffer from certain drawbacks due to distortions in the price-mechanism caused by imperfections in the labour market, government controls, tariffs and quotas, and price inflation. Finally, while the limitations should not be ignored, it would be a folly to disregard the gains of social evaluation of investments.

2.6 PROJECT RISK ANALYSIS

Q20. Define project risk. What are the causes of project risk.

Ans : **(Oct.-22, Imp.)**

Meaning :

Every project is risky, meaning there is a chance, and things would not turn out exactly as planned. Project outcomes are determined by many things, some that are unpredictable and over which project managers have little control. Risk level is associated with the certainty level about technical, schedule and cost outcomes. High-certainty outcomes have low risk; low-certainty outcomes have high risk. Certainty derives from knowledge and experience gained in prior projects, as well as from management's ability to control project outcomes and respond to emerging problems.

In general, risk is a function of the uniqueness of a project and the experience of the project team. When activities are routine or have been performed many times before, managers can anticipate the range of potential outcomes and manipulate aspects of the system design and project plan to achieve the outcomes desired. When the project is unique or the team is inexperienced, the potential outcomes are more uncertain, making it difficult to know what could go wrong and how to avoid problems. Even in routine projects there is risk because outcomes may be influenced either by factors that are new and emerging or those beyond anyone's control.

The notion of project risk involves two concepts:

1) The likelihood that some problematical event will occur.

2) The impact of the event if it does occur.

Risk is a joint function of the two; i.e.,

Risk = f (likelihood, impact)

Given that risk involves both likelihood and impact, a project will be ordinarily considered risky whenever at least one factor either the likelihood or the impact is large. For example, a project will be considered risky where the potential impact is human fatality or massive financial loss even when the likelihood of either is small.

Though risk cannot be eliminated from projects, it can be reduced. That is the purpose of risk management.

Causes of Project Risks

1) **Wrong Decision**

Wrong decision of what to invest in.

2) **Wrong Timing**

Wrong timing of investments.

3) **Nature of Instruments**

Nature of instruments invested such as shares or bonds, chit funds, benefit funds are highly risky than bank deposits or P.O. Certificates etc.

4) **Creditworthiness of Issuer**

Securities of government and semi government bodies are more creditworthy than those issued by the corporate sector.

5) **Maturity Period or length of investment**

Longer the period, the more risky is the investment normally.

6) **Amount of Investment**

Higher the amount invested in any security the larger is the risk.

7) **Method of Investment**

Method of investment, namely, secured by collateral or not.

8) **Terms of lending**

Terms of lending such as periodicity of servicing, redemption periods etc

9) **Nature of Industry**

Nature of industry or business in which the company is operating.

10) **National and International Factors**

National and international factors, acts of god, etc.

Q21. Explain different types of project risk.

Ans :

Projects face various types of risks. Some important project risks are as under:

1) Resource Risk

Raw material, power, fuel, manpower, etc., are the resources used by a project. Shortage of raw material may lead to reduction in capacity utilization and higher cost of production, which will make all profitability estimates wrong. Similarly, shortage of power, fuel and shortage of skilled manpower will also jeopardize the project profitability calculations and the project may run the risk of not earning the estimated returns.

2) Price Risk

Price fluctuations of both inputs and outputs (i.e., raw material and finished products) affect the project. Unforeseen happenings such as Government's interventions in price fixation, ability of competitors to offer their product to customers at a comparatively cheaper price, etc., are likely to have an adverse effect.

3) Technology Risk

Technology risk may appear in two forms. A project that is based on unproven technology (i.e., a technology that is proved at laboratory level but not proved at commercial level) may have hidden defects which may make the project a non-starter. Rapid growth in technology may make a project obsolete in technology due to the evolution of latest technology.

4) Political Risk

The saying goes .... "Do not fight with King and God...." The King (i.e , the Government) acts as a watch dog of the country's economy and frames rules and regulations for regulating the country's economy. The Government intervenes in many forms such as levying and regulating taxes, regulating monopolistic trade practices, imposing import duties, promoting exports, prohibiting export of certain commodities, issuing import licenses, controlling foreign exchange transactions, price controls, expropriation, nationalization, etc. Political risk is a major risk since it cannot be predicted easily.

5) Interest Rate Risk

Fluctuations in interest rate may bring in an adverse effect.

For example, if a project is funded by way of long-term borrowings at a particular rate of interest and if the interest rate falls down subsequently, the project that availed long-term borrowing at a higher interest rate has to service the loan only at the higher rate of interest, unless it makes alternative arrangements to mobilize funds at the prevailing interest rate and swap the old borrowings which is a difficult proposition. New entrants who set up similar projects may have access to long-term loans at the prevailing rate of interest which may be cheaper. In such a situation, projects that were implemented with high-cost borrowings will find it difficult to compete with new entrants.

On the other hand, if the interest rate increases in future, the interest on working capital finance (which normally carries a floating interest rate) increases which will result in lower profit margins than estimated at the time of project appraisal. Interest rate risks can be managed to some extent by entering into interest rate hedging agreements like 'interest cap', 'interest swap', etc.

6) Market Risk

Market risk relates to features, to timing, to cost, or to almost any facet of the project. It can happen when long development efforts are initiated, during which time the problem to be solved changes, goes away, or is addressed by an unexpected new technology. It can happen because a satisfactory deliverable is brought to market a week after an essentially identical offering from a competitor. It can even result when a project produces exactly what was requested by a sponsor or economic buyer but that product is rejected by the intended end-user. Sometimes the people responsible for promoting and selling a good product do not (or cannot) follow through. Many paths can lead to a result that meets the specifications and is delivered on time and on budget, yet is never deployed or fails to achieve the expectations set at the beginning of the project.

The longer and the more complicated the project is, the greater the market risk tends to be. Project leaders contribute to the management of these risks through active, continuing participation in any market research and customer interaction and by frequently communicating with (ideally, without annoying) all the people surrounding the project who will be involved with deployment of the deliverable.

Market risk can be reduced by thoroughly and accurately defining needs and requirements at the start of the project, and continuously monitoring and updating requirements as needed throughout the project.

7) Exchange Rate Risk

Exchange rate risk (also called currency risk) is the risk arising from currency fluctuations. Volatile rates can reduce cost and productivity advantages gained over years of hard work. Firms exposed to international economy face this risk. When a firm has already committed to a foreign currency denominated transaction (i.e., the firm has entered into an agreement agreeing to make foreign currency denominated payments or agreeing to receive payments in foreign currency), the firm is exposed to exchange rate risk. The firm will incur loss if the exchange rate of the foreign currency has moved adversely and will earn profit if the exchange rate has moved favorably. Many exchange rate risk hedging tools such as forward cover, leads and lags, currency options, currency swaps, etc., are available which can be efficiently made use of to manoeuvre exchange rate risk.

8) Completion Risks

These are the risks that focus on the mobility of a project to get completed on time. A project may not get completed, because of technology failures, costs over-runs, force majeure or necessary variations. If the project is delayed, interest will mount up and perhaps not be covered by the projected cash flows. Project lenders will not be prepared to take non-recourse completion risks and require either a completion guarantee or a guarantee of the loans until completion provided by the project sponsors.

9) Permitting Risks

These risks are associated with official licenses and consents required for the project that have too many by-laws or are subjected to costly conditions, in terms of construction, environmental or extractive consents from the host government. Lenders may be reluctant to lend if the project gets blocked or delayed due to non-availability of a necessary permit. Hence, the important permits cannot left to be obtained later and must be settled-or completely assured - before non-recourse money is lent.

10) Environmental Risks

This contemplates such matters like pollution and clean-up costs on abandonment. These are difficult to meet completely but may be mitigated to some extent by an initial environmental audit and by insurance. But one cannot cover potential future legal changes in advance.

11) Insolvency Risks

They arise basically due to insolvency of contractors, project sponsors, suppliers, purchasers, even insurers or a syndicate bank. These risks are inherent to bank credits and are usually assessed by bankers while performing initial project assessment. It is the credit worthiness of sponsors that play a vital note in lending and borrowing. In general these risks are a feature of small scale projects but in the recent past, even public sector projects such as Vizag Steel Plant are confronted with these risks due to a variety of socio- economic reasons.

Q22. What are the factors determining project risk.

Ans :

Factors Considered in Project Management Risk

Managers are not merely content with measuring risk. They want to explore ways and means of mitigating risk.

These risk reduction strategies have a cost associated with them and whether they are profitable in a given situation will depend on circumstances.

1) Fixed and Variable Costs

A common way to modify the risk of an investment is to change the proportion of fixed and variable costs. For example, in the early 1980s Ford Motor Company restructured its operations. Essentially it decided to buy most of its components from outside suppliers instead of manufacturing them in-house. This decreased its fixed costs and increased its variable costs. The net effect was that its break-even level declined.

2) Pricing Strategy

Pricing strategy is used by many firms to manage risk. A lower price increases potential demand, but also raises the break-even level. This is the reason why publishers first bring out a hard-cover edition at a higher price and then introduce a soft-cover edition at a lower price.

3) Sequential Investment

If one is not sure about the market response to his product or service, he may start small and later expand as the market grows. This strategy may entail higher capital cost per unit because capacity is created in stages. However, it reduces risk exposure. He can employ decision tree analysis to hammer out the optimal sequence of investment in face of risk.

4) Improving Information

An African proverb says don't test the depth of a river with both feet. One may like to gather more information about the market and technology before taking the plunge. Additional study often improves the quality of forecasts but involves direct costs (the cost of the study) as well as opportunity costs of delayed action. He has to weigh the costs and benefits of further study and decide how much of additional information should be gathered.

5) Financial Leverage

Reducing the dependence on debt lowers risk. Debt entails a definite contractual commitment whereas equity carries no fixed burden. Hence if the operating risk of the project is high, it makes sense to go for a low level of financial leverage.

6) Insurance

An insurance cover against a variety of risks like physical damage, theft, loss of key person and so on can mitigate risk. Insurance is a pure antidote for such risks.

7) Long-Term Arrangements

One way to mitigate risk is to enter into long-term arrangements with suppliers, employees, lenders and customers. A long-term contract with suppliers ensures availability of inputs at a predictable price; a long-term wage contract with employees removes uncertainty about employee cost; a long-term debt contract reduces risk about interest rate; finally, a long-term sales contract with customers eliminates revenue risk.

Often long-term contracts are indexed. This means that the prices are periodically adjusted in line with the movement of some index which essentially reflects inflation. For example, a supply contract may have an escalator clause that links the supply price to some price index like the Wholesale Price Index. Price indexing protects both the buyer and the seller against inflation risk because indexing ensures that the real price (price in terms of purchasing power) is constant.

8) Strategic Alliance

When the resources required for a project or the risks inherent in a project are beyond the capacity of a single company, strategic alliance may be the way out. A strategic alliance, also referred to as a joint venture, represents a partnership between two or more independent companies which join hands to achieve a common purpose. It is usually organized as a newly created company, though the partners may choose any other form of organization. Typically, the partners partake in the equity of the common enterprise, contribute resources (technology, facilities, distribution networks, brands, key manpower and so on) and share management and control. The massive resource requirements and huge risks in modem enterprises have compelled many traditional rivals to work together. Competitors are beginning co-operate leading to a phenomenon called as 'co-optition'.

9) Derivatives

Derivative instruments like options and futures can be used for managing risk. An option gives its owner the right to buy or sell an underlying asset on or before a given date at a predetermined price. An option to buy is a call option. Options give flexibility which is very valuable in volatile markets. For example, a call option embedded in a debt instrument gives the issuing firm the right to prematurely redeem (buy back) the debt instrument at a certain price. Such an option is very valuable when the interest rate falls.

A futures contract is an agreement between two parties to exchange an asset for cash at a predetermined future date for a price that is specified today. Futures contracts eliminate price risk. For example, a refinery may buy an oil futures contract for its oil requirement. Doing so entitles die refinery to get delivery of oil at a specified future date at a price that is fixed today.

2.6.1 Stages of Project Risk Analysis

Q23. What are the various stages of Stages of Project Risk Analysis?

Ans :

Stages of Project Risk Analysis

Project risk analysis is the process through which perceived risk gets expression, preferably in numbers so that me same can be meaningfully incorporated in the decision-making process. Many techniques and approaches have been developed so far for meeting this purpose. This is a three stage process:

1) Identifying critical sources of risk;

2) Measuring the quantum of risk; and

3) Incorporating risk in decision-making.

This classification is made for easy understanding, but it is not strictly followed in many cases. Some techniques that help in identifying sources of risk may through their extension help in taking decision but without quantifying it. Some measures of risk are directly used for decision-making without actually incorporating risk in the analysis.

2.6.1.1 Identification of Critical Sources of Risk

Q24. Define Critical Sources of Risk. Explain the techniques of project risk analysis.

Ans :

Risk management is an integral part of the project management. Because, projects always go along with various kind of risks. Risk identification step of the risk management plays an important role by determining which risks are likely affect the project and documenting the characteristics of each. A project plan is a description and timetable of all of the research activities that are needed during the

life of a project The critical path is the shortest route through this list of activities from the start of a project to its completion. It is a concept that involves largely common sense and something we do routinely in our daily lives.

Critical path management is a way to help to define all the activities needed in a project, work out the duration of the project and identify the potential key risks. It is also very helpful for Pis in terms of transparency, and for communicating the project plan and activities where collaborators are dependent on each other .Prior knowledge of critical success factors, based on others experiences, may be taken as necessary input iri the identification of risk, but a method of systematic study is also available in sensitivity analysis.

Techniques of Project Risk Analysis

Many different techniques have been suggested and no single technique can be deemed as best in all situations. The variety of techniques suggested handling risk in capital budgeting fall into two broad categories:

1) Sensitivity Analysis
2) Scenario Analysis
3) Break-Even Analysis
4) Hillier Model
5) Mon74te Carlo Approach
6) Simulation Analysis
7) Decision Tree Analysis

Q25. Define sensitivity analysis. What are the advantages and disadvantages of sensitivity analysis?

Ans :

It is a technique that measures the change in the profitability of a project caused by changes in the factors that affect the cash inflows of the project. If a small change in one factor leads to a major change in the profitability of the proposed investment, the project is considered more sensitive to that factor; in other words, the project is more risky . Other things being equal, a project that is less sensitive is preferable to projects that are more sensitive. This is because a small change in a factor will affect a more sensitive project very much and may reduce the estimated profit or may even change the estimated profit into loss. Sensitivity of a project is checked by observing the resr of any measure of profitability (NPV, DSCR, BEP or any other measure) to changes in critical factors.

Sensitivity analysis provides the management the much needed information as to which are the critical factors that is prone to affect the profitability of the project.

Steps in Sensitivity Analysis

In the process of sensitivity analysis, generally the following steps are undertaken:

1) Setting up the relationship between the NPV/ IRR and the basic underlying factors (e.g., selling price, sales volume, life of the project, etc.
2) Estimating the range of variation and the most likely value of each of the basic underlying factors.
3) Studying the effect of variations in the basic variables on the NPV/IRR of the project.

Sensitivity analysis is also known as "what if' analysis and as a part of the analysis, the following questions may be answered:

1) What happens if there is decrease in the selling price of finished goods?
2) What would be the impact of increase in inflation on the profitability of the project?
3) What happens if there is increase in the cost of raw materials?
4) What would be the impact on cost of production if power tariff goes up?
5) What would be the total import cost of plant if there is increase in the import duty?

Thus, sensitivity analysis attempts to convert the profitability estimates into pessimistic estimates and evaluate whether the project is still worthwhile to be accepted. This analysis also suggests management the most sensitive factor in accepting a project.

Sensitivity analysis shows to what extent the viability of a project is influenced by variations, in major quantifiable variables.

Ways of Sensitivity Analysis

1) Accounting Break-Even Approach

In today's competitive marketplace, entrepreneurs need relevant, timely, and accurate information that will enable them to price their products and services competitively and yet be able to earn a fair profit. Break-even analysis supplies this information. Break-even analysis is a technique commonly used to assess expected product profitability. It helps to determine how many units must be sold in order to break-even at a particular selling price.

2) NPV Break Even Point Approach

The viability of projects is evaluated based on a comparison of its internal rate of return (FIRR and EIRR) to the financial or economic opportunity cost of capital. Alternatively, the project is considered to be viable when the Net Present Value (NPV) is positive, using the selected EOCC or FOCC as discount rate. Sensitivity and risk analyses, therefore, focus on analyzing the effects of changes in key variables on the project's IRR or NPV, the two most widely used measures of project worth.

3) Pay-Off Matrix Approach in Sensitivity Analysis:

The newsboy model, expressed as a pay-off matrix, enables inventory control managers to incorporate three important contingencies demand uncertainty, salvage value, and shortage cost in determining run size or purchase quantity. To use this model, managers had to learn to provide subjective probability distributions of demand as well as model formulation, model solution, and sensitivity analysis. Parallel analyses (business as usual versus the model) demonstrated higher profits for model-based decisions. In several product areas, model-based decisions are now business as usual.

Advantages of Sensitivity Analysis

1) It shows how robust or vulnerable a project is to changes in values of the underlying variables.
2) It indicates where further work may be done. If the net present value is highly sensitive to changes in some factor, it may be worthwhile to explore how the variability of that critical factor may be contained.
3) It is intuitively a very appealing as it articulates the concerns that project evaluators normally have.

Disadvantages of Sensitivity Analysis

1) It merely shows what happens to NPV when there is a change in some variable, without providing any idea of how likely that change will be.
2) Typically, in sensitivity analysis only one variable is changed at a time. In the real world, however, variables tend to move together.
3) It is inherently a very subjective analysis. The same sensitivity analysis may lead one decision-maker to accept the project while another may reject it.

Q26. Define decision tree analysis. Explain the steps involved in decision tree analysis.

Ans :

Decision tree approach is a graphical technique that can be used for analyzing the pros and cons of alternative decisions and choosing the best possible course of action. In real life situation, decisions are taken under conditions of uncertainty. In project management this is more so in view of the multiplicity of factors involved. A company, e.g., might have to decide whether to go for investment in a large plant or a small plant; whether to invest in a new venture or to acquire an existing company; whether to produce goods indigenously or to import from abroad, etc. Ali such decisions arc taken keeping various factors in mind. The point to be noted is that the factors that have a bearing on a project are not constants but are subject to variations. Hence, there is always an element of uncertainty' involved in any project decision.

A decision tree is a diagrammatic representation of the logical relationship between the different parts of a complex situation and the possible outcomes of different decisions.

Steps in Decision Tree Analysis

The key steps in decision tree analysis are:

1) Identifying the Problem and Alternatives:

To understand the problem and develop alternatives, information from different sources - marketing research, engineering studies, economic forecasting, financial analysis, etc., - has to be tapped. Imaginative effort must be made to identify the nature of alternatives that may arise as the decision situation unfolds itself and assess the kinds of uncertainties that lie ahead with respect to market size, market share, prices, cost structure, availability of raw material and power, technological changes, competitive action and governmental regulation.

Recognizing that risk and uncertainty are inherent characteristics of investment projects, persons involved in analyzing the situation must be encouraged to express freely their doubts, uncertainties and reservation and motivated to suggest contingency plans and identify promising opportunities in the emerging environment.

2) Delineating the Decision Tree:

The decision tree, exhibiting the anatomy of the decision situation, shows:

i) The decision points (also called decision forks) and the alternative options available for experimentation and action at these decision points.

ii) The chance points (also called chance forks) where outcomes are dependent on a chance process and the likely outcomes at these points.

The decision tree reflects in a diagrammatic form the nature of the decision situation in terms of alternative courses of action and chance outcomes which have been identified in the first step of the analysis.

3) Specifying Probabilities and Monetary Values for Outcomes:

Once the decision tree is delineated, the following data have to be gathered:

i) Probabilities associated with each of the possible outcomes at various chance forks, and

ii) Monetary value of each combination of decision alternative and chance outcome.

The probabilities of various outcomes may sometimes be defined objectively. For example, the probability of a good monsoon may be based on objective, historical data. More often, however, the possible outcomes encountered in real life are such that objective probabilities for them cannot be obtained. How can you, e.g., define objectively the probability' that a new product like an electric moped will be successful in the market? In such cases, probabilities have to be necessarily defined subjectively. This does not, however, mean that they are drawn from a hat. To be useful they have to be based on the experience, judgment intuition and understanding of informed and knowledgeable executives. Assessing the cash flows associated with various possible outcomes, too, is a difficult task. Again, the judgment of experts plays an important role.

4) Evaluating the Alternatives:

Once the decision tree is delineated and data about probabilities and monetary values gathered, decision alternatives may be evaluated as follows:

i) Start at the right-hand end of the tree and calculate the expected monetary value at various chance points that come first as we proceed leftward.

ii) Given the expected monetary values of chance points in step 1, evaluate the alternatives at the final stage decision points in terms of their expected monetary values.

iii) At each of the final stage decision points, select the alternative which has the highest expected monetary value and truncate the other alternatives. Each decision point is assigned a value equal to the expected monetary value of the alternative selected at that decision point.

iv) Proceed backward (leftward) in the same manner, calculating the expected monetary value at chance points, selecting the decision alternative which has the highest expected monetary value at various decision points, truncating inferior decision alternatives and assigning values to decision points, till the first decision point is reached.

Q27. What are the advantages and disadvantages of decision tree analysis?

Ans :

Advantages of Decision Trees Analysis

1) This approach clearly brings out the implicit assumption and calculations for all to see question and revise.

2) The decision tree allows a decision-maker to visualize assumptions and alternatives in graphic form, which is usually much easier to understand than the more abstract, analytical form.

Disadvantages of Decision Trees Analysis

1) It may be very difficult to apply decision tree approach to a project where the product or service is new and the firm has very little information on how the market will respond to it.

2) Decision trees are difficult to apply when investments are gradually made over a period of time rather than in a few well defined stages.

3) The decision tree diagrams can become more and more complicated as the decision-maker decides to include more alternatives and more variables and to look farther and farther in time.

4) The diagram itself quickly becomes cumbersome and calculations become very time consuming or almost impossible.

Q28. Define simulation. Explain the steps involved in simulation.

Ans :

A relatively simple application of simulation is to the evaluation of investment projects the returns from which are subject to a high level of uncertainty. Here, probability distributions are attached to a number of non-controllable exogenous variables which determine annual net cash flows, and synthetic sampling from these distributions is carried out on the computer, so as to generate the probability distribution of one or more financial performance criteria. This overall distribution (of, say, net present value or internal rate of return) is then presented to the decision-maker, perhaps with some summary information, to aid in making a project accept/reject decision.

This technique is known by a variety to names, including, venture analysis, risk simulation and Monte Carlo simulation. There is lack of agreement on the name, since in a general sense any method of measuring the risk of a project could be referred to as risk analysis. The term venture analysis is perhaps inappropriate, since in this context 'venture' is simply a synonym for 'project', though there is an implication that the project is a risky one. Risk simulation is in a sense an abbreviation of the concept of 'project performance simulation taking into account risk in cash flow variables'. The term Monte Carlo simulation or Monte Carlo method arises because of the historical association of gambling and roulette wheels, to which the generation of random values of cash flow variables is likened, with the city of Monte Carlo.

Thus, the Monte-Carlo method of simulation is a technique in which statistical distribution functions are created by using a series of random numbers. This method of simulation is generally used to solve problems which cannot be adequately represented by the mathematical models or where solution of the model is not possible by analytical method. This method of simulation yields a solution that converges to the optimal or correct solution as the number of simulated trials lead to infinity.

Steps of Monte-Carlo Simulation Method

For solving a problem through the Monte-Carlo method, the following steps are taken:

Step 1: Define the Problem

i) Identify clearly the objectives of the problem.

ii) Identify factors which have the greatest effect on the objectives.

Step 2: Construct the Model

i) Specify variables and parameters.

ii) Formulate appropriate decision rules.

iii) Identify the type of distribution to be used.

iv) Specify the manner in which time will change.

v) Define relationship between variables and parameters.

Step 3: Preparation of Model for Experimentation

i) Define starting conditions for simulation.

ii) Specify the number of runs for simulation.

Step 4: Execute Steps 1 to 3 and Experiment with the Model

i) Define a coding system and select a random number generator.

ii) Create the random numbers to be used in simulation.

iii) Associate the generated random numbers with the factors identified in step 1 and coded in step 4 (i).

Step 5:

Summarize and examine the results of step 4,

Step 6: Evaluate the results of simulation and select the best course of action.

Q29. What are the advantages and disadvantages of simulation ?

Ans :

Advantages of Monte Carlo Simulation

An increasingly popular tool of risk analysis, simulation offers certain advantages:

1) Its principal strength lies in its versatility. It can handle problems characterized by:

   i) Numerous exogenous variables following any kind of distribution, and

   ii) Complex interrelationships among parameters, exogenous variables, and endogenous variables.

   Such problems often defy the capabilities of analytical methods.

2) It compels the decision-maker to explicitly consider the interdependencies and uncertainties characterizing the project.

Disadvantages of Monte Carlo Simulation

Simulation, however, is a controversial tool which suffers from several shortcomings:

1) It is difficult to model the project and specify the probability distributions of exogenous variables.

2) Simulation is inherently imprecise. It provides a rough approximation of the probability distribution of net present value (or any other criterion of merit). Due to its imprecision, the simulated probability distribution may be misleading when a tail of the distribution is critical.

3) A realistic simulation model, likely to be complex, would most probably be constructed by a management scientist, not the decision-maker. The decision- maker, lacking understanding of the model, may not use it.

4) To determine the net present value in a simulation run the risk-free discount rats is used. This is done to avoid prejudging risk which is supposed to be reflected in the dispersion of the distribution of net present value. Thus the measure of net present value takes a meaning, very different from its usual one that is difficult to interpret.

2.6.1.2 Measuring of Risk

Q30. What are the different techniques involved in Measurement of Risk?

Ans :

Different types of techniques of measurement of risk are discussed below :

1) Range
2) Mean absolute deviation
3) Variance
4) Semi variance
5) Standard deviation
6) Coefficient of variation

1. Range

"Range is the difference between the highest and the lowest value in a series." This is the simplest absolute measure of dispersion.

Symbiolically : R = L – S

Where, R = Represent Range, L = Maximum (largest) value and S = Minimum (smallest) value

Coefficient of Range

To compare the series, the relative measure of dispersion is defined as :

$$\text{Coefficient of Range (C.R)} = \frac{\text{Largest Value - Smallest Value}}{\text{Largest Value + Smallest Value}} = \frac{L - S}{L + S}$$

Advantages of Range

1) "Range is the difference between the highest and the lowest value in a series." This is the simplest absolute measure of dispersion.

   Symbolically : R = L – S

   Where, R = Represent Range, L = Maximum (largest) value and S = Minimum (smallest) value

Coefficient of Range

To compare the series, the relative measure of dispersion is defined as :

$$\text{Coefficient of Range (C.R.)} = \frac{\text{Largest Value -Smallest Value}}{\text{Largest Value + Smallest Value}} = \frac{L - S}{L + S}$$

Advantages of Range

1) Range is the simplest measure of dispersion. It is simple to understand and easy to calculate. It is rigidly defined.
2) It gives a broad picture of the data that is; it gives the limit within which all of the items occur.

Disadvantages of Range

1) It gives importance to the two extreme values and is very much affected by the extreme items.
2) The range provides no information about the structure of the series.

3) Range is influenced very much by fluctuations of sampling.

4) Due to the above demerits/ disadvatages range is not a reliable measure of dispersion.

2. Mean Absolute Deviation (MAD)

A forecast error measure that is the average forecast error without regard to direction; calculated as the sum of the absolute value of forecast error for all periods divided by the total number of periods evaluated.

$$MAD = \frac{\text{Sum of the absolute value of forecast error for all periods}}{\text{Number of periods}} = \frac{\sum_{i=1}^{n}\left|\text{Forecasterror}_i\right|}{n}$$

$$= \frac{\sum_{i=1}^{n}\left|\text{Forested demand}_i - \text{actual demand}_i\right|}{n}$$

Where n is the number of periods.

3. Variance

Because absolute values are not conducive to easy manipulation, mathematicians developed an alternative mechanism for overcoming the zero - sum property of deviations from the mean. This approach utilizes the square of the deviations from the mean. The result is the variance, an important measure of variability.

The variance is the average of the squared deviations about the arithmetic mean for a set of numbers. The population variance is denoted by σ^2.

$$\text{Population variance, } \sigma^2 = \frac{\sum(x-\mu)^2}{N}$$

4. Semi variance

$$\text{Semi variance} = \sum_{j=1}^{k} P_j\left(R_j - \bar{R}\right)^2$$

Where,

j = set of values of random variables that are less than the expected value

k = number of outcomes which are less than the expected value

Semi variance considers only the downside deviations and hence is a measure of the downside risk of the expected return.

5. Standard Deviation

The standard deviation concept was introduced by Karl Pearson in 1823. It is by far the most important and widely used measure of studying dispersion. Its significance lies in the fact that it is free from those defects from which the earlier methods suffer and satisfies most of the properties of a good measure of dispersion. Standard deviation is also known as root mean square deviation for the reason that it is the square root of the mean of the squared deviation from the arithmetic mean. Standard deviation is denoted by the small Greek letter a (read as sigma).

If x is the mean of x_1, x_2, ..., x_n, then σ is defined by,

$$\sqrt{\left[\frac{1}{n}\left\{(x_1-\bar{x})^2+.....+(x_n-\bar{x})^2\right\}\right]}=\sqrt{\sum\frac{(x_1-\bar{x})^2}{n}}$$

Advantages of Standard Deviation

1) Standard Deviation is based on all the observations and is rigidly defined.

2) It is amenable to algebraic treatment and possesses many mathematical properties.

3) It is possible to calculate the combined standard deviation of two or more groups. This is not possible with any other measure.

4) It is less affected by fluctuations of sampling than most other measures of dispersion.

5) For comparing variability of two or more series, coefficient of variation is considered as most appropriate and this is based on S.D. and mean.

Disadvantages of Standard Deviation

1) It is not easy to understand and calculate.

2) It gives more weight to the extremes and less to the items nearer to mean. Since the squares of the deviation of bigger sizes would be proportionately greater than that which are comparatively small. The deviations 2 and 6 are in the ratio of 1:3, but their squares 4 and 36 would be in the ratio of 1:9.

6. Coefficient of Variation (Relative Dispersion)

Standard deviation is an absolute measure of dispersion. It is expressed in terms of units in which the original figures are collected and stated. The standard deviation of heights of students cannot be compared with the standard deviation of weights of students, as both are expressed in different units, i.e., heights in meters and weights in kilograms. Therefore, the standard deviation must be converted into a relative measure of dispersion for the purpose of comparison. The relative measure is known as the coefficient of variation.

The coefficient of standard deviation is multiplied by 100 gives the coefficient of variation. Symbolically :

Coefficient of variation (C.V.) = $\frac{\sigma}{\bar{X}} \times 100$

According to Karl Pearson, "Coefficient of variation is the percentage variation in mean, standard deviation being considered as the total variation in the mean," That is it shows trie relationship between the standard deviation and the mean expressed in terms of percentage."

2.6.1.3 Incorporating of Risk in Decision Making

Q31. What do you understand by Incorporating of Risk in Decision Making?

Ans :

Incorporating the problems of risk in decision making in the management of an organization is an important issue for any manager, especially for those in the security sector. Many of the decisions, including the strategic ones, made by people or organizations are complex and the expected outcomes are uncertain. This uncertainty stems from the limited possibility to take into account all influencing factors for these decisions or, in other words, the random nature of these factors. This often leads to situations where the

alcome is different from the a desired one. If the resources used m realize a decision are significant, then the deviations could cost a lot. This makes risk management an important process in any endeavour involving a great deal of resources. Obviously, managing risk in itself will rarely be an objective. The objectives will often be formulated as "getting the best out of the resources at our disposal." This implies that on the way to achieve an objective, all decisions have to consider the associated risk' (the level of uncertainty) In other words, the risk is a factor in decisions, which do not aim at the risk itself, i he question is "How can risk be taken in consideration in decision-making?" The answer to this question will depend on our understanding of risk, the complexity of the decision to be made, the level of formalization, the management practice / culture of the organization/ person, etc.

Q32. Explain different techniques of Incorporating of Risk in Decision Making?

Ans :

A) Payoff and Regret Models

A pay-off matrix is simply an organizational tool, arranging the NPVs for mutually exclusive policies with a shared uncertain variable. As seen in table, if after policy implementation the patients' illnesses prove to be less severe, yielding "low" medical benefits and NPV, the expanded clinic promotes efficiency, for the clinic NPV of $ 0.2 million is greater than the hospital NPV, -$11.65 million. The hospital, however, promotes efficiency if the medical benefits (and NPV) range from "likely" to "high" (for hospital NPVs ranging from $ 6.99 million to $ 44.27 million are greater than the expanded clinic's NPVs, $ 4 million to $ 14 million, respectively), if seeking the most efficient policy, the decision-maker must make a judgment.

Alternative decision rules can be applied to help the decision-maker weigh the uncertain trade-offs and select a policy promoting efficiency given the uncertainty. Each rule reflects a different decision-maker outlook toward uncertainty. The two policies' NPVs can be presented in a pay-off matrix (table) :

Table: Pay-Off Matrix (in Millions of Dollars)

Policy	Low NPV	Likely NPV	High NPV
New Hospital	–11.65	6.99	44.27
Clinic Expansion	0.2	4.0	14.0

The three most common decision rales are as follows:

1) Maximax Criterion:

Representing a highly optimistic perspective, the maximax criterion indicates the decision-maker should select the policy with the highest NPV, thus disregarding the uncertainty. (The criterion's name derives from the process of finding each policy's maximum NPV and choosing the one that is the largest - the maximum of the maximum.) Looking at table 6.2, the recommended policy is the new hospital with maximum NP V of $44.27 million. Observe that this criterion does not consider that the hospital's NPVs have the greater spread in value and that if the medical benefits reach their lower bound, a negative NPV results.

2) Maximin Criterion (Pay-Off Model):

This criterion is cautious, focusing solely on each policy's minimum NPV and selecting the maximum of these. As table shows, the expanded clinic is the preferred policy, for its minimum NPV ($0.2 million) is greater than the hospital's minimum (-$11.65 million). This criterion ignores the possibility that the medical benefits could be high or at the likely level While pessimistic in its outlook, this criterion may he useful when one policy has a possible outcome that is in some way catastrophic or

otherwise unacceptable. For example, for a private organization, the prospect that a policy might result in bankruptcy could be reason enough to omit the policy from further consideration. For the rainforest medical clinic, if the possibility of a public hospital generating a negative NPV is unacceptable, then the maximin criterion may be appropriate. In other situations, if one of the compared policies might have a catastrophic effect on human life or the natural environment, the decision choice might be resolved by applying the maximin criterion

3) Minimal Criterion (Regret Model):

Another cautious criterion, this focuses on the regrets of making a wrong decision. A regret is the loss in NPV from not making the best choice. Regrets are calculated by referring to the NPVs in the pay-off matrix (table) For example, S.F. medical benefits after policy implementation prove to be "low", in hindsight, expanding the clinic (with NPV of $ 0.2 million) would have been the best choice. If the clinic was expanded, there would be no (or zero) regret. However, if the hospital was built, a wrong choice would have been made, and the regret is the difference between the clinic and hospital NPVs (clinic NPV - hospital NPV). The regret is thus ($0.2 - (-$11.65)), or $11.85 million. Likewise, the regrets can be calculated in case the medical benefits are actually at the "likely" or "high" levels. In both of these circumstances, the hospital would have been the best choice. Thus, if the hospital was built, the regrets are zero, and if the clinic was expanded, the regrets are positive (hospital NPV - clinic NPV). The regrets are displayed in a regret matrix (table):

Table : Regret Matrix (in Millions of Dollars)

Policy	Low NPV: Regret	Likely NPV: Regret	High NPV: Regret
New Hospital	11.85	0	0
Clinic Expansion	0	2.99	30.27

The minimax regret criterion recommends finding each policy's maximum regret ($11.85 million for the hospital and $30.27 million for the expanded clinic) and selecting the minimum of these. Thus, the hospital is the preferred policy.

In this example, the hospital is recommended by both the optimistic maximax criterion (focusing only on the policies' highest NPVs) and the cautious minimax regret criterion (taking into consideration all NPVs). The expanded clinic is selected by the cautious maximin criterion, which looks only at the lowest NPVs and seeks to avoid the worst outcome. Of the three criteria, no single one is objectively superior Which one might be appropriate in a particular situation depends on the decision-maker's perception of uncertainty. Outlining the alternative rules and their respective policy recommendations illustrates several options for decision-making. This information can help the decision-maker to choose a policy while considering both efficiency and uncertainty.

If several mutually exclusive policy alternatives share a common uncertain variable, a selective sensitivity analysis can be performed for each alternative, with the calculated NPVs displayed in a pay-off matrix. Alternative decision rules, such as the maximax, maximin, or minimax regret criteria, can be applied to help to identify an appropriate policy in light of both efficiency and uncertainty considerations.

Cash flow Adjustments or Uncertainty Equivalent Method

Upto this point, risk has been incorporated into project appraisal by employing the risk adjusted discount rate. The projects expected cash flows were discounted using the RADR, where adjustments were made to the denominators of the NPV equation.

The Certainty Equivalent (CE) method is an alternative approach to incorporating risk into project analysis. This approach incorporates risk into the analysis by adjusting the expected cash flows rather than the discount rate. The CE approach thus involves adjustments to the numerator of the N PV equation.

The basic formula for the calculation of NPV using the certainty' equivalent method is:

$$NPV_{\alpha} = \sum_{t=1}^{n} \frac{b_t C_t}{(1+r)^t} - CO$$

Where,

NPV_{α} = Net present value calculated using the certainty equivalent approach.

C_t = expected (risky) net cash inflow in period t.

b_t certainty equivalent coefficient which converts the expected risky cash flows (C_t) into their perceived certainty equivalent values.

r = Risk-free rate (assumed to remain constant over the life of the project).

n = Number of years in the project's economic life.

CO = Capital outlay.

Compared to the basic NPV formula under certainty, the only difference in the certainty equivalent method's NPV formula is the term b_t. In the certainty equivalent method, the uncertain cash flows are first converted into their certainty equivalents using CE coefficients. These certainty equivalent cash flows are then discounted by a risk-free rate.

Estimation of CE Coefficients

The certainty equivalent coefficient b, ranges from 0 to 1. The greater the certainty of the expected cash flows, the higher the value of the CE coefficient. Conversely, the greater the uncertainty, the lower is the value of the coefficient. For example, 0.9 for a particular year's cash flow suggests a lower risk associated with that year's cash flow than does 0.2 for another year's cash flow. A value of 1 implies that there is no risk associated with that cash flow.

CE coefficients reflect subjective management perceptions of the degree of risk of the cash flows. In more formal words, they reflect the decision-makers' perception of the degree of risk associated with the forecasted cash flow distribution and their degree of aversion to perceived risk. The product of the expected cash flow and the coefficient b_t represents the amount that management would be willing to accept for certain in each year of the project's life as opposed to accepting the cash flow distribution and its associated risk. Thus, the values for b_t are essentially subjective and the management will determine these values based on their experience and expert knowledge.

Accept-Reject Decision

Finally, it has to be decided whether the project would be accepted or not. The decision-criterion here can either be the NPV method or the IRR method.

Using the NPV method, the proposal would be accepted if the NPV of the certainty-equivalent cash flow is positive, otherwise it would be rejected.

If the IRR method is employed, the internal rate of return (r), that equates the present value of certainty- equivalent cash inflows with the present value of the cash inflows, would be compared with the risk-free discount rate. As is the practice with this method, if the r exceeds the risk-free rate, the investment project would be accepted. If not, it would be rejected.

Advantage of Certainty Equivalent

The certainty equivalent approach is theoretically a superior technique over the risk adjusted discount rate approach, because it can measure risk more accurately.

Disadvantages of Certainty Equivalent

1) The procedure for reducing the forecasts of cash flows is implicit and likely to be inconsistent from investment to investment.

2) The forecaster, expecting the reduction that will be made in his forecasts, may inflate them in anticipation. This will no longer give forecasts according to 'best estimate'.

3) If the forecasts have to pass through several layers of management, the effect may be to greatly exaggerate the original forecast or to make it ultra conservative.

4) By focusing attention only on the gloomy outcomes, chances are increased for passing by some good investments.

Risk Adjusted Discount Rate or Adjustment in Discount Rate

Risk-adjusted Rate of Return or risk- adjusted discount rate (RADR) is a performance measure that adjusts for the initial risk an investor takes at the time of a purchase. Every investor works with risk, but if they can quantify it, they should be able to make more informed decisions about which risks are worth taking. Calculating risk-adjusted return enables investors to compare volatile stocks with steadier, lower-risk investments.

The risk - adjusted discount rate (RADR) approach is one of the simplest and most widely-used methods for incorporating risk into the capital budgeting decision. Under this method, the amount of risk inherent in a project is incorporated in the discount rate employed in the present value calculations. The relatively risky projects would have high discount rates and relatively safe projects would have relatively low discount rates.

Short Question & Answers

1. Project Planning.

Ans :

Planning is a process of deciding in advance about tasks and activities to be undertaken in future. Planning in business is the function of selecting enterprise objectives and establishing policies, procedures and programmes necessary for achieving them. Likewise, project planning may be described as the establishment of course of action for the project, within the forecasted environment. Main objective of 'project planning' is to define the work required to be done, so that each participant will be able to understand and carry out the role and work expected from him.

The projects generally are based upon inter-departmental and inter-functional cooperation. Project planning therefore, requires a deliberate effort to determine the job to be done, results expected, and the method to achieve the same. Thus, if a project is not planned properly it may face difficulties in implementation and this may result in time over-run and cost over-run.

Project planning is a common thread that intertwines all the activities from conception to commissioning and handing over the clockwork to clients. Project planning encompasses the essential activities such as work breakdown structure, statement of work and accurate time estimates and schedules which help further in anticipating snags in a project and overcome them. A plan is the first step in providing the means to satisfy the needs of a project sponsor and help in paving the way to reach desired goal. It is a beginning of the project manager's input to ensure that potential problems are identified timely and can easily be assessed on the basis of which further estimating and resource allocation may be comfortably done.

2. What is Project Appraisal?

Ans :

Project appraisal is the process of assessing and questioning proposals before resources are committed. It is an essential tool for effective action in community renewal. It's a means by which partnerships can choose the best projects to help them achieve what they want for their community.

But appraisal has been a source of confusion and difficulty for projects in the past. Audits of the operation of Single Project Budget schemes have highlighted concerns about the design and operation of project appraisal systems, including:

- Mechanistic, inflexible systems
- A lack of independence and objectivity
- A lack of clear definition of the stages of appraisal and of responsibility for these stages
- A lack of documentary evidence after carrying out the appraisal

3. Economic Appraisal.

Ans :

The need for economic analysis arises out of the fact that Higher Local Governments (HLGs) operate within limited resources. As a result, some difficult choices of where to commit limited resources from a large pool of deserving and competing priorities and needs must be made by HLG officials. The economic costs and benefits of a project are estimated through the application of a cost-benefit analysis, i.e. evaluating both the implicit and social cost-benefits of a project. For profit making projects, profitability tools like Net Present Value, Internal financial rate of return, Pay Back Period and Incremental Profit are used to estimate the viability of the project.

HLGs do not generally operate on profit motivation when considering projects; therefore, social cost-benefit analysis is most applicable for HLGs. In a cost benefit analysis, one must ask basic questions as to what costs and benefits should directly and indirectly accrue to the target beneficiaries in terms of

poverty reductions, enhanced savings, improved medical care, educational, water and health services.

The figure below illustrates the participatory process including especially the beneficiaries of medical, water and sanitation in the design and discussion of project formulation. The participatory process allows for more ideas to be incorporated into the project, and often increases the success of the project.

4. Financial Appraisal.

Ans :

Finance is one of the most important prerequisites to establish an enterprise. It is finance only that facilitates an entrepreneur to bring together the labour, machines and raw materials to combine them to produce goods. In order to adjudge the financial viability of the project, the following aspects need to be carefully analyzed :

- Cost of capital
- Means of finance
- Estimates of sales and production
- Cost of production
- Working capital requirement and its financing
- Estimates of working results
- Break-even point
- Projected cash flow
- Projected balance sheet.

The activity level of an enterprise expressed as capacity utilization needs to be well spelled out. However the enterprise sometimes fails to achieve the targeted level of capacity due to various business vicissitudes like unforeseen shortage of raw material, unexpected disruption in power supply, instability to penetrate the market mechanism etc.

5. Social Appraisal

Ans :

The validity of the planners' assumptions about the social conditions are tested through social analysis. Where necessary, adjustments should be made so that the project goals are expressed in terms that have more meaning for both the project population and the implementing agencies. Social analysis focuses on four areas indicated below;

- The social-cultural and demographic characteristics of the project population – its size and social structure, including ethnic, tribal and class composition
- How the project population has organized itself to carry out productive activities, including the structure of households and families, availability of labor, ownership of land, and access to and control of resources
- The project's cultural acceptability; in other words, its capacity both for adapting to and for bringing about desirable changes in people's behavior and in how they perceive their needs
- The strategy necessary to elicit commitment from the project population and to ensure their sustained participation from design through to successful implementation, operation and maintenance.

6. What is Project Feasibility ?

Ans :

Feasibility literally means whether some idea will work or not. It knows beforehand whether there exists a sizeable market for the proposed product/ service, what would be the investment requirements and where to get the funding from, whether and where from the necessary technical know-how to convert the idea into a tangible product may be available, and so on. In other words, feasibility study involves an examination of the operations, financial, HR and marketing aspects of a business on *ex ante* (before the venture comes into existence) basis.

Project feasibility analysis results in a reasonably adequate formulation of the project in terms of location, production technology, production capacity, material inputs, etc., and contains fairly specific estimates of project cost, means of financing, sales revenues, production costs, financial profitability and social benefits.

Various dimensions of project feasibility study are analyzed throughout different stages of feasibility study in varying degrees of detail, both separately and in relation to others. Thus, a multi-dimensional feasibility analysis is a vital exercise.

If a project is seen to be feasible from the results of the study, the next logical step is to proceed with it. The research and information uncovered in the feasibility study will support the detailed planning and reduce the research time.

7. Explain briefly about Technical feasibility.

Ans :

Technical appraisal of a project broadly involves a critical study of the following:

1) Appropriateness of the technology, the suitability of selected technical process under Indian conditions and arrangements made or proposed to be made therefore.

2) Scale of operations and whether the size of the unit would be adequate for economic and financial viability of the project.

3) Selection of the plant site in relation to load bearing capacity, flood and earthquake hazards, free access from public roads, satisfactory sources of raw materials, water, power and fuel as also transport facilities, availability of skilled labor, nearness to the market for finished products, etc.

4) Adequacy and suitability of the plant and equipment and their specifications, plant layout, reputation of machinery suppliers, balancing of different sections of the plant, proposed arrangements for procurement of plant and equipment, technical engineering services, etc.

5) Technical and executive management available during the implementation period and for operation of the project.

6) Arrangements for the disposal of factory effluents, prevention and control of pollution, maintenance of environmental and ecological balances, and utilization of by-products, if any.

7) Project Implementation Schedule - PERT or CPM Chart, if any, and monitoring arrangements for implementation of the project.

8) Technical collaboration arrangements, if any, terms of technology transfer, etc.

8. What is Social Cost Benefit Analysis ?

Ans :

Social Cost Benefit Analysis (hereafter referred to as SCBA), called economic analysis, is a methodology developed for evaluating investment projects from the point of view of the society (or economy) as a whole. Used primarily for evaluating public investments (though it can be applied to both private and public investments), SCBA has received a lot of emphasis in the decades of 1960s and 1970s in view of the growing importance of public investments in many countries, particularly in developing countries, where governments have played a significant role in the economic development. SCBA is also relevant, to a certain extent, to private investments as these have now to be approved by various governmental and quasi-governmental agencies which bring to bear larger national considerations in their decisions.

In the context of planned economies, SCBA aids in evaluating individual projects within the planning framework which spells out national economic objectives and broad allocation of resources to various sectors. In other words, SCBA is concerned with tactical decision making within the framework of broad strategic choices defined by planning at the macro level. The perspectives and parameters provided by the macro level plans serve as the basis of SCBA which is a tool for analyzing and appraising individual projects.

9. Explain the features of Social Cost Benefit Analysis.

Ans :

1. Assessing the desirability of projects in the public, as opposed to the private sector.

2. Identification of costs and benefits.

3. Measurement of costs and benefits.

4. The effect of (risk and uncertainty) time in investment appraisal.

5. Presentation of results– the investment criterion.

10. Causes of Project Risks.

Ans :

1) **Wrong Decision**

Wrong decision of what to invest in.

2) **Wrong Timing**

Wrong timing of investments.

3) **Nature of Instruments**

Nature of instruments invested such as shares or bonds, chit funds, benefit funds are highly risky than bank deposits or P.O. Certificates etc.

4) **Creditworthiness of Issuer**

Securities of government and semi government bodies are more creditworthy than those issued by the corporate sector.

5) **Maturity Period or length of investment**

Longer the period, the more risky is the investment normally.

6) **Amount of Investment**

Higher the amount invested in any security the larger is the risk.

7) **Method of Investment**

Method of investment, namely, secured by collateral or not.

8) **Terms of lending**

Terms of lending such as periodicity of servicing, redemption periods etc

9) **Nature of Industry**

Nature of industry or business in which the company is operating.

10) **National and International Factors**

National and international factors, acts of god, etc.

11. Stages of Project Risk Analysis

Ans :

Project risk analysis is the process through which perceived risk gets expression, preferably in numbers so that me same can be meaningfully incorporated in the decision-making process. Many techniques and approaches have been developed so far for meeting this purpose. This is a three stage process:

1) Identifying critical sources of risk;

2) Measuring the quantum of risk; and

3) Incorporating risk in decision-making.

This classification is made for easy understanding, but it is not strictly followed in many cases. Some techniques that help in identifying sources of risk may through their extension help in taking decision but without quantifying it. Some measures of risk are directly used for decision-making without actually incorporating risk in the analysis.

12. Define sensitivity analysis.

Ans :

It is a technique that measures the change in the profitability of a project caused by changes in the factors that affect the cash inflows of the project. If a small change in one factor leads to a major change in the profitability of the proposed investment, the project is considered more sensitive to that factor; in other words, the project is more risky . Other things being equal, a project that is less sensitive is preferable to projects that are more sensitive. This is because a small change in a factor will affect a more sensitive project very much and may reduce the estimated profit or may even change the estimated profit into loss. Sensitivity of a project is checked by observing the resr of any measure of profitability (NPV, DSCR, BEP or any other measure) to changes in critical factors.

Sensitivity analysis provides the management the much needed information as to which are the critical factors that is prone to affect the profitability of the project.

UNIT III

Project Finance

Project Cost Estimation, Project Financing- Investment Criteria, Project Evaluation Techniques- Pay Back Period, Accounting rate of return, Net present value, Internal Rate of return, Profitability Index, Cash Flows Estimation for new and replacement projects- Cost of Capital, Risk Analysis.

3.1 PROJECT FINANCE

Q1. What is Project Finance? Explain the evolution of Project Finance.

Ans :

Project finance is the long-term financing of infrastructure and industrial projects based upon the projected cash flows of the project rather than the balance sheets of its sponsors. Usually, a project financing structure involves a number of equity investors, known as 'sponsors'; a 'syndicate' of banks or other lending institutions that provide loans to the operation.

They are most commonly non-recourse loans, which are secured by the project assets and paid entirely from project cash flow, rather than from the general assets or creditworthiness of the project sponsors, a decision in part supported by financial modeling. The financing is typically secured by all of the project assets, including the revenue-producing contracts. Project lenders are given a lien on all of these assets and are able to assume control of a project if the project company has difficulties complying with the loan terms.

Generally, a special purpose entity is created for each project, thereby shielding other assets owned by a project sponsor from the detrimental effects of a project failure. As a special purpose entity, the project company has no assets other than the project.

Capital contribution commitments by the owners of the project company are sometimes necessary to ensure that the project is financially sound or to assure the lenders of the sponsors' commitment. Project finance is often more complicated than alternative financing methods. Traditionally, project financing has been most commonly used in the extractive (mining), transportation, telecommunications, power industries as well as sports and entertainment venues.

Evolution of Project Finance

Limited recourse lending was used to finance maritime voyages in ancient Greece and Rome. Its use in infrastructure projects dates to the development of the Panama Canal, and was widespread in the US oil and gas industry during the early 20th century. However, project finance for high-risk infrastructure schemes originated with the development of the North Sea oil fields in the 1970s and 1980s. Such projects were previously accomplished through utility or government bond issuances, or other traditional corporate finance structures.

Project financing in the developing world peaked around the time of the Asian financial crisis, but the subsequent downturn in industrializing countries was offset by growth in the OECD countries, causing worldwide project financing to peak around 2000. The need for project financing remains high throughout the world as more countries require increasing supplies of public utilities and infrastructure. In recent years, project finance schemes have become increasingly common in the Middle East, some incorporating Islamic finance.

The new project finance structures emerged primarily in response to the opportunity presented by long term power purchase contracts available from utilities and government entities. These long term revenue streams were required by rules implementing PURPA, the Policy resulted in further deregulation of electric generation and, significantly, international privatization following amendments to

the Public Utilities Holding Company Act in 1994. The structure has evolved and forms the basis for energy and other projects throughout the world.

Q2. Explain the importance of project finance.

Ans :

Project finance refers to the financing of long term infrastructure, industrial projects and public services based upon a non-recourse or limited recourse financial structure where project debt and equity used to finance the project are paid back from the cash flow generated by the project.

Project finance is used by private sector companies as a means of funding major projects off balance sheet. At the heart of the project finance transaction is the concession company, a special purpose Vehicle (SPV) which consists of the consortium shareholders who may be investors or have other interests in the project (such as contractor or operator). The SPV is created as an independent legal entity which enters into contractual agreements with a number of other parties necessary in the project finance deals.

The attractiveness of project finance is the ability to fund projected in the off balance sheet with limited or non-recourse to the equity investors i.e. if a project fails, the project lenders recourse is to ownership of the actual project and they are unable to pursue the equity investors for debt. For this reason lenders focus on the projects cash flow as the main source for repaying project debt.

Importance of Project finance

Project financing is being used throughout the world across a wide range of industries and sectors. This funding technique is growing in popularity as governments seek to involve the private sector in the funding and operation of public infrastructure.

Private sector investment and management of public sector assets is being openly encouraged by governments and multilateral agencies who recognize that private sector companies are better equipped and more efficient than government in developing and managing major public services.

Project finance is used extensively in the following sectors.

- Oil and gas
- Mining
- Electricity Generation
- Water
- Telecommunications
- Road and highways
- Railways and Metro systems
- Public services

Q3. Explain the source of project financing in India.

Ans :

The long-term sources of finance used for meeting the cost of project are referred to as the means of finance. To meet the cost of project, the following sources of finance may be available :

1. Equity Capital
2. Preference Capital
3. Debentures
4. Rupees term loans
5. Foreign currency term loans
6. Euro issues
7. Deferred credit
8. Bill rediscounting scheme
9. Suppliers line of credit
10. Seed capital assistance
11. Government subsidies
12. Sales tax deferment and exemption
13. Unsecured loans and deposits
14. Foreign currency loan
15. Lease and hire purchase finance
16. Public Deposit
17. Bank Credit

1. Equity Capital

This is the contribution made by the owners of business, the equity shareholders, who enjoy the rewards and bear the risks of ownership. However, their liabilities, limited to their capital contribution. From the point

of view of the issuing film, equity capital offers, two important advantages: (i) It represents permanent capital. Hence there is no liability for repayment. (ii) It does not involve any fixed obligation for payment of dividend. The disadvantages of raising funds by way of equity capital are : (i) The cost of equity capital is high because equity dividend are not tax-deductible expenses. (ii) The cost of issuing equity capital is high.

2. Preference Capital

A hybrid form of financing, preference capital partakes some characteristics of equity capital and some attributes of debt capital. It is similar, to equity capital because preference dividend, like equity dividend, is not a tax-deductible payment. It resembles debt capital because the rate of preference dividend is fixed. Typically, when preference dividend is skipped it is payable in future because of the cumulative feature associated with it. The near-fixity of preference dividend payment renders preference capital somewhat unattractive in general as a source of finance. It is, however, attractive when the promoters do not want a reduction in their share: share of equity and yet there is need for widening the net worth base (net worth consists of equity and preference capital) to satisfy the requirements of financial institutions. In addition to the conventional preference shares, a company may issue Cumulative Convertible Preference Shares (CCPS). These shares carry a dividend rate of 10 per cent (which; if unpaid, cumulates) and are compulsory convertible into equity shares between three and five years from the date of issue.

3. Debenture Capital

In the last few years, debenture capital has emerged as an important source for project financing. There are three types of debentures that are commonly used in India: Non- Convertible Debentures (NCDs), Partially Convertible Debentures (PCDs), and Fully Convertible Debentures (FCDs). Akin to promissory, NCDs are used by companies for raising debt that is generally retired over a period of 5 to 10 years. They are secured by a charge on the assets of the issuing company. PCDs are partly convertible into equity shares as per pre-determined terms of conversion. The unconverted portion of PCDs remains like NCDs. FCDs, as the name implies, are converted wholly into equity shares as per pre-determined terms of conversion. Hence FCDs may be regarded as delayed equity instruments.

4. Rupee Term Loans

Provided by financial institutions and commercial banks, rupee term loans which represent secured borrowings are a very important source for financing new projects as well as expansion, modernisation, and renovation schemes of existing units. These loans are generally repayable over a period of 8-10 years which includes a moratorium period of l-3 years.

5. Foreign Currency Terms Loans

Financial institutions provide foreign currency term loans for-meeting the foreign currency expenditures towards import of plant, machinery, equipment and also towards payment of foreign technical know-how fees. Under the general scheme, the periodical liability towards interest and principal remains in the currency/currencies of the loan/ s and is translated into rupees at the then prevailing rate of exchange for making payments to the financial institution. Apart from approaching financial institutions (which typically serve as intermediaries between foreign agencies and Indian borrowers), companies can directly obtain foreign currency loans from international lenders. More and more companies appear to be doing so presently.

6. Euro issues

Beginning with Reliance Industries' Global Depository Receipts issue of approximately $150 ml in May 1992, a number of companies have been making euro issues. They have employed two types of securities: Global Depository Receipts (GDRs) and Euroconvertible Bonds (ECBs).

Denominated in US dollars, a GDR is a negotiable certificate that represents the publicly traded local currency (Indian Rupee) equity shares of a non-US (Indian) company. (Of course, in. theory, a GDR may represent a debt security; in practice it rarely does so.) GDRs are issued by the Depository Bank (such as the Bank of New York) against the local currency shares (such as Rupee shares) which are delivered to the depository's local custodian banks. GDRs trade freely in the overseas markets.

A Euroconvertible Bond (ECB) is an equity-linked debt security. The holder of an ECB has the option to convert it into equity shares at a pre-determined conversion ratio during a specified period. ECBs are regarded as advantageous by the issuing company because (i) they carry a lower rate of interest compared to a straight debt security, (ii) they do not lead to dilution of earnings per share in the near future, and (iii) they carry very few restrictive covenants.

7. Deferred Credit

Many a time the suppliers of machinery provide deferred credit facility under which payment for the purchase of machinery is made over a period of time. The interest rate on deferred credit and the period of payment vary rather widely. Normally, the supplier of machinery when he offers deferred credit facility insists that the bank guarantee should be furnished by the buyer.

8. Bills Rediscounting Scheme

Operated by the IDBI, the bills rediscounting scheme is meant to promote the sale of indigenous machinery on deferred payment basis. Under this scheme, the seller realises the sale proceeds by discounting the bills or promissory notes accepted by the buyer with a commercial bank which in turn rediscounts them with the IDBI. This scheme is meant primarily for balancing equipments and machinery required for expansion, modernisation, and replacement schemes.

9. Suppliers' Line of Credit

Administered by the ICICI, the Suppliers' Line of Credit is somewhat similar to the IDBI's Bill Rediscounting Scheme. Under this arrangement, ICICI directly pays to the machinery manufacturer against usance bills duly accepted or guaranteed by the bank of the purchaser.

10. Seed Capital Assistance

Financial institutions, through what may be labelled broadly as the 'Seed Capital Assistance scheme, seek to supplement the resources of the promoters and of medium scale industrial units which are eligible for assistance from All-India financial institutions and/ or state-level financial institutions. Broadly three schemes have been formulated:

(i) Special Seed Capital Assistance Scheme The quantum of assistance under this scheme is Rs 0.2 million or 20 per cent of the project cost, whichever is lower. This scheme is administered by the State. Financial Corporations.

(ii) Seed Capital Assistance Scheme The assistance order this scheme is applicable to projects costing not more then Rs 20 million. The assistance per project is restricted to Rs 1.5 million. The assistance is provided by IDBI through state level financial institutions. In special cases, the IDBI may provide the assistance directly.

(iii) Risk Capital Foundation Scheme Under this scheme, the Risk Capital Foundation, an autonomous foundation set up and funded by the IFCI, offers assistance to promoters of projects costing between Rs 20 million and Rs 150 million. The ceiling on the assistance provided between Rs 1.5 million and Rs 4 million depending on the number of applicant promoters.

11. Government Subsidies

Previously the central government as well as the state governments provided subsidies to

industrial units located in backward areas. The central subsidy has been discontinued but the state subsidies continue. The state subsidies vary between 5 per cent to 25 per cent of the fixed capital investment in the project, subject to a ceiling varying between Rs 0.5 million and Rs 2.5 million depending on the location.

12. Sales Tax. Deferments and Exemptions

To attract industries, the states provide incentives, inter alia, in the form of sales tax deferments and sales tax exemptions. Under the sales tax deferment scheme, the payment of sales tax on the sale of finished goods may be deferred for a period ranging between five to twelve years. Essentially, it implies that the project gets an interestfree loan, represented by the quantum of sales tax deferred, during the deferent period.

Under the sales tax exemption scheme, some states exempt the payment of sales tax applicable on purchases of raw materials, consumables, packing, and processing materials from within the state which are used for manufacturing purposes. The period of exemption ranges from three to nine years depending upon the state and the specific location of the project within the state.

13. Unsecured Loans and Deposits

Unsecured loans are typically provided by the promoters to fill the gap between the promoters' contribution required by financial institutions and the equity capital subscribed by the promoters. These loans are subsidiary to the institutional loans. The rate of interest chargeable on these loans is less than the rate of interest on the institutional loans. Finally these loans cannot be taken back without the prior approval of financial institutions.

Deposits from public, referred to as public deposits, represent unsecured borrowing of two to three years' duration. Many existing companies prefer to raise public deposits instead of term loans from financial institutions because restrictive covenants do not accompany public deposits. However, it may not be possible for a new company to raise public deposits. Further, it maybe difficult for it to repay public deposits within three years.

14. Foreign Currency Loans

Apart from rupee term loans, financial institutions provide foreign currency loans. This assistance is now provided only for the import of capital equipment (as per the liberalised exchange risk management system, foreign currency required for other purposes has to be purchased from authorised dealers at market rates). On foreign currency loans sanctioned under the general scheme, the interest rate charged is typically a floating rate as determined by the lenders, (the foreign agency that has given a line of credit to the financial institution for onward lending) and the risk of exchange rate fluctuation is born by the borrower. On foreign currency loans sanctioned under the Exchange Risk Administration Scheme, the principal repayment obligations of the borrower are rupee tied at the rate of exchange prevailing on the dates of disbursement. On such rupee-tied loan liability, the borrower pays by way of servicing his loan a composite, cost every quarter. The composite cost consists of three elements:

(i) the interest portion which is arrived on the basis of the weighted average interest cost of the various components of the currency pool,

(ii) the spread of the financial institutions, and

(iii) the exchange risk premium. The 'composite cost' is a variable rate determined at six-monthly intervals. It has a floor and a cap. Both the floor and the cap as well as the rate of interest applicable for the period is reviewed and announced from time to time.

15. Leasing and Hire Purchase Finance

With the emergence of scores of finance companies engaged in the business of leasing and hire purchase finance, it may be possible

to get a portion, albeit a small portion, of the assets financed under a lease or a hire purchase arrangement. Typically, a project is financed partly by financial institutions and partly through the resources raised from the capital market. Hence, in finalising the financing scheme for a project, you should bear in mind the norms and policies of financial institutions and the guidelines of Securities Exchange Board of India and the requirements of the Securities Contracts Regulation Act (SCRA).

16. Public Deposit

Public deposits have been a peculiar feature or industrial finance in India. Companies have been receiving public deposits for a long time in order to meet their medium-term and long-term requirements for finance. This system was very popular in the cotton textile mills or Bombay, Ahmedabad and Sholapur and in the tea gardens or Assam and Bengal. In recent years, the method or raising finance through the public deposits has again become popular for various reasons. Rates or interest offered by the companies are higher than those offered by banks. At the same time the cost of deposits to the company is less than the cost or borrowings from banks.

While accepting public deposits, a company must follow the provisions or the companies Act and the directions issued by the Reserve bank of India. According to the companies (Acceptance of Deposits Rules, 1975 as amended in 1984) Act, no company can receive secure and unsecured deposits in excess of 10% and 25% respectively of paid up share capital plus free reserves. The Central Government has laid down that no company shall invite a deposit unless an advertisement, including a statement showing the financial position of the company, has been issued in the prescribed form. Under the new rule, deposits can be renewed. The rate of interest payable on deposits must not exceed 15% per annum. In order to repay the deposits maturing in a particular year, the company must deposit 110% or the deposits with a scheduled bank or in specified securities.

17. Bank Credit

Commercial banks in the country serve as the single largest source or shortterm finance to business firms. They provide it in the form of Outright Loans. Cash credit, and Lines of Credit.

3.1.1 Project Cost Estimation

Q4. What is Project Cost Estimation? Explain the factors contributing project cost estimation.

Ans :

Project cost estimating scares a lot of people. They don't know how much something will cost, but they know whatever value they give, they will be held to it by their manager. The challenge with estimating is that it always involves some uncertainty. Some of the factors that contribute to this uncertainty include...

Factors

- **Experience with Similar Projects**

  The less experience you have with similar projects, the greater the uncertainty. If you've managed similar projects, you will be able to better estimate the costs of the project.

- **Planning Horizon**

  The longer the planning horizon, the greater the uncertainty. The planning horizon you are considering may be the whole project or just a certain phase. Either way, you will be able to better estimate costs for the time periods that are closer to the present.

- **Project Duration**

  The longer the project, the greater the uncertainty. This is similar to planning horizon in the sense that if a project is of a shorter duration you are more likely to account for most of the costs.

- **People**

  The quantity of people and their skill will be a huge factor in estimating their costs. Early in the project, you may not even know the specific people that will be on the project. That will increase the uncertainty of your cost estimates.

Q5. Explain the Tools and Techniques of Cost Estimates.

Ans :

Fortunately, there are some tools and techniques used by professional project managers that you can use to develop more accurate cost estimates.

Expert Judgment

Expert judgment uses the experience and knowledge of experts to estimate the cost of the project. This technique can take into account unique factors specific to the project. However, it can also be biased.

Analogous Estimating

Analogous estimating uses historical data from similar projects as a basis for the cost estimate. The estimate can be adjusted for known differences between the projects. This type of estimate is usually used in the early phases of a project and is less accurate than other methods.

Parametric Estimating

Parametric estimating uses statistical modeling to develop a cost estimate. It uses historical data of key cost drivers to calculate an estimate for different parameters such as cost and duration. For example, square footage is used in some construction projects.

Bottom-Up Estimating

Bottom-up estimating uses the estimates of individual work packages which are then summarized or "rolled up" to determine an overall cost estimate for the project. This type of estimate is generally more accurate than other methods since it is looking at costs from a more granular perspective.

Three-Point Estimates

Three-point estimates originated with the Program Evaluation and Review Technique (PERT). This method uses three estimates to define an approximate range for an activities cost: Most Likely (Cm), Optimistic (Co), and Pessimistic (Cp). The cost estimate is calculated using a weighted average: Cost Estimate = (Co + 4Cm + Cp)/6

Reserve Analysis

Reserve analysis is used to determine how much contingency reserve, if any, should be allocated to the project. This funding is used to account for cost uncertainty.

Cost of Quality

Cost of Quality (COQ) includes money spent during the project to avoid failures and money spent during and after the project due to failures. During cost estimation, assumptions about the COQ can be included in the project cost estimate.

Project Management Estimating Software

Project management estimating software includes cost estimating software applications, spreadsheets, simulation applications, and statistical software tools. This type of software is especially useful for looking at cost estimation alternatives.

Vendor Bid Analysis

Vendor analysis can be used to estimate what the project should cost by comparing the bids submitted by multiple vendors.

Using some of these tools and techniques when you're planning your project can help with your project budgeting.

3.1.2 Project Financing

Q6. What is Project Financing?

Ans : **(Oct.-22, Imp.)**

Project Financing is Loan arrangement in which the repayment is derived primarily from the project's cash flow on completion, and where the project's assets, rights, and interests are held collateral.

Project finance is only possible when the project is capable of producing enough cash to cover all operating and debt-servicing expenses over the whole tenor of the debt. A financial model is needed to assess economic feasibility of the project.

Model's output is also used in structuring of a project finance deal. Most importantly, it is used to determine the maximum amount of debt the project company can have and debt repayment profile, so that in any year the Debt Service Coverage Ratio (DSCR) should not exceed a predetermined level. DSCR is also used as a measure of riskiness of the project and, therefore, as a determinant of interest rate on debt. Minimal DSCR set for a project depends on riskiness of the project, i.e. on predictability and stability of cash flow generated by it. As a rule of thumb, DSCR should not be less than 1.60. However, in some cases (such as power plant projects with strong off-take agreements) it could be set at as low as 1.05.

3.2 Investment Criteria

Q7. What do you mean by Investment Criteria?

Ans :

There are several criteria that have been suggested by economists, accountants, and others to judge the worthwhileness of capital projects. More than thirty criteria have been proposed, in the extensive literature on this subject. Some are general and applicable to a wide range of investments; others are specialised and suitable for certain types of invest-ments and industries.

The important investment criteria, classified into two broad categories discounting criteria and non-discounting criteria .

3.2.1 Project Evaluation Techniques

3.2.1.1 Payback Period

Q8. Define Payback Period. What are the advantages and disadvantages of Payback Period?

Ans :

The payback period is defined as the number of years required for the proposal's cumulative cash inflows to be equal to its cash outflows. In other words, the payback period is the length of time required to recover the initial cost of the project. The payback period therefore, can be looked upon as the length of time required for a proposal to 'break even' on its net investment.

Calculation of the Payback Period

The payback period can be calculated in two different situations:

1. When Annual Inflows are Equal

When the cash inflows being generated by a proposal are equal per time period, i.e., the cash inflows are in the form of an annuity, the payback period can be computed by dividing the cash outflow by the amount of annuity.

2. When the Annual Cash Inflows are Unequal

In case the cash inflows from the proposal are not in annuity form then the cumulative cash inflows areaised to compute the payback period.

Advantages of Payback Method

Following are the advantages of payback methods:

1. Simple to Operate

The payback period is simple and easy, in concept as well as in its applications. In particular, it can be adopted by a small firm having limited man-power which does not have any special skill to apply other sophisticated techniques.

2. Liquidity Indication

It gives an indication of liquidity. In case a firm is having liquidity problems, then the payback period is a good method to adopt as it emphasizes the earlier cash inflows.

3. Risk of Obsolescence High

In a broader sense, the payback period deals with the rijsk also. The project with a shorter payback period will be less risky as compared to project with a longer payback period, as the cash inflows which arise further in the future will be less certain and hence more risky. So, the payback period helps in weeding out the risky proposals by assigning lower priority.

Disadvantages of Payback Method

Following are the disadvantages of payback methods:

1. Ignores Cash Inflows

The payback period entirely ignores many of the cash inflows which occur after the payback period. This could be misleading and could lead to discrimination against the proposal which generates substantial cash inflows in later years. It ignores what happens after the initial investment is recouped.

2. Equal Weightage to all Cash Flows

It ignores the timing of the occurrence of the cash flows. It considers the cash flows occurring at different point of time as equal in money worth and ignores the time value of money. It gives equal weights to all the cash flows before the payback date and no weight at all to cash flows occurring thereafter.

3. Ignores Salvage Value

The payback period also ignores the salvage value and the total economic life of the project. A project which has substantial salvage value may be ignored (though more profitable it may be otherwise) in favour of a project with higher inflows in earlier years. It is insensitive to the economic life span and thus not a truly meaningful criterion for determining the economic viability of a proposal. The speed with which the initial investment is recovered is not a sufficient way to appraise the profitability.

4. Method of Capital Recovery

The payback period is more a method of capital recovery rather than a measure of profitability of a project. To recover the capital is not enough, of course, because from an eco-nomic view point one would hope to earn a profit on the funds while they are invested.

3.2.1.2 Accounting Rate of Return

Q9. Define Accounting / Average Rate of Return. What are the advantages and disadvantages of Accounting / Average Rate of Return ?

Ans :

According to this method, the capital investment proposals are judged on the basis of their relative profitability. For this purpose, capital employed and related income is determined according to commonly accepted accounting principles and practices over the entire economic life of the project and then the average yield is calculated. Such a rate is termed as Accounting Rate of Return.

The ARR is also known as Return on Investment (ROI). It is the ratio of average after tax profit to average investment.

Calculation of ARR

$$\boxed{ARR = \frac{\text{Average Annula Profit after Tax}}{\text{Average or Initial Investment}} \times 100} = \frac{\text{Average EBIT } (1-t)}{\text{Average Investment}} \times 100$$

Where,

$$\text{Average Investment} = \frac{\text{Initial Investmet} + \text{Salvage Value}}{2}$$

(or)

$$\frac{\text{Initial investment} - \text{Scrap value}}{2} + \text{Addl.net working capital} + \text{Scrap value}$$

Advantages of Average Rate of Return Method

The advantages of average rate of return method are as follows:

1. Easy to Calculate

It is easy to calculate because it makes use of readily available accounting information. In contrast, discounted cash flow technique involves tedious calculations.

2. Considers Entire Cashflows

It takes into consideration the entire cash inflows during the project life. Payback Method does not use the entire stream of incomes.

3. Based on Financial Data

As this method is based upon accounting concept of profits, it can be readily calculated from the financial data.

Disadvantages of Average Rate of Return Method

The disadvantages of average rate of return method are as follows:

1. Ignores Time Value of Money

If we use ARR to compare two projects having equal initial investments. The project which has higher annual income in the latter years of its useful life may rank higher than the one having higher annual income in the beginning years, even if the present value of the income generated by the latter project is higher.

2. Cost of Project cannot be Determined Accurately

Future sales and anticipated cost of project over a long period cannot be determined accurately because they are influenced by a large number of outside factors.

3. Used as the Only Way to Appraise a Project

It can not be used as the only way to appraise a project. The net present value should be also calculated as calculating only the return of a project can give a distorted image when projects that have significantly different capital expenditure are compared.

4. Uses Only Accounting Figures

It uses accounting figures which can be affected by judgment, accounting policies and non cash items (depreciation).

5. Problem of Comparability

There are two ways to calculate the accounting rate of return which causes a problem of comparability.

PROBLEMS

1. A project proposal requires a cash outflow of `1,00,000 and yield an annual cash inflows of `18,500/- for next 7 years. Calculate PBP for a given project.

Sol :

$$\boxed{\text{PBP} = \frac{\text{Initial Investment}}{\text{Annual Cash Inflow}}}$$

$$\Rightarrow \quad \frac{1,00,000}{18,500} = 5.4 \text{ years}$$

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2. A project proposed requires cash outlay of `19,000/- and is expected to generate cash inflows of `8,000/-, 6,000/-, 4,000/-, 2,000/- and 4,000/- over next 5 years. Calculate PBP for the given projects.

Sol :

In a given problem the cash inflows are unequal so PBP -

$$\boxed{\text{PBP} = \text{Base year} + \frac{\text{Required CFAT}}{\text{Next year CFAT}}}$$

Year	CFAT	Cumulative CFAT
1	8,000	8,000
2	6,000	14,000
3	4,000	18,000
4	2,000	20,000
5	4,000	24,000

$$\text{PBP} = 3 + \frac{1000}{2000} = 3.5 \text{ years}$$

Acceptance Rule for PBP

Many firms use the PBP as an accept or reject criteria as well as a method of ranking the projects. If the PBP is calculated for a project is less than the std PBP set by the management then such project would be accepted.

If the PBP is more than the std once such project would be rejected.

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3. Calculated PBP for the following projects each project requires initial cash outlay of Rs. 1,00,000/-. If std PBP is 5 years. Suggest which project should be accepted?

Year	Cash inflows		
	A	B	C
1	30,000	30,000	10,000
2	30,000	40,000	20,000
3	30,000	20,000	40,000
4	30,000	20,000	40,000
5	30,000	5,000	–

Sol :

Project A

Year	CFAT
1	30,000
2	30,000
3	30,000
4	30,000
5	30,000

$$PBP = \frac{\text{Initial Investment}}{\text{Annual Cash Inflow}}$$

$$\Rightarrow \frac{1,00,000}{30,000} \Rightarrow 3.3 \text{ years}$$

Project B

Year	CFAT	Cumulative CFAT
1	30,000	30,000
2	40,000	70,000
3	20,000	90,000
4	20,000	1,10,000
5	5,000	1,15,000

$$PBP = \text{Base year} + \frac{\text{Required CFAT}}{\text{Next year CFAT}} \Rightarrow 3 + \frac{10,000}{20,000}$$

$\Rightarrow$ 3 + 0.5 = 3.5 years

Project C

Year	CFAT	Cumulative CFAT
1	10,000	10,000
2	20,000	30,000
3	40,000	70,000
4	40,000	1,10,000
5	–	1,10,000

$$PBP = \text{Base year} + \frac{\text{Required CFAT}}{\text{Next year CFAT}}$$

$$\Rightarrow 3 + \frac{30,000}{40,000}$$

$\Rightarrow$ 3 + 0.75 = 3.75 years

Conclusion

In a given problem the std PBP for all projects is 5 years. All the 3 projects having less PBP when compared to the std PBP. So, all the 3 projects are acceptable. To rank the projects "Project A" is given 1st priority, as its PBP is less than the other 2 projects B and C.

4. The following details related to 3 mutually exclusive projects. Find PBP for all the 3 projects. The std PBF is 3 years. Suggest the Management which project should be acceptable. The initial cash outlay of each project is `1,00,000/-

Year	Cash Inflows		
	A	B	C
1	30,000	30,000	40,000
2	30,000	50,000	50,000
3	30,000	40,000	10,000
4	30,000	20,000	20,000
5	30,000	10,000	20,000

Sol :

Project A

Year	CFAT
1	30,000
2	30,000
3	30,000
4	30,000
5	30,000

$$PBP = \frac{\text{Initial Investment}}{\text{Annual Cash Inflow}} \Rightarrow \frac{1,00,000}{3} \Rightarrow 3.3 \text{ years}$$

Project B

Year	CFAT	Cumulative CFAT
1	30,000	30,000
2	50,000	80,000
3	40,000	1,20,000
4	20,000	1,40,000
5	10,000	1,50,000

$$PBP = \text{Base year} + \frac{\text{Required CFAT}}{\text{Next year CFAT}} \Rightarrow 2 + \frac{20,000}{40,000}$$

$PBP \Rightarrow 2 + 0.5 = 2.5$ years

Project C

Year	CFAT	Cumulative CFAT
1	40,000	40,000
2	50,000	90,000
3	10,000	1,00,000
4	20,000	1,20,000
5	20,000	1,40,000

∴ The total/initial cash outlay is 1,00,000. We are recovering total amount of 1,00,000 in 3rd year.

∴ PBP = 3 yrs.

As project 'B' is have less PBP, it should be acceptable.

5. A project requires an investment of `6,00,000 and has a scrap value of `30,000 after 4 years. It is expected to yield profits after depreciation and taxes during the four years amounting to `40,000, `60,000, `50,000 and `30,000. Calculate ARR on the investment.

Sol :

Total profits = 40,000 + 60,000 + 50,000 + 30,000

= 1,80,000

$$\text{Average profit} = \frac{1,80,000}{4} = 45,000$$

$$\text{Average investment} = \frac{6,00,000 - 30,000}{2} = 2,85,000$$

$$\text{ARR} = \frac{45,000}{2,85,000} \times 100 = 15.8\%$$

3.2.1.3 Net Present Value

Q10. Define Net Present Value. Explain advantages and disadvantages of NPV.

Ans : **(Oct.-22, Aug.-21, Imp.)**

The cash inflow in different years are discounted (reduced) to their present value by applying the appropriate Miscount factor or rate and the gross or total present value of cash flows of different years are ascertained. The total present value of cash inflows are compared with present value of cash outflows (cost of project) and the net present value or the excess present value of the project and the difference between total present value of cash inflow and present value of cash outflow is ascertained.

Calculation of NPV

The following four steps constitute a net-present-value analysis of an investment proposal:

1. Prepare a table showing the cashflows during each year of the proposed investment.

2. Compute the present value of each cashflow, using a discount rate that reflects the cost of acquiring investment capital. This discount rate is often called the hurdle rate or minimum desired rate of return.
3. Compute the net present value, which is the sum of the present values of the cashflows.
4. If the Net Present Value (NPV) is equal to or greater than zero, accept the investment proposal. Otherwise, reject it.

The present value of ?1 due in any number of years can be found with the use of the following mathematical formula:

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

Where, PV = Present Value; r = Rate of interest/discount rate; n = Number of years

Net present value gives explicit consideration to the time value of money; it is considered a sophisticated capital budgeting technique. All such techniques in one way or another, discount the firm's cash flowsat a specified rate. This rate often called the discount rate, required return, cost of capital, or opportunity cost is the minimum return that must be earned on a project to leave the firm's market value unchanged.

The NPV is found by subtracting the present value of project's cash outflows (CF_0) from the present value of its cash inflows (CF_t) discounted at a rate equal to the firm's cost of capital (k).

NPV = Present Value of Cash Inflows - Present Value of Cash Outflows

$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+k)^t} - CF_0 = \sum_{t=1}^{n} (CF_t \times PVIF_{k,t}) - CF_0$$

Accept-Reject Decision

When NPV is used to make accept-reject decisions, the decision criteria are as follows:

NPV > Zero	Accept the proposal
NPV < Zero	Reject the proposal
NPV = Zero	Indifference

Advantages of NPV Method

The advantages of NPV method for evaluating investment proposals are as follows:

1. Recognition of Time Value of Money

The most significant advantage is that it explicitly recognizes the time value of money, e.g., total cash flows pertaining to two machines are equal but the net present value are different because of differences of pattern of cash streams. The need for recognizing the total value of money is thus satisfied.

2. Sound Method of Appraisal

It also fulfils the second attribute of a sound method of appraisal. In that it considers the total benefits arising out of proposal over its life time.

3. Selection of Mutually Exclusive Projects

It is particularly useful for selection of mutually exclusive projects.

4. Maximization of the Shareholder's Wealth

This method of asset selection is instrumental for achieving the objective of financial management, which is the maximization of the shareholder's wealth. In brief the present value method is a theoretically correct technique in the selection of investment proposals.

Disadvantages of NPV Method

Disadvantages of NPV method are:

1. Difficult to Understand

It is difficult to calculate as well as to understand and use, in comparison with payback method or average return method.

2. May not Give Accurate Decision

NPV can not give accurate decision if the amounts of investment of mutually exclusive projects are not equai.

3. Difficult Calculation

The second and more serious problem associated with present value method is that it involves calculations of the required rate of return to discount the cash flows. The cost of capital is generally the basis of the firm's discount rate. The calculation of cost of capital is very complicated. In fact there is a difference of opinion even regarding the exact method of calcu lating it.

4. Absolute Measure

Another shortcoming is that it is an absolute measure. This method will accept the project which has higher present value. But it is likely that this project may also involve a larger initial outlay. Thus, in case of projects involving different outlays, the present value may not give dependable results.

3.2.1.4 Internal Rate of Return

Q11. What is Internal Rate of Return? How is it calculated? State the merits and demerits of Internal Rate of Return.

Ans : **(Oct.-22, Aug.-21, May-19, Imp.)**

The internal rate of return is also one of the capital budgeting technique that identifies the time value of money. This method is also known as yield method, discounted rate of return and trial and error yield method. It is that rate of return which equates the present value of cash inflows to the present value of cash outflows. The hit and trial method is used in internal rate of return method to discount the cash flows of the project as discount rate is not known. The internal rate of return is calculated with the help of the following formula.

$$C = \frac{A_1}{(1+r)^1} + \frac{A_2}{(1+r)^2} + \frac{A_3}{(1+r)^3} + ... + \frac{A_n}{(1+r)^n}$$

Where,

C – Initial outlay at time zero

r – Rate of discount of internal rate of return

A_1 , A_2, ... A_n – Future net cash flows at different periods

n – Number of years.

The internal rate of return method involves following steps,

1. Calculate the future cash inflows before depreciation but after tax.
2. Calculate fake payback period by dividing the initial investment by average cash flows. Initial investment

$$\text{Fake payback period} = \frac{\text{Initial investment}}{\text{Average cash flows}}$$

3. Identify the discounting factor from present value annuity table and calculate NPV with that percentage.
4. If NPV is positive take a higher rate and if NPV is negative take a lower rate and once again calculate NPV.
5. After getting one positive NPV and one negative NPV, use interpolation to calculate actual IRR.

Actual IRR can be calculated by using the following formula,

$$\text{Lower rate} + \frac{\text{Present value at lower rate} - \text{Cash outflow}}{\text{PV at lower rate} - \text{PV at higher rate}} \times \text{Difference in the rates}$$

A particular project is accepted when IRR is more than cost of capital and if IRR of the project is less than cost of capital it is rejected.

Merits

1. IRR also take into consideration the time value of money and easily applicable to situations in which even and uneven cash flows exists.
2. It helps in calculating true profitability of the project as it consider all profits of the project.
3. The ascertainment of cost of capital is not very important as in case of NPV method.
4. It is suitable for goal of maximizing profits and it is one of the dependable techniques of capital budgeting. Demerits

Demerits

1. The internal rate of return is one of the difficult method for evaluation of investment proposals.
2. If the expected life, size and cash outlays of the projects are not equal then the result of NPV and IRR will also differ.
3. When different rates are used it may create confusion.

3.2.1.5 Profitability Index

Q12. Define Profitability Index. How is it calculated? State the merits and demerits of Profitability Index.

Ans :

The profitability index (PI) refers to the ratio of discounted benefits over the discounted costs. It is an Evaluation of the profitability of an investment and can be compared with the profitability of other similar investments which are under consideration. The profitability index is also referred to as benefit-cost ratio, cost- benefit ratio, or even capital rationing.

Calculation of PI

The profitability index is one of the numerous ways used to quantify and measure the efficiency of a proposed investment. Calculation of PI is done by the following formula:

$$\text{Profitability Index} = \frac{\text{Present Value of Cashinflows}}{\text{Present Value of Cashoutflows}}$$

The profitability index may be found for net present values of inflows:

PV of Cash inflows

$$\text{P.I. (Net)} = \frac{\text{NPV (Net Present Value)}}{\text{Initial Cash outlay}} \quad \text{or P. I.} = \frac{\text{PV of Cash inflows}}{\text{Initia Cash outlay}}$$

The net profitability index can also be found as Profitability Index (gross) minus one.

Accept-Reject Decision

When PI is used to make accept-reject decisions, the decision criteria are as follows:

PI > 1	Accept the proposal
PI < I	Reject the proposal
PI = 0	Indifference

Advantages of Profitability Index Method

Following are the advantages of profitability index method:

1. It is consistent with the goal of maximizing the shareholders wealth.
2. It recognizes the time value of money.
3. It considers analysis all cash flows of entire life.
4. It makes the right in the case of different amount of cash outlay of different project.
5. It ascertains the exact rate of return of the project.
6. It helps in ranking and picking projects while rationing of capital.

Disadvantages of Profitability Index Method

Following are the advantages of profitability index method:

1. It is requires detailed long term forecasts of the incremental benefits and costs.
2. It poses difficulty in understanding interest rate or discount rate.
3. It is difficult to calculate profitability index if two projects having different useful lif

PROBLEMS ON NPV, IRR AND PI

6. Calculate NPV for the given project.

Year	0	1	2	3	4	5
(A) Cash flows	200	35	80	90	75	20
(B) Cash flows	200	18	10	10	40	35

The company anticipates the cost of capital of 12%. Rank the project according to it ?

Sol :

Calculation of NPV for Project A

Year	CFAT	PV. factor @ 12%	PV CFAT
1	35	0.893	31.255
2	80	0.797	63.76
3	90	0.712	64.08
4	75	0.636	47.7
5	20	0.567	11.34
			218.135

$NPV = \Sigma PV.CFAT - \Sigma PV\ Co$

= 218.135 – 200 = 18.135

Calculation of NPV for Project B

Year	CFAT	PV. factor @ 12%	PV CFAT
1	8	0.893	16.074
2	10	0.797	7.97
3	10	0.712	7.12
4	40	0.636	25.44
5	35	0.567	19.845
			76.444

$NPV = \Sigma PV.CFAT - \Sigma PV\ Co$

76.44 – 200 = (–123,556)

7. A project cost Rs. 2,500/- and is expected to generate cash inflows of Rs. 900, 800, 700, 600 and 500 respectively for 5 years. The opportunity cost of capital may be assumed to be 10% calculate NPV for the given project.

Sol :

Initial cost = 2,500

Year	CFAT	PV factor @ 10%	PV. CFAT
1	900	0.909	818.1
2	800	0.826	660.8
3	700	0.751	525.7
4	600	0.683	409.8
5	500	0.621	310.5
			2,724.9

NPV = ΣPv of CFAT – Pv of Co.

NPV = 2724.9 – 2,500 = 224.9

8. A firm whose cost of capital is 10% considering two mutually exclusive projects X and Y. The details of which are:

	Project A Rs.	Project B Rs.
Investment	Rs. 50,000	Rs. 50,000
Life	5 years	5 years
Cost of Capital 10%		
Tax Rate 50%		

Cash flows before depreciation and taxes (CFBT) are as follows:

Year	Rs.	Rs.
1	20,000	30,000
2	22,000	27,000
3	28,000	22,000
4	25,000	25,000
5	30,000	20,000

Which Project should be accepted under NPV method?

Project : A

Calculation of Net Cash Flows (CFAT)

Year	CFBT	–	DEP	=	NP	–	TAX @50%	=	PAT	+	DEP	=	CFAT
1.	20,000	–	10,000	=	10,000	–	5,000	=	5,000	+	10,000	=	15.000
2.	22,000	–	10,000	=	12,000	–	6,000	=	6,000	+	10,000	=	16.000
3.	28,000	–	10,000	=	18,000	–	9,000	=	9,000	+	10.000	=	9.000
4.	25,000	–	10,000	=	15,000	–	7,500	=	7,500	+	10.000	=	17,500
5.	30,000	–	10,000	=	20,000	–	10,000	=	10,000	+	10,000	=	20.000

$$\text{Depreciation} = \frac{50,000 - 0}{5}$$

= Rs. 10,000

Calculation of net present value

Year	CFAT Rs.	Discount * Factor @ 10%	Total Present Value
1	15,000	0.909	13,635.00
2	16,000	0.826	13,216.00
3	19,000	0.751	14,269.00
4	17,500	0.683	11,952.50
5	20,000	0.621	12,420.00
		Total present value	65,492.50
		Investment	50,000.00
		Net Present Value Rs.	15,492.00

Project : B

1) Calculation of CFAT

Year	CFBT	–	DEP	=	NP	–	TAX @50%	=	PAT	+	DEP	=	CFAT
1.	30,000	–	10,000	=	20,000	–	10,000	=	10,000	+	10,000	=	20,000
2.	27,000	–	10,000	=	17,000	–	8,500	=	8,500	+	10,000	=	18,500
3.	22,000	–	10,000	=	12,000	–	6,000	=	6,000	+	10.000	=	16,000
4.	25,000	–	10,000	=	15,000	–	7,500	=	7,500	+	10.000	=	17,500
5.	20,000	–	10,000	=	10,000	–	5,000	=	5,000	+	10,000	=	15,000

$$\text{Depreciation} = \frac{50,000 - 0}{5}$$

$$= \text{Rs. } 10,000$$

2) Calculation of Net Present Value

Year	CFAT Rs.	Discount * Factor @ 10%	Total Present Value
1	20,000	0.909	18,180.00
2	18,500	0.826	15,281.00
3	16,000	0.751	12,016.00
4	17,500	0.683	11,952.50
5	15,000	0.621	9,315.00
		Total present value	66,774.50
		- Initial Investment	50,000.00
		Net Present Value Rs.	16,744.50

Since NPV of project B is higher than that of project A , it is advisable to select project B.

9. Calculate the profitability index from the information given below

Cost of project	**Rs. 6,00,000**
Life of the project	**5 years**
Annual cash Inflow Rs.	**2,00,000**
Cut off rate	**10%**

Sol :

Calculation of Profitability Index

Year	CFAT	PV factor	Total PV
1-5	2,00,000	3.791	7,58,200

$$\text{Profitability index} = \frac{7,58,200}{6,00,000} = 1.263$$

Since the calculated PI is more than 1, it is advisable to accept the project.

10. A project requires an investment of ` 11,11,111 and is expected to generate cash in flows of ` 3,33,333, ` 4,44,444, ` 5,55,555, ` 4,44,444 and ` 3,33,333 for the next five years. The risk free cost of capital is 11 percent. Evaluate the project using IRR method. If a risk premium of 9 percent is considered how do you evaluate the project and do you observe any change in your earlier decision?

Sol :

Step-1

Calculation of fake pay back period,

$$FPBP = \frac{\text{Investment}}{\text{Average yearly inflow}}$$

$$\text{Average yearly inflow} = \frac{21,11,109}{5} = 4,22,221.8$$

$$= \frac{11,11,111}{4,22,221.8} = 2.632$$

Step-2

Present value annuity table indicates that, IRR lies between 25% and 26%.

Step-3

Calculation of present values at different rates.

Year	CFAT in flow	PV@ 25%	P.V. of cash	P.V.@ 26%	P.V. of cash
1	3,33,333	0.800	2,66666	0.794	2,64,666
2	4,44,444	0.640	2,84,444	0.630	2,80,000
3	5,55,555	0.512	2,84,444	0.500	2,77,778
4	4,44,444	0.410	1,82,222	0.397	1,76,444
5	3,33,333	0.328	1,09,333	0.315	1,05,000
			11,27,109		11,03,888

Step-4

Interpolation

$$IRR = \text{Lower rate} + \frac{\text{NPV @ LR}}{\Delta \sum PVs} \times \Delta R$$

$$= 25 + \frac{11,27,109 - 11,11,111}{11,27,109 - 11,03,888} \times 1$$

$$= 25 + \frac{15998}{23221}$$

$$= 25 + 0.69$$

$$= 25.69\%$$

Comment

The project can be accepted. If a risk premium of 9% is considered, there will be no change in earlier decision

11. A project requires an investment of ` 1,44,000 and is expected to generate cash in flows of ` 54,000, ` 63,000, ` 72,000, ` 63,000 and ` 54,000 per annum for the next five years. The risk free rate is 10%.
Evaluate the project using IRR method.

Year	1	2	3	4	5
C.E	0.96	0.92	0.88	0.82	0.79

Sol :

Step-1

Calculation of FPBP (Fake Pay Back Period)

$$FPBP = \frac{\text{Initial investment}}{\text{Average CFAT's}}$$

$$\text{Average CFATs} = \frac{3.06,000}{5}$$

$$= 61,200$$

$$\text{Initial investment} = 1,44,000$$

$$FPBP = \frac{1,44,000}{61,200} = 2.3529$$

Step-2

Present value annuity table indicates that, IRR lies between 31% and 32%.

Step 3

Calculation of present values.

Year	CFAT	P.V.@ 32%	P.V. of cash	P.V.@31%	P.V. of cash
1.	54,000	0.758	40,932	0.763	41,202
2.	63,000	0.574	36,162	0.583	36,729
3.	72,000	0.435	31,320	0.445	32,040
4.	63,000	0.329	20,727	0.340	21,420
5.	54,000	0.250	13,500	0.259	13,986
			1,42,641		1,45,377

Step-4

The exact rate will be obtained by the method of interpolation as given below.

$$IRR = L.R + \frac{NPV\ @\ LR}{\Delta \sum PVs} \times \Delta R$$

$$= 31 + \frac{1,45,377 - 1,44,000}{1,45,377 - 1,42,641} \times (32 - 31)$$

$$= 31 + \frac{1377}{2736} \times 1$$

$$= 31 + 0.5$$

$$= 31.5\%$$

Comment

The project is profitable on the basis of a higher IRR and on the basis of CE approach also.

3.3 Cash Flows Estimation for New and Replacement Projects

Q13. What is cashflow ? Explain the elements of cashflow.

Ans : **(Oct.-22, May-19, Imp.)**

A cash flow describes a real or virtual movement of money:

A cash flow in its narrow sense is a payment (in a currency), especially from one central bank account to another; the term 'cash flow' is mostly used to describe payments that are expected to happen in the future, are thus uncertain and therefore need to be forecasted with cash flows

Elements of the cash flow stream

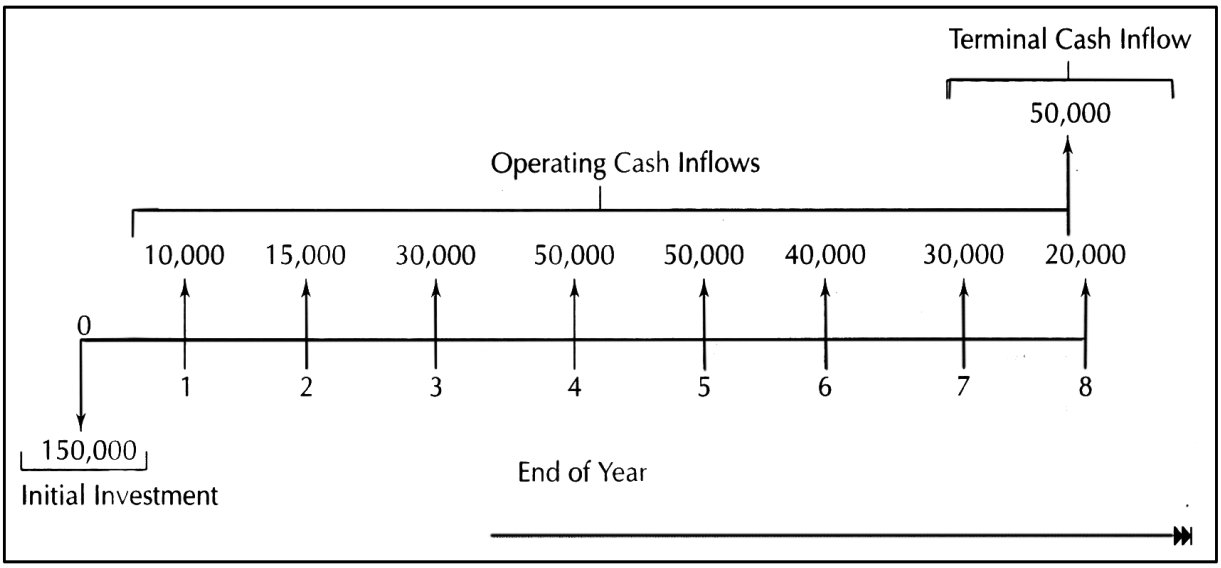
To evaluate a project, you must determine the relevant cash flows, which are the incremen-tal after-tax cash flows associated with the project.

The cash flow stream of a conventional project—a project which involves cash outflows followed by cash inflows—comprises three basic components: (i) initial investment, (ii) operating cash inflows, and (iii) terminal cash inflow.

The initial investment is the after-tax cash outlay on capital expenditure and net working capital when the project is set up. The operating cash inflows are the after-tax cash inflows resulting from the operations of the project during its economic life. The terminal cash inflow is the after-tax cash flow resulting from the liquidation of the project at the end of its economic life.

It depicts on a time line the cash flows for an illustrative project, with each of the cash flow components labelled.

Cash Flow Components



Physical Life of the Plant

This refers to the period during which the plant remains in a physically usable condition, i.e., the number of years the plant would perform the function for which it had been acquired. This depends on the wear and tear which the plant is subject to. Suppliers of the plant may provide information on the physical life under nor-mal operating conditions. While the concept of physical life may be useful for determining the depreciation charge, it is not very useful for investment decision making purposes.

Technological Life of the

Plant New technological developments tend to render existing plants obsolete. The technological life of a plant refers to the period of time for which the present plant would not be rendered obsolete by a new plant. It is very difficult to esti-mate the technological life because the pace of new developments is not governed by any law. While it is almost certain that a new development would occur when it would occur is anybody's guess. Yet an estimate of the technological life has to be made.

Product Market Life of the Plant

A plant may be physically usable, its technology may not be obsolete, but the market for its products may disappear or shrink and hence its continu-ance may not be justified. The product market life of a plant refers to the period for which the product of the plant enjoys a reasonably satisfactory market.

Investment Planning Horizon of the Firm

The time period for which a firm wishes to look ahead for purposes of investment analysis may be referred to as its investment planning horizon. It naturally tends to vary with the complexity and size of the investment. For small investments (say, installation of a lathe) it may be five years, for medium-size investments (say, expansion of plant capacity) it may be 10 years, and for large-size investments (say, a new division) it may be 15 years, and for infrastructure projects it may go up to 30 years.

Q14. What are the basic principles of cashflow estimation?

Ans : **(Aug.-21, Imp.)**

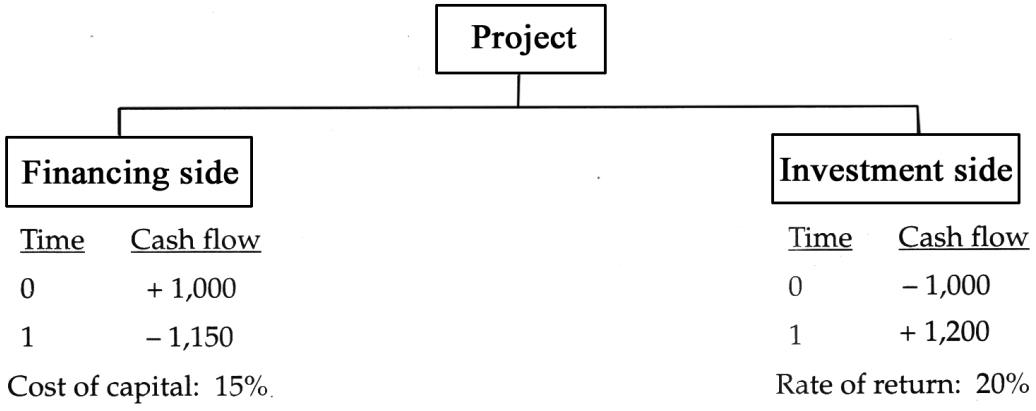
The following principles should be followed while estimating the cash flows of a project:

1. Separation principle
2. Incremental principle
3. Post-tax principle
4. Consistency principle

1. Separation Principle

There are two sides of a project, viz., the investment (or asset) side and the financing side and the cash flows associated with these sides should be separated. A simple example may be given to illustrate how this is done.

Suppose a firm is considering a one-year project that requires an investment of Rs 1,000 in fixed assets and working capital at time 0. The project is expected to generate a cash inflow of Rs 1200 at the end of year 1—this is the only cash inflow expected from the project. The project will be financed entirely by debt carrying an interest rate of 15 percent and maturing after 1 year. Assuming that there are no taxes, the cash flows associated with the investment side of the project, the rate of return on the investment side of the project, th'e cash flows associated with the financing side of the project, and the cost of capital on the financing side are as follows:



Note : that the cash flows on the investment side of the project do not reflect financing costs (interest in our example)* The financing costs are included in the cash flows on the financing side and reflected in the cost of capital figure (which is 15 percent in our example). The cost of capital is used as the hurdle rate against which the rate of return on the investment side (which is 20 per cent in our case) is judged.

The important point to be emphasised is that while defining the cash flows on the in-vestment side, financing costs should not be considered because they will be reflected in the cost of capital figure against which the rate of return figure will be evaluated.

2. Incremental Principle

The cash flow of a project must be measured in incremental terms. To ascertain a project's incremental cash flows you have 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 incremenal cash flows attributable to the project. The is,

$$\begin{pmatrix}\text{project cash flow}\\ \text{for the year t}\end{pmatrix} = \begin{pmatrix}\text{Cash flow for the firm with}\\ \text{the project for year t}\end{pmatrix} - \begin{pmatrix}\text{Cash flow for the firm without}\\ \text{the project for year t}\end{pmatrix}$$

3. Post-tax Principle

Cash flows should be measured on an after-tax basis. Some firms may ignore tax payments and try to compensate this mistake by discounting the pre-tax cash flows at a rate that is higher than the cost of capital of the firm. Since there is no reliable way of adjusting the discount rate, you should always use after-tax cash flows along with after-tax discount rate. The important issues in assessing the impact of taxes are: What tax rate should be used to assess tax liability? How should losses be treated? What is the effect of noncash charges?

Tax Rate Let us examine the choices in terms of tax rates. The average, tax rate is the total tax burden as a proportion of the total income, of the business. The marginal tax rate is the tax rate applicable to the income at margin—the next rupee of income. The marginal tax rate is typically higher than the average tax rate because tax rates are often progressive.

The income from a project typically is marginal. Put differently, it is additional to the income generated by the assets of the firm already in place. Hence, the marginal tax rate of the firm is the relevant rate for estimating the tax liability of the project.

4. Consistency Principle

Cash nows and the discount rates applied to these cash flows must be consistent with respect to the investor group and inflation.

Investor Group The cash flow of a project may be estimated from the point of view of all investors (equity shareholders as well as lenders) or from the point of view of just equity shareholders.

The cash flow of a project from the point of view of all investors is the cash flow avail-able to all investors after paying taxes and meeting investment needs of the project, if any. It is estimated as follows:

Cash flows to all investors = PBIT (1 - tax rate)

\+ Depreciation and noncash charges

– Capital expenditure

– Change in working capital

The cash flow of a project from the point of view of equity shareholders is the cash flow available to equity shareholders after paying taxes, meeting investment needs, and fulfill-ing debt-related commitments. It is estimated as follows:

Cash flow to equity shareholders = Profit after tax

+ Depreciation and other noncash charges Preference dividend

- Capital expenditures

- Change in working capital Repayment of debt

+ Proceeds from debt issues

- Redemption of preference capital + Proceeds from preference issue

The discount rate must be consistent with the definition of cash flow:

Cashflow	Discount rate
Cash flow to all investors	Weighted average cost of capital
Cash flow to equity	Cost of equity

Generally, in capital budgeting we look at the cash flow to all investors and apply the weighted average cost of capital of the firm. We will also follow this convention.

Q15. Explain the cashflow estimation replacement of project.

Ans :

Initial Investment	=	Cot of the new assets + Net working capital required for the new asset	–	After tax salvage value realised from the asset + Net working capital required for the old asset
Operating cash inflows	=	Operating cash inflows from the new asst	–	Operating cash inflows from the old asset, had it not been replaced
Terminal cash flow	=	After tax salvage value of the new asset + Recovery capital associated with the nwe asset	–	After tax salvage value of the old asset, had, it not been replaced + Recovery of net woking capital associated with the old asset

3.4 COST OF CAPITAL

Q16. What is Cost of Capital?

Ans :

Meaning

The cost of capital of a firm is the minimum rate of return expected by its investors. It is the weighted average cost of various sources of finance used by a firm. The capital used by a firm may be in the form of debt, preference capital, retained earnings and equity shares. The concept of cost of capital is very important in the financial management. A decision to invest in a particular project depends upon the cost of capital of the firm or the cut off rate which is the minimum rate of return expected by the investors.

In case a firm is not able to achieve even the cut off rate, the market value of its shares will fall. In fact, cost of capital is the minimum rate of return expected by its investors which will maintain the market value of shares at its present level. Hence, to achieve the objective of wealth maximisation, a firm must earn a rate of return more than its cost of capital. Further, optimal capital structure maximises the value of a firm and hence the wealth of its owners and minimises the firm's cost of capital. The cost of capital of a firm or the minimum rate of return expected by its investors has a direct relation with the risk involved in the firm. Generally, higher the risk involved in a firm, higher is the cost of capital.

Cost of capital for a firm may be defined as the cost of obtaining funds, *i.e.,* the average rate of return that the investors in a firm would expect for supplying funds to the firm.

Definitions

According to Hunt, William and Donaldson, "Cost of capital may be defined as the rate that must be earned on the net proceeds to provide the cost elements of the burden at the time they are due".

According to James C. Van Home defines cost of capital as, "a cut-off rate for the allocation of capital to investments of projects. It is the rate of return on a project that will leave unchanged the market price of the stock."

According to Solomon Ezra, "Cost of capital is the minimum required rate of earnings or the cut-off rate of capital expenditures."

Accordig to Hampton, John J. defines cost of capital as, "the rate of return the firm requires from investment in order to increase the value of the firm in the market place".

Thus, we can say that cost of capital is that minimum rate of return which a firm, must and, is expected to earn on its investments so as to maintain the market value of its shares.

From the definitions given above we can conclude three basic aspects of the concept of cost of capital:

i) Cost of capital is not a cost as such. In fact, it is the rate of return that a firm requires to earn from its projects.

ii) It is the minimum rate of return. Cost of capital of a firm is that minimum rate of return which will at least maintain the market value of the shares.

iii) It comprises of three components. As there is always some business and financial risk in investing funds in a firm, cost of capital comprises of three components :

a) the expected normal rate of return at zero risk level, say the rate of interest allowed by banks;

b) the premium for business risk ; and

c) the premium for financial risk on account of pattern of capital structure.

Symbolically cost of capital may be represented as :

$$K = r_0 + b + f$$

where, K = Cost of capital

r = Normal rate of return at zero risk level

b = Premium for business risk.

f = Premium for financial risk.

Q17. Explain the different types of costs.

Ans :

The classification of cost is given as follows:

1. Future Cost (vs) Historical Cost

Financial decisions are based on the future costs and not on the historical costs. The decisions relate to the future and hence the costs likely to be incurred in future are more significant than the costs which have already been incurred. Historical costs act simply as guides to estimate the future costs.

2. Specific Cost (vs) Composite Cost

The cost of individual source of capital is referred to as the specific cost and the cost of capital of all the sources combined is termed as composite cost or overall cost. It is thus the weighted cost of capital. The cost of debentures, preference shares, equity shares, retained earnings etc. is to be separately calculated first and then only the combined cost can be computed. Since the combined cost considers the quantum of financing through each source, the cost is known as the weighted cost.

3. Average Cost (vs) Marginal Cost

Average cost of capital refers to the weighted average cost of capital calculated on the basis of cost of each source of capital and weights are assigned to the ratio of their share to total capital funds. Marginal cost of capital may be defined as the 'Cost of obtaining another rupee of new capital.'

When a firm rises additional capital from only one sources (not different sources), than marginal cost is the specific or explicit cost. Marginal cost is considered more important in capital budgeting and financing decisions. Marginal cost tends to increase proportionately as the amount of debt increase.

4. Implicit Cost (vs) Explicit Cost

The implicit cost is the rate of return associated with the best investment opportunity for the firm and its shareholders that will be foregone if the projects presently under consideration by the firm were accepted. It is thus the opportunity cost.

For example, the implicit cost of retained earnings is the rate of return available to the shareholders had the funds been distributed to them. The explicit cost of any source of capital is the discount rate that equates the present value of the cash inflows that are incremental to the taking of the financial opportunity with present value of its incremental outflows.

Q18. Define Cost of Debt.

Ans :

The rate of interest which is paid on debt is termed as cost of debt. For calculation of the cost of debt following are required - net proceeds of debenture, amount of interest paid periodically and the principal quality of debt. The cost of debt before tax is calculated from following formula,

$$K_{dh} = \frac{1}{P}$$

Where,

K_{dh} = Before tax cost of debt

I = Interest

P = Principal.

When firm raises debt at premium or discount, then P is not the face value of securities but it is the amount of net proceeds received from the issue. In this case the formula will be,

$$K_{dh} = \frac{1}{NP}$$

Where, NP = Net proceeds.

When firm raises capital from debt a sufficient amount of tax is saved because interest is treated as a deductible expense in calculation of tax. Hence it reduces cost of debt. The cost of debt after tax is calculated as,

$$K_{dh} = K_{dh}(1-t) = \frac{1}{NP}(1-t)$$

Where,

K_{dh} = After tax cost of debt

t = Rate of tax.

Cost of Redeemable Debt

The debt which is issued to be redeemed after specific period of time is known as redeemable debt. The cost of redeemable debt capital is calculated as,

The cost of redeemable debt before tax is calculated as,

$$K_{dh} = \frac{1+\frac{1}{n}(RV - NP)}{\frac{1}{2}(RV + NP)}$$

Where,

I = Annual interest

n = Number of years in which debt is to be redeemed

RV = Redeemable value of debt

NP = net proceeds of debentures.

The cost of redeemable debt after tax is calculated as,

$$K_{dh} = \frac{1(1-t)+\frac{1}{n}(RV - NP)}{\frac{1}{2}(RV + NP)}$$

Where,

I = Annual interest t - Tax rate

n = Number of years in which debt is to be redeemed

RV = Redeemable value of debt

NP = Net proceeds of debentures.

Q19. Explain the term Cost of Preference Share Capital.

Ans :

Preference shares are the fixed cost bearing securities. In case of preference shares, the rate of dividend is fixed in advance at the time of the issue. Preference shareholders have a preferential rights unlike equity shareholders with regard to payment of dividend and return of principal amount. Preference dividend is paid from after tax profits, so adjustments are not made in tax at the time of calculating cost of preference shares. Preference dividend is considered as an appropriation of profits and not as a charge on profits.

There are two types of preference capital,

a) Irredeemable preference capital

b) Redeemable preference capital,

a) Irredeemable Preference Capital

Irredeemable preference capital involves perpetual payment of dividend to preference shareholders at a prescribed rate.

$$K_p = \frac{D_p}{P}$$

K = Cost of preference capital

D = Annual preference dividend

P = Net proceeds of preference share capital.

[or]

$$K_p = \frac{D_p}{N_p}$$

[When preference shares are issued at a premium or discount]

b) Redeemable Preference Capital :

Redeemable preference shares are those which can be redeemed or recovered on maturity of issue or after specific period of time.

$$K_p = \frac{D_p + \frac{(P_n - P}{n}}{\frac{(P_n + P)}{2}} \text{ or}$$

$$P = \sum_{i=1}^{x} \frac{D_{pi}}{(1+K_p)} + \ldots + \frac{P_n}{(1+K_p)^x}$$

Where,

K = Cost of preference capital

D = Annual preference dividend

P = Net proceeds of preference share capital.

D_p = Annual preference dividend

P_n = Amount payable at time of redemption

n = Redemption period of preference shares.

Q20. What do you understand by Cost of Equity Share Capital?

Ans :

The cost of equity capital is the return which is expected by its investors. In order to provide expected returns to the equity shareholders, company must earn minimum rate of return which is necessary to have a constant market price of the shares. The expectations of the shareholders must be considered before issuing new equity shares for raising additional capital.

The calculation of cost of equity shares is a complicated process because interest or dividend is not paid on fixed rate and also there is no legal commitment to pay dividend to equity shareholders. Hence market value of shares depends on the amount of dividend paid and the rate of dividend depends on the degree of business and financial risk. Following are the approaches or methods through which cost of equity shares can be computed,

a. Dividend yield method or dividend/price ratio method
b. Dividend yield with annual growth rate
c. Earning yield method
d. CAPM approach (Capital Asset Pricing Model)
e. Bond yield with risk premium
f. Realized yield method.

a) Dividend Yield Method or Dividend/ Price Ratio Method

In this method, the cost of equity capital is considered as a discount rate at which current value of expected future dividends per share is equal to net proceeds or market price of a share. In this approach the cost of equity shares will be,

$$K_e = \frac{D}{NP} \times 100 \text{ or } \frac{D}{MP} \times 100$$

Where,

K = Cost of equity capital

D = Expected dividend per share

NP = Net proceeds per share

MP = Market price per share.

Dividend yield method involves some assumptions,

i) It does not consider any growth in dividend

ii) Capital gains and retained earnings are also not considered.

This method is applicable to the companies which have constant profits and constant dividend policy throughout the period of time.

b) Dividend Yield with Annual Growth Rate

The dividend yield with annual growth rate method is used in the situation where dividend-pay-out ratio remains constant and dividends are expected to grow at a constant rate in the firm, then this method is suitable to calculate cost of equity capital. In this method, dividends are the growth rate form the basis for the cost of equity capital.

$$K_e = \frac{D_1}{NP} + G = \frac{D_0(1+g)}{NP} + G$$

Where,

K_e = Cost of equity capital

D_1 = Expected dividend per share at the end of the year

NP = Net proceeds per share

G = Rate of growth in dividend

D_0 = Previous year's dividend.

When cost of existing equity share capital is calculated, then net must be replaced with market price.

$$K_e = \frac{D_1}{MP} + G$$

c) Earning Yield Method

In this method, the cost of equity capital is considered as the discount rate at which the current value of expected future EPS (earnings per share) is equal to the prevailing market price or net proceeds of the shares. In this method the cost of equity capital is,

$$K_e \frac{\text{Earnings per share}}{\text{Net proceeds}} = \frac{EPS}{NP}$$

When, cost of existing equity capital is calculated.

The earning yield method is applicable in following situations for calculating cost of equity capital,

i) When it-is expected that earnings per share remains constant.

ii) In times when the dividend pay out ratio is 100% or retention ratio is zero, i.e., when firm distributes all its profits as dividends.

iii) When market price of the share is effected only by the earnings per share.

iv) When firm expects that earnings on new equity shares capital is equal to present rate of earnings.

d. Capital Asset Pricing Model : [CAPM] Approach

The cost of equity is also calculated with the help of CAPM model. It separates the cost of equity into risk-free return which is available for investing in government bonds and an additional risk premium which is for investing in a specific share or investment. The risk premium involves the average return on the overall market portfolio and the beta factor i.e., the risk factor of the particular investment. The cost of equality for an investment with the help of CAPM approach is calculated as follows,

$$K_e = R_f + b_i(R_m - R_f)$$

Where,

K_e = Cost of equity

R_f = Risk free rate of return

b_i = Beta of the investment

R_m = Average market return.

e. Bond Yield with Risk Premium Approach

According to bond yield with risk premium approach, the required rate of return of the equity shareholders of a firm is equal to the returns on long term bonds and risk premium.

K_e = Return on long term bonds + Risk premium

This approach explains that risk of equity investors is much greater than risk of bond investors. Hence required rate of return of the equity investor involves premium for higher risk. There is no theoretical basis to calculate the risk premium.

f. Realized Yield Method

The problem of evaluating the expectations of the investors relating to future dividends and earnings can be solved with the help of realized yield method. It is difficult to calculate accurate future dividends and earnings because they are dependent on many uncertain factors. Hence the realized yield method is suitable, which considers the actual average rate of return realized in the past to calculate the cost of equity share capital. In order to calculate the average rate of return realized, the dividend received in the past and the gain realized at the time of sale of shares must be taken into consideration. The realized yield method involves following assumptions,

a) The firm will have constant risk for a specific period of time.

b) The expectations of the shareholders are dependent on past realized yield.

c) Investors assume that they get same rate of return as the realized yield even if they invest somewhere else.

d) It is assumed that there are no remarkable changes in market price of shares.

Q21. Define Cost of Retained Earnings.

Ans :

As firms do not pay any dividends on retained earnings, hence no cost is involved in retained earnings.

The cost of retained earnings can be evaluated as rate of return acquired by the shareholders from an alternative by investing after-tax dividends. It is similar to the opportunity cost of dividends which is scarified by the shareholders.

The cost of retained earnings can be calculated as follows,

$$k_r = \frac{D_1}{MP} + G$$

Where,

K_r = Cost of retained earnings

D_1 = Expected dividend

MP = Market price per share

G = Growth rate.

Inspite of 100% payout ratio, shareholders are unable to get whole amount of retained earnings in the form of dividends. Shareholders need to pay tax on dividend income. Some alternative way is to be made with regard to tax, following formula is useful,

$$K_r = \left[\frac{D}{NP} + G\right] \times (1 - t) \times (1 - b)$$

$$K_r = k_e(1 - t)(1 - b)$$

Where,

K_r = Cost of retained earnings

D = Expected dividend

G = Growth rate

NP = Net proceeds of equity issue

t = Tax rate

b – Cost of purchasing new securities

k_e = Rate of return available to shareholders.

3.5 Risk Analysis

Q22. Define risk ? Explain the nature / scope of risk.

Ans :

Risk is virtually anything that threatens or limits the ability of a community or nonprofit organisation to achieve its mission. It can be unexpected and unpredictable events such as destruction of a building, the wiping of all your computer files, loss of funds through theft or an injury to a member or visitor who trips on a slippery floor and decides to sue.

Meaning of Risk Management

Risk management is a process of thinking systematically about all possible risks, problems or disasters before they happen and setting up procedures that will avoid the risk, or minimise its impact, or cope with its impact. It is basically setting up a process where you can identify the risk and set up a strategy to control or deal with it.

Risk Policy

In every market investment risk policy is identified. Based on this policy risk factor involved is estimated. The following factors are involved in risk policy.

1. Organisation has to identify its risk tolerance levels by considering return factors (high expected return - high risk involved).
2. The level of the organization at which the management is expected to be implemented.
3. Identification of risk and their consequences.
4. Risk performance of share holders.
5. Clarity of objectives in a particular business activities.
6. Identification of internal (or) external factors that limit the application of risk management strategies.

7. Establish the general rules for successful risk management.

8. Portfolio investment and its usages.

9. Tools and techniques to be used to reduce the risk factors.

10. Source of investment and the risk factors are identified in advance.

11. Strategic planning and better communication facilities must be introduced in the organization to achieve the better risk management process.

Risk policy must be determined by the management by using the above factors to achieve the better or returns.

Nature and Scope of Risk

All organisations deal with risks, though the nature and magnitude may differ for each type of organisation. This is especially true for banks / financial institutions, as they deal with money. They act as financial intermediaries in any economic system. They help in mobilising household / corporate savings and making them available to deficit units. In their role as financial intermediaries, banks and financial institutions are involved in the following activities which results in various types of risks :

a) **Funds mobilisation:** Funds are mobilised by accepting term deposits as well as by allowing customers to operate their checking accounts by leaving balances in them.

b) **Funds deployment:** The funds that are mobilised are first subject to regulatory investment requirements i.e., banks have to invest a specified proportion of their funds in certain instruments, often government securities. The surplus funds are available as loans for various segments of corporate and retail borrowers.

c) **Funds transfer:** Banks and financial institutions are key vehicles for moving funds on behalf of their customers. Banks acts as settlement agents for their corporate clients in the realization and payment of their funds.

d) **Risk transfer:** Manufacturing and other companies are exposed to a number of risks. Some of the risks are central to their business. The risk that arise from the financial markets should transfer to the Banks, since if is the latter's core competence to handle them.

e) **Transaction services:** Banks assist their customers in carrying out various trade transactions, both domestic and international. International transactions involves dealing with multiple currencies. The global network of the banking system and its relationship constitute the backbone of such trade.

f) **Credit enhancement services:** In the course of trade, the concerned parties may not be familiar with each other. Therefore, the suppliers of goods often expect the bank's help in evaluating or enhancing the credit worthiness of a customer.

Q23. Explain the Sources of Risk.

Ans :

Variety of sources lead towards risk and have an impact on the value of assets of a firm. The risk arises when the actual outcome is believed to be different from the expected outcome. The expected outcome depends upon various factors. Governments play a vital role and have a direct impact on the expected outcomes.

The factors or sources of risk are as follows :

1. The government policies related to prices and economy is one of the major sources of risk.

2. Consumer preference, consumption and savings habit are essential in deciding the market share. Therefore, is a source of risk.

3. The political, social, racial and ethnimic issue also have an impact on expected outcome.

4. Technological factors are responsible for the introduction of new products in the market and therefore has an impact on expected outcomes.

5. Corporate governance and financial performance and financial structure adopted by the firm also has an impact on expected performance.

Therefore, these factor are some of the basic sources of risk.

Apart from there risks a firm also faces market risk. The following are the different sources of market risk.

1. Price Level Risk

The price level risk refers to the change in the level of foreign exchange rates, interest rates, commodity rates and equity prices. This one of the major sources of market risk.

2. Foreign Exchange Rate Risk

The cash flow expected from a portfolio in foreign currency is always subjected to foreign exchange rate risk. Fluctuations or change in exchange rates directly have an impact on expected cash flows.

3. Interest Rate Risk

The change in the interest rates has an impact on fixed income securities. The forward and future contracts are also subjected to interest rate risk. Therefore, interest rate risk is also a major source of market risk.

4. Correlation and Concentration Risk

The equity risk management is divided into two activities. Firstly, managing over all market risk, secondly, managing risk in individual equities. This uses factor models for yield curve analysis and is comparatively easier than variance- covariance matrix.

5. Dividend and Stock Loan Risk

The cost of borrowing the two deliverables is used to determine the forward price. The forward equity price is affected by the cash flows that are expected to be paid before forward rate.

6. Index Bench marking Risk

The banks have an absolute return on equity and profit and loss are managed in relation to the fixed budget. Its participants have a return target which is variable and has relation to the return on an index.

7. Price Volatility Risk

Change in price volatility has an impact on VaR option of products. The volatility of prices exposure is handled as the exposure to prices. Change in price leads to change in price volatility.

8. Price Correlation Risk

In 1990s, the market witnessed the risk faced by products whose payoffs depended upon more than one underlying price. Even today there are options that are dependend upon two or more prices. Therefore, price correlation risk is also one of the sources of market risk.

9. Prepayment Variance Risk

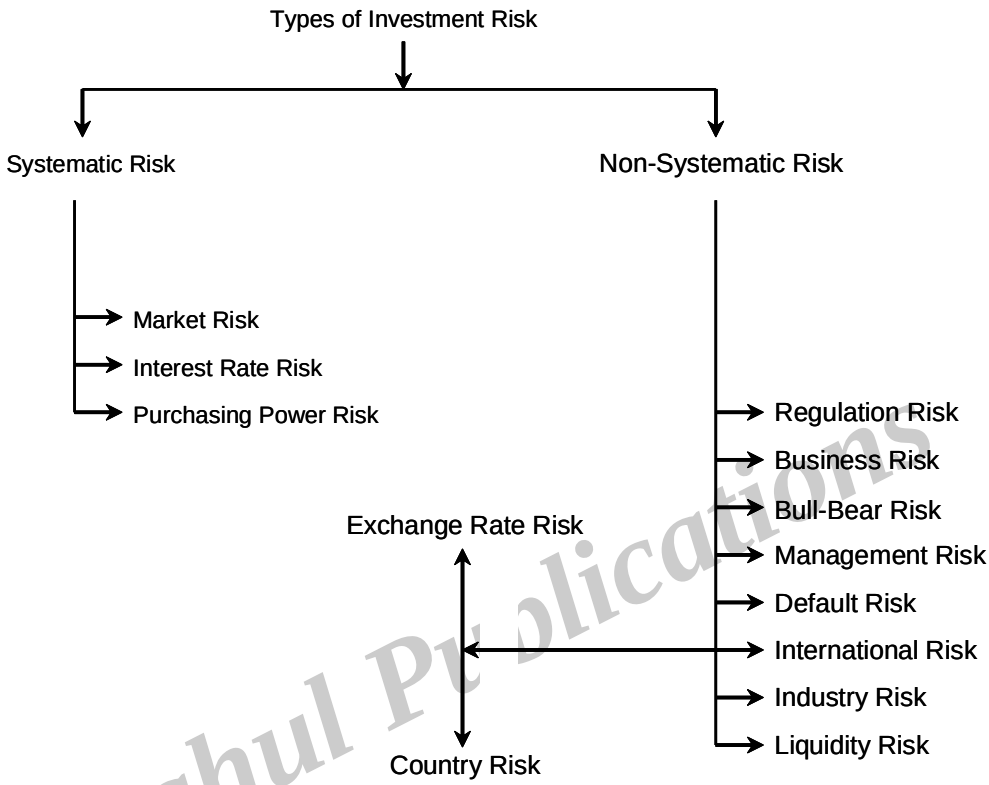
This risk is faced by Mortgage-Back-Securities (MBS) and Asset Backed Securities (ABS). The investor of securities sells the borrower the option to payoff their debt early. A fall in rate enables the house owners to refinance and the MBS principal is paid back to the investor which the MBS investors is to reinvest at a rate lower than the MBS coupon rate.

Q24. Explain the classification of risk.

Ans :

Types of Risk

Investment Risks are :



Dividing total risk into its two components, a general (market) component and a specific (issuer) component, we have systematic risk and non-systematic risk, which are additive :

Total Risk = General Risk + Specific Risk

= Market Risk + Issuer Risk

= Systematic Risk + Non-Systematic Risk

A) SYSTEMATIC RISK

Variability in a security's total returns that is directly associated with overall movements in the general market or economy is called systematic risk. Virtually all securities have some systematic risk because systematic risk directly encompasses interest rate, market, and inflation risks. Systematic risk is attributable to broad macro factors affecting all securities. Different types of systematic risk are explained as under:

1. Market Risk

Market risk is referred to as stock variability due to changes in investor's attitudes and expectations. The investor's reaction towards tangible and intangible events is the chief cause affecting 'market risk'. The first set, that is, the tangible events has a 'real' basis but the intangible events are based on a 'psychological' basis or reaction to expectations or realities.

Market risk triggers off through real events comprising political, social and economic reasons. The initial decline or 'rise' in market price will create an emotional instability of investors and cause a fear of loss or create an undue confidence, relating possibility of profit. The reaction to loss will culminate in excessive selling and pushing prices down and the reaction to gain will bring in the activity of active buying of securities. However, investors are more reactive towards decline in prices rather than increase in prices.

Market risks cannot be eliminated while financial risks can be reduced. Through diversification also, market risk can be reduced but not eliminated because prices of all stocks move together and any equity stock investor will be faced by the risk of a downwards market and decline in security prices.

2. Interest Rate Risk

There are four types of movements in prices of stocks in the market. These may be termed as (a) long-term, (b) cyclical (bull and bear markets), (c) intermediate or within the cycle, and (d) short-term. The prices of securities will rise or fall, depending on the change in interest rates. The longer the maturity period of a security the higher the yield on an investment and lower the fluctuations in prices. Shorter-term interest rates fluctuate at a great speed and are now more volatile than long-term securities but their changes have a similar effect, price. Traditionally, investors could attempt to forecast cyclical swings in interest rates and prices merely by forecasting ups and downs in general business activity. However, in India a combination of factors have produced a situation where it is difficult to accurately find out the changes in interest rates. Some of the factors that are responsible for complicated analysis are the differences between actual and expected inflation, monetary policies and industrial recessions in the economy. If interest rates could be calculated and forecasted accurately, investors would buy and sell securities with confidence.

Interest rates continuously change for bonds, preferred stock and equity stock. Interest rate risk can be reduced by diversifying in various kinds of securities and also buying securities of different maturity dates.

Interest rate risk can also be reduced by analyzing the different kinds of securities available for investment. A government bond or a bond issued by the financial institution like IDBI is a risk-less bond. Even if government bonds give a slightly lower rate of interest, in the long run they are better for a conservative investor because he is assured of his return. Moreover, government bonds are made more attractive by additional advantages of tax benefits. Therefore, one way to avert interest rate risk would be to purchase government securities. Then the price of securities in the private corporate sector will fall and interest rates will increase. This process will create a chain reaction in the securities. This is rarely possible in the real world situation.

3. Purchasing Power Risk

Purchasing power risk is also known as inflation risk. This risk arises out of change in the prices of goods and services and technically it covers both inflation and deflation periods. During the last two decades, it has been seen that inflationary have been continuously affecting the Indian economy. Therefore, in India purchasing power risk is associated with inflation and rising prices in the economy.

Inflation in India has been either 'cost push' or 'demand puli'. This type of inflation has been seen when costs of production rise or when there is a demand for products but there is no smooth supply and consequently prices rise. In India, the cost push inflation has led to enormous problems as the rise in prices of raw materials has greatly increased costs of production. The increase in costs of production has shown a rising trend in 'wholesale price index' and 'consumer price index'. A rising trend in price index reflects a price spiral in the economy.

The consumers who wanted to forego their present consumption level to purchase commodities in future found that they could not adjust their budgets because they were faced with rising prices and shortage of funds for allocation according to their preferences.

B) UNSYSTEMATIC RISK

1. Business Risk

Every corporate organization has its own objectives and goals and aims at a particular gross

profit and operating income-had also expects to provide a certain level of dividend income to its shareholders. It also hopes to plough back some profits. Once it identifies its operating level of earnings, the degree of variation from this operating level would measure business risk. For example, if operating income is expected to be 15% in a year, business risk will be low if the operating income varies between 14 and 16%. If the operating income is as low, as 10% or as high as 18% it would be said that the business risk is high.

Business risk is also associated with risks directly affecting the internal environment of the firm and those of circumstances beyond its control. The former is classified as internal business risk and the latter as external business risk. Within these two broad categories of risk, the firm operates.

Internal business risk may be represented by a firm's limiting environment within which it conducts its business. It is the framework within which the firm conducts its business drawing its efficiency largely from the constraints within which it functions. Internal business risk will be of differing degrees in each firm and the degree to which each firm achieves its goals and attainment level is reflected in its operating efficiency.

Each firm also has to deal with specific external factors. Many a times, these factors are beyond the control of a firm as they are responsive to specific operating environmental conditions. External risks of the business are due to many factors. Some of the factors that can be summarized are:

- **Business cycle:** Some industries move automatically with the business cycle, others move counter-cyclically;
- **Demographic factors:** Such as geographical distribution of population by age, group and race;
- **Political policies:** Change in decisions, toppling of State Governments to some extent affect the working of an industry;
- **Monetary policy:** Reserve Bank of India's policies with regard to monetary and fiscal policies may also affect revenues through an effect on cost as well as availability of funds. When the RBI controls its monetary policies in a way that money asset becomes expensive, people postpone their purchases and the impact of such factors can be seen in retailers' showrooms. As buying activity is restricted, sales slide down;
- **Environment:** The economic environment of the economy also influences the firm and costs and revenues.

2. Financial Risk

Financial risk in a company is associated with the method through which it plans its financial structure. If the capital structure of a company tends to make earnings unstable, the company may fail financially. How a company raises funds to finance its needs and growth will have an impact on its future earnings and consequently on the stability of earnings. Debt financing provides a low cost source of funds to a company, at the same time providing financial leverage for the common stock holders. As long as the earnings of the company are higher than the cost of borrowed funds, the earnings per share of common stock are increased. Unfortunately, large amounts of debt financing also increases the variability of the returns of the common stock holders and thus increases their risk. It is found that variation in returns for shareholders in levered firms (borrowed funds company) is higher than in un-levered firms. The variance in returns is the financial risk.

Financial risk and business risk are somewhat related. While business risk is concerned with an analysis of the income statement between revenues and earnings before interest and taxes (EBIT), financial risk can be stated as being between Earnings Before Interest and Taxes (EBIT) and Earnings Before Taxes (EBT). If the revenue, cost and EBIT of a firm is variable, it implies that there is business risk and in this situation borrowed funds can magnify risk especially in unprofitable years. Debt in modest amounts is desirable. Excessive debt is to be avoided as the long range profitability of the company can be depressed. The company should constantly test its debt to fixed assets, debts to net worth, debts to working capital and give coverage of interest charges and preferred dividends by net income after taxes. These methods will check imbalance in the firm's financing method and help to reduce risk.

3. Regulation Risk

Some investments can be relatively attractive to other investments because of certain regulations or tax laws that give them an advantage of some kind. Municipal bonds, for example, pay interest that is exempt from local, state and federal taxation. As a result of that specific tax exemption, municipals can price bonds to yield a lower interest rate since the net after-tax yield may still make them attractive to investors.

4. Business Risk

The risk of doing business in a particular industry or environment is called business risk. For example, as one of the largest steel producers, U.S. Steel faces unique problems.

5. Bull-Bear Market Risk

This risk arises form the variability in the market returns resulting from alternating bull and bear market forces.

- When security index rises fairly consistently from a low point, this upward trend is called a bull market. The bull market ends when the market index reaches a peak and starts a downward trend.
- The period during which the market declines, this downward trend is called a bear market.

6. Management Risk

Management, all said and done, is made of people who are mortal, fallible and capable of making a mistake or a poor decision. Errors made by the management can harm those who invested in their firms.

7. Default Risk

It is that portion of an investment's total risk that results from changes in the financial integrity of the investment. For example, when a company that issues securities moves either further away from bankruptcy or closer to it, these changes in the firm's financial integrity will be reflected in the market price of its securities. The variability of return that investors experience, as a result of changes in the credit worthiness of a firm in which they invested, is their default risk.

8. International Risk

International risk can include country risk and exchange rate risk.

i) **Exchange Rate Risk :** All investors who invest internationally in today's increasingly global investment arena face the prospect of uncertainty in the returns after they convert the foreign gains back to their own currency.

ii) **Country Risk :** Country risk, also referred to as political risk, is an important risk for investors today. With more investors investing internationally, both directly and indirectly, the political and therefore economic stability and viability of a country's economy need to be considered.

9. Industry Risk

An industry may be viewed as group of companies that compete with each other to market a homogeneous product. Industry risk is that portion of an investment's total variability of return caused by events that affect the products and firms that make up an industry.

10. Liquidity Risk

Liquidity risk is the risk associated with the particular secondary market in which a security trades. An investment that can be bought or sold quickly and without significant price concession is considered liquid. The more uncertainty about the time element and the price concession, the greater the liquidity risk.

Short Question and Answers

1. What is Project Finance?

Ans :

Project finance is the long-term financing of infrastructure and industrial projects based upon the projected cash flows of the project rather than the balance sheets of its sponsors. Usually, a project financing structure involves a number of equity investors, known as 'sponsors'; a 'syndicate' of banks or other lending institutions that provide loans to the operation.

They are most commonly non-recourse loans, which are secured by the project assets and paid entirely from project cash flow, rather than from the general assets or creditworthiness of the project sponsors, a decision in part supported by financial modeling. The financing is typically secured by all of the project assets, including the revenue-producing contracts. Project lenders are given a lien on all of these assets and are able to assume control of a project if the project company has difficulties complying with the loan terms.

2. Unsecured Loans and Deposits.

Ans :

Unsecured loans are typically provided by the promoters to fill the gap between the promoters' contribution required by financial institutions and the equity capital subscribed by the promoters. These loans are subsidiary to the institutional loans. The rate of interest chargeable on these loans is less than the rate of interest on the institutional loans. Finally these loans cannot be taken back without the prior approval of financial institutions.

Deposits from public, referred to as public deposits, represent unsecured borrowing of two to three years' duration. Many existing companies prefer to raise public deposits instead of term loans from financial institutions because restrictive covenants do not accompany public deposits. However, it may not be possible for a new company to raise public deposits. Further, it maybe difficult for it to repay public deposits within three years.

3. Foreign Currency Loans.

Ans :

Apart from rupee term loans, financial institutions provide foreign currency loans. This assistance is now provided only for the import of capital equipment (as per the liberalised exchange risk management system, foreign currency required for other purposes has to be purchased from authorised dealers at market rates). On foreign currency loans sanctioned under the general scheme, the interest rate charged is typically a floating rate as determined by the lenders, (the foreign agency that has given a line of credit to the financial institution for onward lending) and the risk of exchange rate fluctuation is born by the borrower. On foreign currency loans sanctioned under the Exchange Risk Administration Scheme, the principal repayment obligations of the borrower are rupee tied at the rate of exchange prevailing on the dates of disbursement. On such rupee-tied loan liability, the borrower pays by way of servicing his loan a composite, cost every quarter. The composite cost consists of three elements:

(i) the interest portion which is arrived on the basis of the weighted average interest cost of the various components of the currency pool,

(ii) the spread of the financial institutions, and

(iii) the exchange risk premium. The 'composite cost' is a variable rate determined at six-monthly intervals. It has a floor and a cap. Both the floor and the cap as well as the rate of interest applicable for the period is reviewed and announced from time to time.

4. What is Project Financing?

Ans :

Project Financing is Loan arrangement in which the repayment is derived primarily from the project's cash flow on completion, and where the project's assets, rights, and interests are held collateral.

Project finance is only possible when the project is capable of producing enough cash to cover all operating and debt-servicing expenses over the whole tenor of the debt. A financial model is needed to assess economic feasibility of the project.

Model's output is also used in structuring of a project finance deal. Most importantly, it is used to determine the maximum amount of debt the project company can have and debt repayment profile, so that in any year the Debt Service Coverage Ratio (DSCR) should not exceed a predetermined level. DSCR is also used as a measure of riskiness of the project and, therefore, as a determinant of interest rate on debt. Minimal DSCR set for a project depends on riskiness of the project, i.e. on predictability and stability of cash flow generated by it. As a rule of thumb, DSCR should not be less than 1.60. However, in some cases (such as power plant projects with strong off-take agreements) it could be set at as low as 1.05.

5. Disadvantages of Payback Method

Ans :

Following are the disadvantages of payback methods:

1. Ignores Cash Inflows

The payback period entirely ignores many of the cash inflows which occur after the payback period. This could be misleading and could lead to discrimination against the proposal which generates substantial cash inflows in later years. It ignores what happens after the initial investment is recouped.

2. Equal Weightage to all Cash Flows

It ignores the timing of the occurrence of the cash flows. It considers the cash flows occurring at different point of time as equal in money worth and ignores the time value of money. It gives equal weights to all the cash flows before the payback date and no weight at all to cash flows occurring thereafter.

3. Ignores Salvage Value

The payback period also ignores the salvage value and the total economic life of the project. A project which has substantial salvage value may be ignored (though more profitable it may be otherwise) in favour of a project with higher inflows in earlier years. It is insensitive to the economic life span and thus not a truly meaningful criterion for determining the economic viability of a proposal. The speed with which the initial investment is recovered is not a sufficient way to appraise the profitability.

4. Method of Capital Recovery

The payback period is more a method of capital recovery rather than a measure of profitability of a project. To recover the capital is not enough, of course, because from an eco-nomic view point one would hope to earn a profit on the funds while they are invested.

6. Advantages of Average Rate of Return Method.

Ans :

The advantages of average rate of return method are as follows:

1. Easy to Calculate

It is easy to calculate because it makes use of readily available accounting information. In contrast, discounted cash flow technique involves tedious calculations.

2. Considers Entire Cashflows

It takes into consideration the entire cash inflows during the project life. Payback Method does not use the entire stream of incomes.

3. Based on Financial Data

As this method is based upon accounting concept of profits, it can be readily calculated from the financial data.

7. Advantages of NPV Method.

Ans :

The advantages of NPV method for evaluating investment proposals are as follows:

1. Recognition of Time Value of Money

The most significant advantage is that it explicitly recognizes the time value of money, e.g., total cash flows pertaining to two

machines are equal but the net present value are different because of differences of pattern of cash streams. The need for recognizing the total value of money is thus satisfied.

2. Sound Method of Appraisal

It also fulfils the second attribute of a sound method of appraisal. In that it considers the total benefits arising out of proposal over its life time.

3. Selection of Mutually Exclusive Projects

It is particularly useful for selection of mutually exclusive projects.

4. Maximization of the Shareholder's Wealth

This method of asset selection is instrumental for achieving the objective of financial management, which is the maximization of the shareholder's wealth. In brief the present value method is a theoretically correct technique in the selection of investment proposals.

8. Define Profitability Index.

Ans :

The profitability index (PI) refers to the ratio of discounted benefits over the discounted costs. It is an Evaluation of the profitability of an investment and can be compared with the profitability of other similar investments which are under consideration. The profitability index is also referred to as benefit-cost ratio, cost- benefit ratio, or even capital rationing.

9. What is cashflows?

Ans :

A cash flow describes a real or virtual movement of money:

A cash flow in its narrow sense is a payment (in a currency), especially from one central bank account to another; the term 'cash flow' is mostly used to describe payments that are expected to happen in the future, are thus uncertain and therefore need to be forecasted with cash flows

Elements of the cash flow stream

To evaluate a project, you must determine the relevant cash flows, which are the incremen-tal after-tax cash flows associated with the project.

The cash flow stream of a conventional project—a project which involves cash outflows followed by cash inflows—comprises three basic components: (i) initial investment, (ii) operating cash inflows, and (iii) terminal cash inflow.

The initial investment is the after-tax cash outlay on capital expenditure and net working capital when the project is set up. The operating cash inflows are the after-tax cash inflows resulting from the operations of the project during its economic life. The terminal cash inflow is the after-tax cash flow resulting from the liquidation of the project at the end of its economic life.

10. What is Cost of Capital?

Ans :

Meaning

The cost of capital of a firm is the minimum rate of return expected by its investors. It is the weighted average cost of various sources of finance used by a firm. The capital used by a firm may be in the form of debt, preference capital, retained earnings and equity shares. The concept of cost of capital is very important in the financial management. A decision to invest in a particular project depends upon the cost of capital of the firm or the cut off rate which is the minimum rate of return expected by the investors.

In case a firm is not able to achieve even the cut off rate, the market value of its shares will fall. In fact, cost of capital is the minimum rate of return expected by its investors which will maintain the market value of shares at its present level. Hence, to achieve the objective of wealth maximisation, a firm must earn a rate of return more than its cost of capital. Further, optimal capital structure maximises the value of a firm and hence the wealth of its owners and minimises the firm's cost of capital. The cost of capital of a firm or the minimum rate of return expected by its investors has a direct relation with the risk involved in the firm. Generally, higher the risk involved in a firm, higher is the cost of capital.

Cost of capital for a firm may be defined as the cost of obtaining funds, *i.e.,* the average rate of return that the investors in a firm would expect for supplying funds to the firm.

Definitions

According to Hunt, William and Donaldson, "Cost of capital may be defined as the rate that must be earned on the net proceeds to provide the cost elements of the burden at the time they are due".

According to James C. Van Home defines cost of capital as, "a cut-off rate for the allocation of capital to investments of projects. It is the rate of return on a project that will leave unchanged the market price of the stock."

According to Solomon Ezra, "Cost of capital is the minimum required rate of earnings or the cut-off rate of capital expenditures."

Accordig to Hampton, John J. defines cost of capital as, "the rate of return the firm requires from investment in order to increase the value of the firm in the market place".

UNIT IV

Project Control: Network Diagrams, Network Analysis, Critical Path, Quality Management, Project Execution, Monitoring and control, Agile project Management, Scrum, Lean Production and project management.

4.1 PROJECT CONTROL

Q1. What is Project Control? Explain the need for Project Control.

Ans :

Introduction

Project control is a necessary step to ensure that whether the project is on the right path or not and if not then to take corrective action to bring it on the track. The term control has several meanings. Those new to project management are initially dismayed by the use of the term "control", because they mistakenly equate it with the concept of authority. In the world of project management, control has very little to do with telling people what to do, dictating their actions or thoughts or trying to force them to behave in certain way - all of which are common interpretations of control.

In project management, the term "control" is much more analogous to steering a ship. It's about continually making course adjustments with one main objective in mind - bringing the ship into safe harbor, as promised at the start of the voyage. And the successful project voyage includes identifying a specific destination, carefully charting a course to get there, evaluating location throughout the voyage and keeping a watchful eye on what lies ahead.

Project controls are tools developed to diagnose the system for deviations from the actual plan and reset them back with the actual plans/ schedule. Project controls are required to check whether the project is progressing in accordance with the plans and standards set during the planning phase. In fact, project controls are measures taken by the project manager in order to minimize the gap between the planned output and the delivered output.

Need for Project Control

Project control focuses on performance, cost, and schedule. Things such as unexpected technical problems, insufficient resources, and quality or reliability problems can increase the need for project control.

- The need for project control is important no matter the size of the project and should be based on the management methodology.
- While some project management methodologies include intertwining control processes, failing to utilize them will cause chaos.
- Project controls are, "The process of tracking, reviewing, and regulating the process to meet the performance objectives defined in the project management plan".
- That statement can mean implementing many different controls to reach project goal. The importance and need for project control can be measured by the project plan.
- Controls should be set based on the size and depth of the project goal. Further still, if a project is measuring a process to correct it, there is need to be able to implement controls that show fluctuation, defects, and risks.
- The importance of project control and its impact on business performance has long been recognized.
- Effective control helps to run the project according to plan, often in spite of changes, contingencies and work related contingencies.

- Any organization concerned with its business performance in these uncertain times must implement effective cost control as one of its key control mechanisms when managing projects.
- Cost control is the process of monitoring the status of the project to update the project budget and managing changes to the cost baseline.

Q2. Explain the features of Project Control.

Ans :

Features of Project Control

In project control, the emphasis is on scope, quality, schedule and cost.

1) Scope Change Control

A change in project scope is an alteration to the original, agreed-upon scope statement defined in the project plan and specified in the WBS. Projects have a natural tendency to grow over time because of changes and additions in the scope, a phenomenon called "creeping scope".

Changes or additions to the scope reflect changes in requirements and work definition that usually result in time and cost increases. The aim of scope change control is to identify where changes have occurred, ensure the changes are necessary and/or beneficial, contain or delimit the changes wherever possible and manage the implementation of changes.

Because changes in scope directly impact schedules and costs, controlling scope changes is an important aspect of controlling schedules and costs. Scope change control is implemented through the change control system and configuration management.

2) Quality Control

Quality is synonymous with ability to conform to the requirements of the end-item and work processes and procedures. Quality control is managing the work to achieve the desired requirements and specifications, taking preventive measures to keep errors and mistakes out of the work process and determining and eliminating the sources of errors and mistakes as they occur.

The quality plan describes necessary "quality conditions" for every work package, i.e., prerequisites or stipulations about what must exist before, during and after the work package to ensure quality. The quality plan should specify the measures and procedures (tests, inspections, reviews, etc.) to assess conditions and progress toward meeting requirements.

Another part of quality control is tracking project performance with respect to technical requirements and modifying the work or the requirements as necessary. A methodology for doing this is called technical performance measurement.

3) Schedule Control

The intent of schedule control is to keep the project on schedule and minimize schedule overruns. One cause of project schedule overruns is poor planning and, especially, poor definition and time estimating. However, even when projects are carefully planned and estimated, they can fall behind schedule from causes beyond anyone's control, including, e.g., changes in project scope, weather problems and interrupted shipments of materials.

4) Cost Control

Cost control tracks expenditures versus budgets to detect variances. It seeks to eliminate unauthorized or inappropriate expenditures and to minimize or contain cost changes. It identifies why variances occur, where changes to cost baselines are necessary and what cost changes are reflected in budgets and cost baselines.

Cost control is accomplished at both the work-package level and the project level using the cost account structure and PCAS.

Q3. What are the objectives of Project Control.

Ans :

Objectives of Project Control

1) Primary Objective

The primary objective of control is regulation. The purpose is to monitor the delivered output by comparing it with the actual/ scheduled output suggested in the planning phase. The regulatory function of control helps in:

i) Translating the objectives into performance standards that are represented by program activities and events.

ii) Formulating budgets in order to compare the delivered output with the actual/scheduled output.

2) Secondary Objective

The secondary objective of control is conservation of resources. The project manager is entrusted the responsibility of protecting the physical, human and financial resources of the organization.

i) Physical project control is the process of controlling the use of physical projects. It includes the preventive or corrective maintenance of the projects. A project manager has to schedule the maintenance / replacement plan in a way as to minimize interruption to the work in progress and without overlooking the quality aspect.

ii) Human resource control is the process of controlling and maintaining the growth and development of the human capital of the organization. Conserving human resource is therefore a significant aspect of the control system.

iii) Financial resource control is a combination of regulatory and conservatory functions. The regulatory and conservatory techniques of financial resource control consist of a control on current projects and project budgets along with capital investments.

3) Tertiary Objective

The tertiary objective of project control is to facilitate decision-making. Effective decision-making by the management requires the following reports:

i) A report comprising the plan, schedule and budget made during the planning phase.

ii) Data consisting of the comparison between the resources spent in order to achieve the delivered output and the scheduled output. This report should also include an estimation of the remaining work.

iii) An estimate of the resources required for the completion of the project.

Q4. Outline the steps involved in Project Control.

Ans :

Project Control Process

Control is the process of comparing actual performance against plan to identify deviations, evaluate possible alternative courses of actions and take appropriate corrective action. The project control steps for measuring and evaluating project performance are explained below:

1) Step 1: Setting a Baseline Plan

The baseline plan provides us with the elements for measuring performance. The baseline is derived from the cost and duration information found in the Work Breakdown Structure (WBS) database and time-sequence data from the network and resource scheduling decisions. The WBS defines the work in discrete work packages that are tied to deliverables and organization units. In addition, each work package defines the work, duration and budget. From the WBS the project network schedule is used to time-phase all work, resources and budgets into a baseline plan.

2) Step 2: Measuring Progress and Performance

Time and budgets are quantitative measures of performance that readily fit into the integrated information system. Qualitative measures such as meeting customer technical specifications and product function are most frequently determined by on-site inspection or actual use. Measurement of time performance is relatively easy and obvious. That is, the critical path early, on schedule or late; is the slack of near-critical paths decreasing to cause new critical activities? Measuring performance against budget (e.g., money, units in place, labor hours) is more difficult and is not simply a case of comparing actual versus budget. Earned Value is necessary to provide a realistic estimate of performance against a time-phased budget. Earned Value will be defined as the budgeted cost of the work performed (EV).

3) Step 3: Comparing Plan against Actual

Because plans seldom materialize as expected, it becomes imperative to measure deviations from plan to determine if action is necessary. Periodic monitoring and measuring the status of the project allow for comparisons of actual versus expected plans. It is crucial that the timing of status reports be frequent enough to allow for early detection of variations from plan and early correction of causes. Usually status reports should take place every one to four weeks to be useful and allow for proactive correction.

4) Step 4: Taking Action

If deviations from plans are significant, corrective action will be needed to bring the project back in line with the original or revised plan. In some cases, conditions or scope can change, which, in turn, will require a change in the baseline plan to recognize new information.

Q5. Explain the different types of Project Control.

Ans :

The process of controlling a project is a highly complex task. The complexity is more than fixing the problem after waiting for something to go wrong. Control starts from identifying the points in the project to exert control, knowing what should be controlled and how to measure it, what should be the tolerable limit of deviation and how to identify and correct these deviations as they happen. Project control is used to check the four key parameters time; cost, scope and performance. There are three types of basic project control:

1) Cybernetic Control

Cybernetic controls, also known as steering controls, are very common control systems. Automatic operation is its chief characteristic. A cybernetic control is like a steering in an automobile that enables the controller to keep the project on track.

Cybernetic controls are generally used to monitor and control tasks that are carried out more or less continuously, e.g., software projects. The designing of cybernetic controls requires identifying mechanical tasks, based on the Work Breakdown Structure.

A cybernetic control system that minimizes the variation from the set standards is known as a negative feedback loop. The control mechanism in a cybernetic control system acts in a direction that is opposite to the one in which the variation moves away from the standard. Also the speed of action of a control is directly proportionate to the size of variation from the standard.

Cybernetic controls can be classified into three types, depending on the sophistication of the standards set.

i) A first order control system is a goal-seeking device. It is a rigid system that seldom allows altering the set standards. The standards once set can be altered only by an external intervention. For example, once a standard temperature is set in a thermostat, the air-

conditioning systems operate to maintain it.

ii) A second order control system can alter the standards that are set only in accordance with predetermined rules and regulations.

iii) A third order control system is a flexible goal seeking device. These systems are flexible enough to alter their standards from time to time, based on the evaluation of the past performances. These systems can deal with contingencies better than the rest.

2) Go/No-Go Controls

As cost and time over-runs may require the organization to pay penalties to the customer, Go/No-go controls are instituted to check whether the output meets the preset cost and time standards. These control systems are flexible and apply to all the aspects of project management.

The project plan, budget and schedule are the control documents that contain preset milestones that act as verification points. Controls are usually done at the level of detail in the project plan, budget and schedule. The periodicities with which Go/no-go controls are operated are regular and preset. Preset intervals are decided upon with the help of calendars or the operating cycles.

The major difference between the cybernetic and the Go/No-go control system is that a cybernetic system functions automatically and continuously, while a go/no-go system functions only when it is put into application by the controller and is periodic.

3) Post Controls

These are the control systems that are applied after the completion of the project. These are also called post project controls or reviews.

According to George Santayana, "Those who cannot remember the past are condemned to repeat it". Thus, while cybernetic and Go/No-go controls help a firm to accomplish the goals of current projects, post control tries to enhance the firm's chances of meeting future project goals, on the basis of lessons learn in the past projects.

4.1.1 Network Analysis

Q6. What is Network ? Explain the rules for Network construction with an example.

Ans :

The network diagram, also referred to as the project graph, shows the activities and events of the project and their logical relationships.

Rules for Network Construction

The rules to be observed in constructing the network diagram are discussed below:

1. Each activity must have a preceding and a succeeding event. An activity is numerically denoted by the pair of preceding and succeeding events. In the dinner project, for example, the activity 'send invitations' is designated as (1-2).

2. Each event should have a distinct number. The number given to an event can be chosen in any way, provided this condition is satisfied. In practice, however, events are so numbered that the number at the head of the arrow is greater than that at its tail.

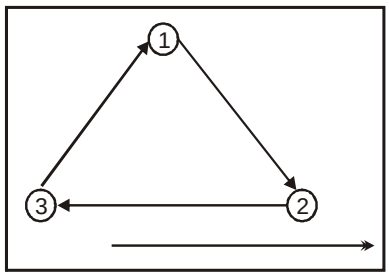


Fig. A Network Diagram

3. There should be no loops in the project network. A situation like the one shown in fig is not permissible.

4. Not more than one activity can have the same preceding and succeeding events. This means that each activity is represented by a uniquely numbered arrow and a situation like the one shown in fig is not permissible.

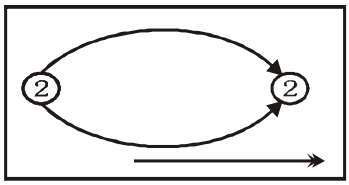


Fig. A Loop

To ensure that each activity is uniquely numbered it may be necessary sometimes to introduce dummy activities. A dummy activity is an imaginary activity which can be accomplished in zero time and which does not consume resources. It is represented by a dashed arrow. If shows a variant of with a dummy activity (3-2) introduced to conform to the rules of network construction.

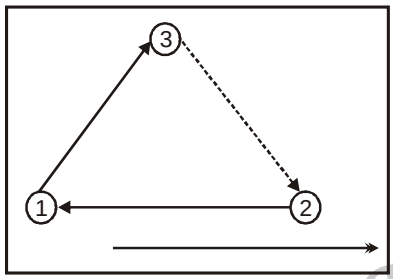


Fig. A Dummy Activity

A dummy activity may also be used to represent a constraint, necessary to show the proper relationship between activities. If shows part of a network diagram having a dummy activity.

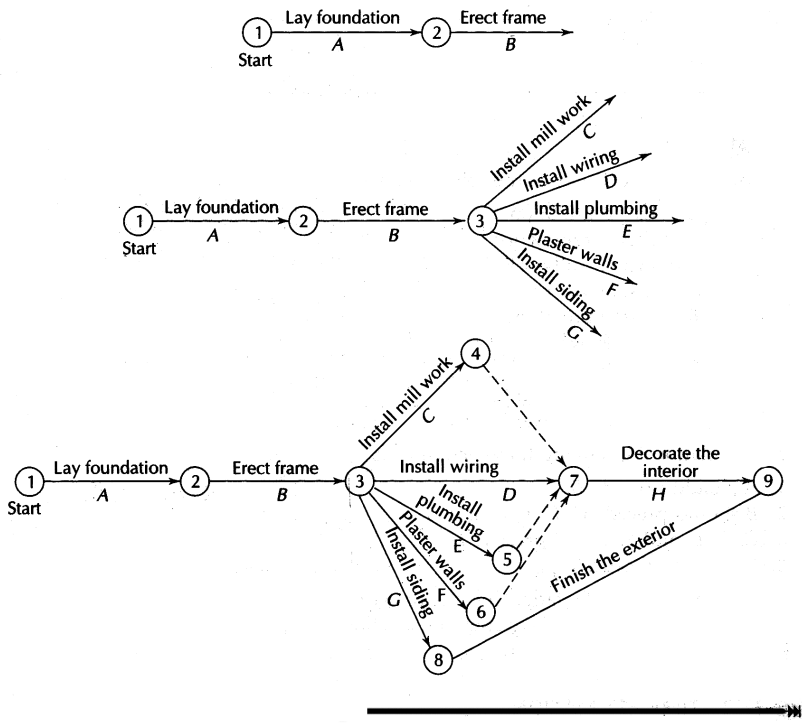
Illustration

A building project consists of the following activities :

A = Lay foundation
B = Erect framework
C = Install millwork
D = Install wiring
E = Install plumbing
F = Plaster walls
G = Install siding
H = decorate the interior
I = Finish the exterior

The interrelationship among these activities is as follows :

1. A should precede B.
2. B should precede C, D, E, F, and G.
3. C, D, E, and F should precede H.
4. G should precede I.



Q7. Explain the features and advantages of Network.

Ans : **(Aug.-21, Imp.)**

Features of Network Analysis

The following are the salient features of network analysis,

(i) Network analysis is a technique which is used to estimate the time and resources required for the completion of a project. This helps firm in planning, scheduling and controlling the projects.

(ii) The information of network analysis and the linkages of events represents the relationship and sequence existing between the activities of a project.

(iii) The events of a network are meaningful and easily identifiable.

(iv) The estimates of time for each event are associated with uncertainties

(v) Network analysis provide optimum solution to minimize the utilities of resources.

(vi) Through network analysis, the criticality of each event of a project can be determined.

Advantages of Using Networks

1. Networks give a logical representation of layout and sequence of difficult project.
2 Critical activities or events of the complete project can be identified through networks.
3. Networks are the focus point for co-ordination and action.
4. The base of the project like cost, revenue, working out times etc., are provided by networks.
5. Networks help in planning and controlling complex projects.

Q8. Define time estimation. Explain the obtaining of time estimates.

Ans : **(Oct.-22, Imp.)**

Time Estimation

Once the logic and detail of the network have been established, time estimates must be assigned to each activity. Generally, three time values are obtained for each activity :

1. Optimistic time (t_0)
2. Most likely time (t_m)
3. Pessimistic time (t_p)

The optimistic time, t_0, is the time required if no hurdles or complications arise. The most likely time, t_m, is the time in which the activity is most likely to be completed. This estimate takes into consideration normal circumstances, making allowance for some un-foreseen delays. The pessimistic time, t_p, is the time required if unusual complications and/ or unforeseen difficulties arise.

Obtaining Time Estimates

Time estimates should be obtained by the PERT planner from persons who are responsible for estimation. The following points should be borne in mind while obtaining time estimates:

1. Time estimates should be obtained by skipping around the network rather than by following a specific path. If estimates are obtained by following one path, there is a tendency for the person providing the estimates to add them mentally and compare them with a previously conceived notion of the time of the total path.
2. The estimates of t_0, t_m, and t_p should be defined independently of each other.
3. The time available for completing the project should not influence the estimates of t_0, t_m, and t_p.
4. It should be made known that t_0, t_m, and t_p are estimates and not schedule commitments.
5. The estimates of t_0, t_m, and t_p should include allowances for occurrences which are generally considered as random variables (weather conditions, administrative delays, etc.) but not for occurrences that are normally not considered as random variables (flood, wars, etc.)

Average Time

Once the three time estimates for each activity are obtained, the expected value of activity durations is calculated. The expected value, t_e, is usually obtained by the formula:

$$t_e = \frac{t_o + 4t_m + t_p}{6}$$

where t_e = weighted arithmetic average time

t_0 = optimistic time

t_m = most likely time

t_p = pessimistic time

4.1.2 Critical Path

Q9. What is CPM ? Discuss forward and backward pass methods.

Ans : **(Oct.-22, Imp.)**

CPM

It assumes that the time required to complete an activity can be predicted accurately. Thus the cost can be known once the critical path is identified. Since time is an important factor, CPM involves trade-off between the cost and time. It determines the optimum duration for the project, i.e., a maximum duration which involves the lowest overall costs.

Forward and Backward Pass Methods

Forward pass method is used to find out the earliest events time. The computations begin from the start node and move to the end node by assuming zero as earliest occurrence time for the initial event.

(i) $E_j = \text{Max}\ (E_i + t_{ij})$

Where,

E_j - Earliest event occurrence time of event 'j'.

E_i - Earliest event occurrence time of event 'i'.

t_{ij} - Time estimate of activity (i,j).

(ii) $ES_{ij} = E_i$

(iii) $EF_{ij} = ES_{ij} + t_{ij}$

Where.

ES_{ij} - Earliest starting time for an activity (i,j).

EF_{ij} - Earliest finishing time for an activity (i,j).

Backward pass method is used to find out the latest events time. It specifies the time by which all activities entering into that event must be completed without delaying the total project.

They are computed by reversing the method of calculation or earliest time.

Assuming,

Latest time = Earliest time for last or terminal event.

(i) $L_i = \text{Min}\ (L_j - t_{ij})$

Where,

L_i = Latest allowable event occurrence time of event i.

L_j = Latest allowable event occurrence of an activity (i, j).

Where,

(ii) $LF_{ij} = L_j$

(iii) $LS_{ij} = LF_{ij} - t_{ij}$

Where,

LF_{ij} – Latest finish time of an activity (i,j)

LS_{ij} – Latest start time of an activity (i,j).

Q10. (a) What do you mean by floats? What are its different types?

(b) Define stack and event slack.

Ans :

(a) Floats in Networks

Floats represent flexibility in scheduling. The concept of floats is useful for management in representing under-utilized resources and flexibility of the schedule and the extent to which the resources will be utilized on different activities.

The critical activities cannot be scheduled later than their earliest schedule time, without delaying the project duration. So they do not exhibit any flexibility in scheduling. But flexibility exists for scheduling the non-critical activities of the project.

Different Types of Floats

Total Float

It is the amount of time by which the completion of an activity can be delayed beyond the earliest expected completion time without affecting the overall project duration time.

$TF_{ij} = (L_j - E_i) - t_{ij}$

Where,

TF_{ij} - Total float of activity (i,j)

L_j - Latest time of event j

E_i - Earliest time of event i

t_{ij} - Time estimate of activity (i,j)

Free Float

It is the amount of time by which the completion of an activity can be delayed beyond the earliest finish time without affecting the earliest start of a subsequent activity.

$FF_{ij} = (E_j - E_i) - t_{ij}$

Where,

FF_{ij} - Free float of activity (i,j).

E_j - Earliest time of event j.

E_i - Earliest time of event i.

t_{ij} - Time estimate of activity (i,j).

Independent Moat

It is the time by which the start of an activity can be delayed without affecting activities, assuming

that the preceding activity has finished at its latest finish time. Negative float is taken as zero.

$IF_{ij} = (E_j - L_i) - t_{ij}$

Where,

IF_{ij} - Independent float

E_j - Earliest time of event j

L_i - Latest time of event i

t_{ij} - Time estimate of an activity (i,j).

Interfering Float

It is that part of total float which causes reduction in lit of successor activities.

In $F_{ij} = TF_{ij} - FF_{ij}$

Note that $IF \leq FF \leq TF$

(b) Slack and Event Slack

Slack

Slack refers to the time for which the event can be comfortably delayed without affecting the project completing time. Like floats, slack represents flexibility in scheduling. The basic difference between slack and floats is that slack is used for events whereas float is applied for activities.

Event Slack

For any event, slack is the difference between the latest event and the earliest event times.

For a given activity (i, j)

Head slack = $L_j - E_j$

Tail slack = $L_i - E_i$

Where E_i - Earliest time of event i

E_j - Earliest time of event j

L_i - Latest time of event i

L_j - Latest time of event j

Floats can be represented in terms of slacks

Total float = $(L_j - E_i) - t_{ij}$

Free float = Total float - Head slack

Independent float = Free float - Tail slack

PROBLEMS

1. The following table lists the jobes of a network along wiht the time estimates.

Jobs	Optimistic	Duration in Days Most Likely	Pessimistic
1-4	3	9	27
1-3	3	6	15
1-2	6	12	30
4-5	1	4	7
3-5	3	9	27
3-6	2	5	8
5-6	6	12	30
2-6	4	19	28

(a) Draw the project network.

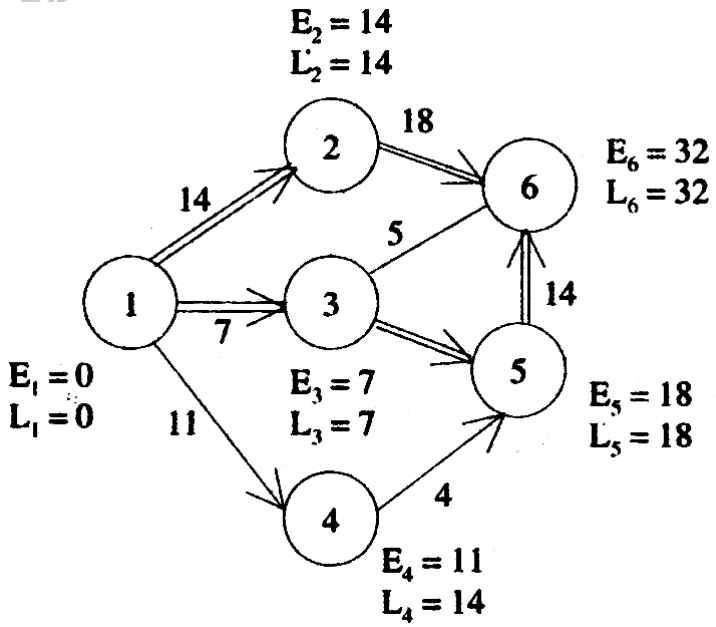
(b) What is the approximate probability that jobs on the critical path will be completed by the due date of 35 days ?

(c) What is your estimate of the probability that the entire project will be completed by the due date? Explain.

(d) What due date has 90% of chance of being met ?

Sol :

Network Diagram



Activity Time	Optimistic Time (t_p)	Most Likely Time (t_m)	Pessimistic Duration (t_p)	Expected $t_e = \frac{t_0 + 4t_m + t_p}{6}$	Expected Variable $\sigma_e^2 = \left[\frac{t_p - t_0}{6}\right]^2$
1–4	3	9	27	11	$\left(\frac{24}{6}\right)^2 = 16$
1–3	3	6	15	7	$\left(\frac{12}{6}\right)^2 = 4$
1–2	6	12	30	14	$\left(\frac{24}{6}\right)^2 = 16$
4–5	1	4	7	4	$\left(\frac{6}{6}\right)^2 = 1$
3–5	3	9	27	11	$\left(\frac{24}{6}\right)^2 = 16$
3–6	2	5	8	5	$\left(\frac{6}{6}\right)^2 = 1$
5–6	6	12	30	14	$\left(\frac{24}{6}\right)^2 = 16$
2–6	4	19	28	18	$\left(\frac{24}{6}\right)^2 = 16$

Critical Path

Paths	Duration
1-2-6	14 + 18 = 32
1-3-6	7 + 5 = 12
1-3-5-6	7 + 11 + 14 = 32
1-4-5-6	11 + 4 + 14 = 29

$\therefore$ The critical paths are, 1-2-6 and 1-3-5-6.

The expected project completion time is 32 days.

Variance of critical paths,

For 1-2-6 $\Rightarrow$ 16 + 16 = 32

For 1-3-5-6 $\Rightarrow$ 4 + 16 + 16 = 36

Since there are two critical paths in this case, the path with largest variance is to be considered. Hence, the path 1-3-5-6 is considered.

Now, standard deviation of critical path is $\sigma_e = \sqrt{36} = 6$

Now, the probability of completion 6f the project is given by, probability $z \leq \left[\frac{T_p - T_e}{\sigma_e}\right]$

Where,

T_e = Expected completion time = 32 days

T_p = Proposed completion time = 5 days.

Probability $\left[z \leq \frac{35-32}{6}\right]$ = Probability $[z \leq 0.5]$

But, $z = 0.5$ from normal distribution table is 0.1915.

$\therefore$ Completion of the project with in 35 days is,

$= 1 - 0.1915 = 0.8085 = 80.85\%$

The probability that the project can be completed in 35 days is 80.85%.

For 90% chance,

Completion of project with in 'x' days, $= 1 - 0.90 = 0.1$

From normal distribution table for 0.1, the value of z is 0.26.

But, $z = \frac{x-32}{6}$

$$0.26 = \frac{x-32}{6}$$

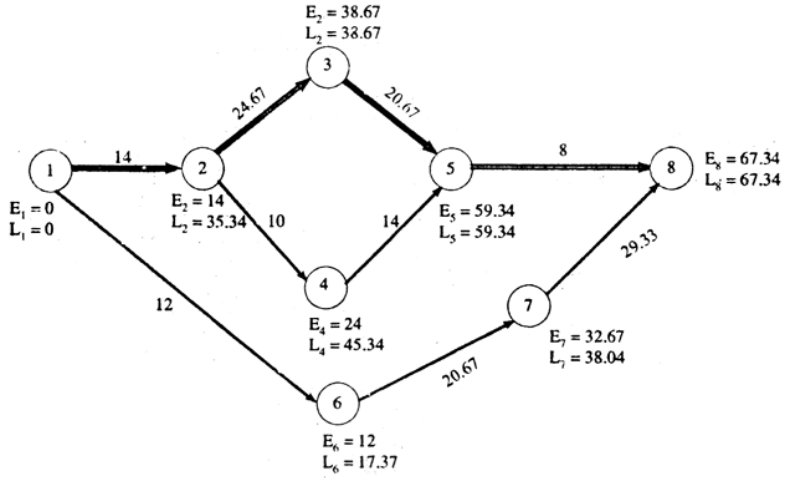
$\therefore$ $x = 33.56$ Days.

2. From the below details draw the project network and identify the critical path

Activity	Optimistic time (Days)	Most likely time (Days)	Pessimistic time (Days)
1-2	6	12	30
1-6	4	10	28
2-3	12	24	40
2-4	4	10	16
3-5	10	20	34
4-5	6	12	30
6-7	6	16	54
5-8	2	8	14
7-8	8	18	96

Sol :

Network Diagram:



Identifying the critical path by calculating expected duration

Activity	Optimistic time (Days) t_o	Most likely time (Days) t_{ra}	Pessimistic time (Days) t_p	Expected duration = $t_o = \frac{t_o + 4t_m + t_p}{6}$
1-2	6	12	30	$\frac{6+4\times12+30}{6}=14$
1-6	4	10	28	$\frac{4+4\times10+28}{6}=12$
2-3	12	24	40	$\frac{12+4\times24+40}{6}=24.67$
2-4	4	10	16	$\frac{4+4\times10+16}{6}=10$
3-5	10	20	34	$\frac{10+4\times20+34}{6}=20.67$
4-5	6	12	30	$\frac{6+4\times12+30}{6}=14$
6-7	6	16	54	$\frac{6+4\times16+54}{6}=20.67$
5-8	2	8	14	$\frac{2+4\times8+14}{6}=8$
7-8	8	18	96	$\frac{8+4\times18+96}{6}=29.33$

Critical Paths	Duration
1-2-3-5-8	14 + 24.67 + 20.67 + 8 = 67.34

The critical path is 1 -2-3-5- 8

The expected project completion time is 67.34 days.

3. From the following information,

(a) Draw the project network and find critical path.

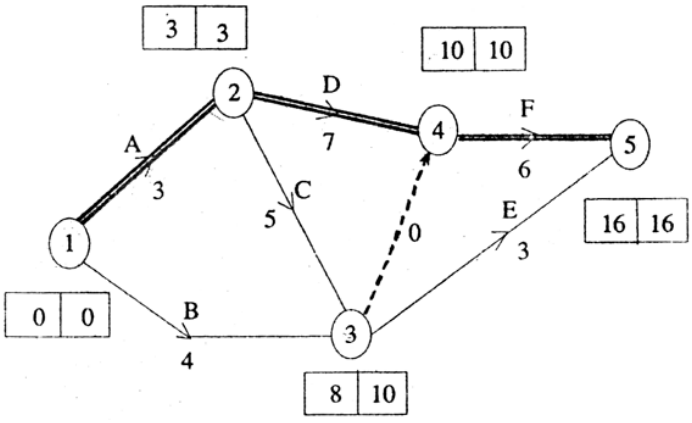
(b) Calculate earliest starting times and earliest finished times for each activity.

(c) Determine total, free and independent floats.

Activity Predecessor	Immediate	Duration
A	–	3
B	–	4
C	A	5
D	A	7
E	B, C	3
F	B, C, D	6

Ans :

(a) Network Diagram



Figure

Critical Path

$1 \rightarrow 2 \rightarrow 4 \rightarrow 5$ or $A \rightarrow D \rightarrow F$

= 3 + 7 + 6 = 16 days.

(b) Calculation of EST and EFT Time for Each Activity

To compute the times,

$E = \text{Max} [E_i + t_{ij}]$

$L = \text{Min } [L_j - t_{ij}]$

Earliest Times [Forward pass]

Node 1

Assume, $E_1 = 0$

Node 2

$E_2 = E_1 + t_{12} = 0 + 3 = 3$

Node 3

$E_3 = \text{Max } [E_1 + t_{13};\ E_2 + t_{23}]$

$= \text{Max } [0 + 4; 3 + 5]$

$= \text{Max } [4; 8] = 8$

Node 4

$E_4 = \text{Max } (E_2 + t_{24}, E_3 + t_{34})$

$= \text{Max } (3 + 7 ; 8 + 0)$

$= \text{Max } (10; 8) = E_4 = 10$

Node 5

$E_5 = \text{Max } [E_3 + t_{35} ; E_4 + t_{45}]$

$= \text{Max } [8 + 3; 10 + 6]$

$= \text{Max } [11; 16] = 16$

Latest Time: [Backward pass]

Assume, $L_5 = E_5 = 16$

Working backwards

$L_4 = L_5 - t_{45}$

$= 16 - 6 = 10$

$L_3 = \text{Min } [L_5 - t_{35} ; L_4 - t_{34}]$

$= \text{Min } [16 - 3 ; 10 - 0]$

$= \text{Min } [13; 10] = 10$

$L_2 = \text{Min}[L_3 - t_{23}\ ;\ L_4 - t_{24}]$

$= \text{Min } [10 - 5\ ; 10 - 7]$

$= \text{Min } [5; 3] = 3$

$L_1 = \text{Min } [L_3 - t_{13} ; L_2 - t_{12}]$

$= \text{Min } [10 - 4\ ; 3 - 3]$

$= \text{Min } [6\ ;\ 0] = 0$

(c) Calculation of Total, Free and Independent Floats

Activity (1)	Duration (2) (t_{ij})	Start		Finish		$[L_j - E_i - t_{ij}]$	$[E_j - E_i - t_{ij}]$	$[E_j - L_i - t_{ij}]$
		Earliest (3)	Latest (4)=(6)–(2)	Earliest (5)=(3)+(2)	Latest (6)	Total (7)=(4)–(3)	Free (8)=$E_j - E_i - T_{ij}$	Independent (9)=(8)–($L_i - E_i$)
1 – 2	3	00	3	3	0	0	0	0
1 – 3	4	06	4	10	6	4	4	4
2 – 3	5	35	8	10	2	0	0	0
2 – 4	7	33	10	10	0	0	0	0
.3 – 5	3	8	13	11	16	5	5	3
4 – 5	6	10	10	16	16	0	0	0

4.1.3 Gantt chart

Q11. What is Gantt chart? Explain the advantages and disadvantages of gantt chart.

Ans :

The most common type of display is the bar or Gantt chart. It is named after Henry Gantt, who first utilized this procedure in the early 1920s. It is a means of displaying simple activities or events plotted against time. These are commonly used to exhibit programme progress or define specific work required to accomplish an objective. It includes list of activities, activity durations, schedule dates, and progress-to-date.

Advantages

1. It is simple to understand and easy to change.
2. It is the simplest and least complex means of portraying progress.
3. It can easily be expanded to identify specific elements that may be either behind or ahead of schedule.

Disadvantages

1. It does not show the interdependencies of the activities, and therefore does not represent a network of activities.
2. It cannot show the result of an early or a late start in activities.

4.2 QUALITY MANAGEMENT

Q12. What do you understand by project quality management?

Ans : **(Oct.-22, Imp.)**

Introduction

Project quality management includes the processes required to ensure that the project will satisfy the needs for which it was undertaken. It includes "All activities of the overall management function that determine the quality policy, objectives, and responsibilities and implements them by means such as quality planning, quality control, quality assurance, and quality improvement, within the quality system".

It provides an overview of the following major project quality management processes:

1) Quality Planning

Identifying which quality standards are relevant to the project and determining how to satisfy them.

2) Quality Assurance

Evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards.

3) Quality Control

Monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance.

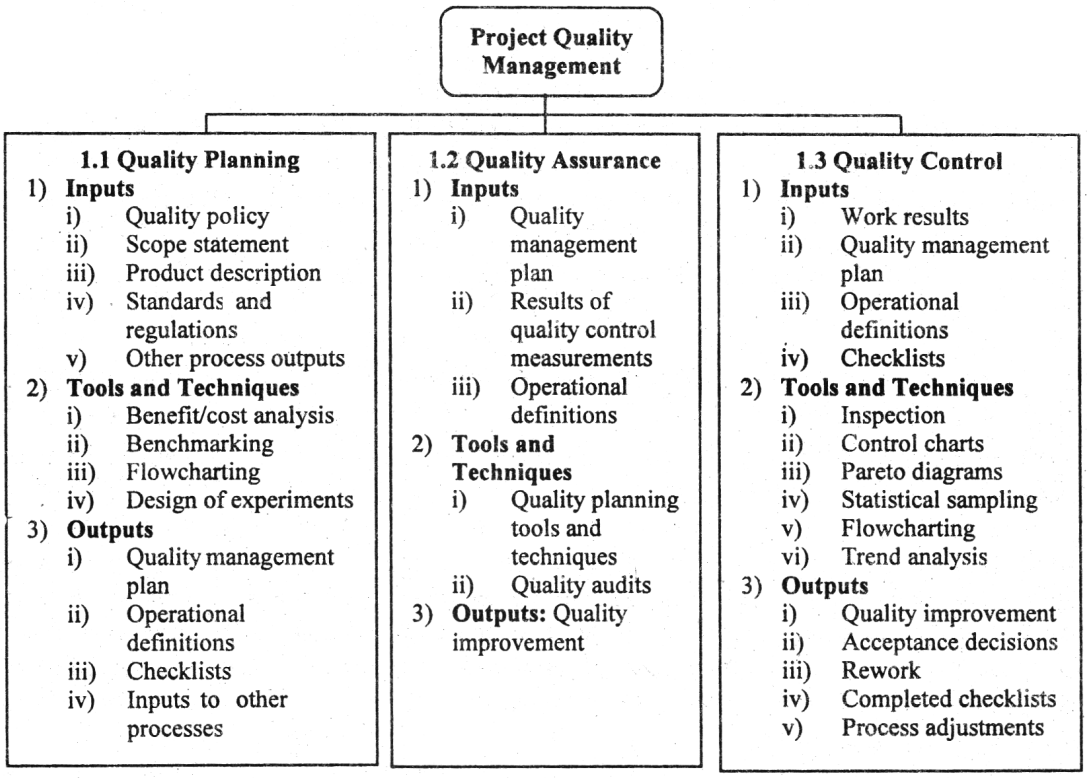


Fig. Project Quality Management Overview

These processes interact with each other and with the processes in the other knowledge areas as well. Each process may involve effort from one or more individuals or groups of individuals based on the needs of the project. Each process generally occurs at least once in every project phase.

The basic approach to quality management described is intended to be compatible with that of the International Organization for Standardization (ISO) as detailed in the ISO 9000 and 10000 series of standards and guidelines. This generalized approach should also be compatible with:

1) Proprietary approaches to quality management such as those recommended by Deming, Juran, Crosby, and others, and

2) Non-Proprietary approaches such as Total Quality Management (TQM), Continuous Improvement, and others.

Project quality management must address both the management of the project and the product of the project. Failure to meet quality requirements in either dimension can have serious negative consequences for any or all of the project stakeholders.

For Example

1) Meeting customer requirements by overworking the project team may produce negative consequences in the form of increased employee turnover.

2) Meeting project schedule objectives by rushing planned quality inspections may produce negative consequences when errors go undetected.

Quality is "The totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs". A critical aspect of quality management in the project context is the necessity to turn implied needs into stated needs through project scope management.

The project management team must be careful not to confuse quality with grade. Grade is "A category or rank given to entities having the same functional use but different requirements for quality". Low qualify is always a problem; low grade may not be. For example, a software product may be of high quality (no obvious bugs, readable manual) and low grade (a limited number of features), or of low quality (many bugs, poorly organized user documentation) and high grade (numerous features). Determining and delivering the required levels of both quality and grade are the responsibilities of the project manager and the project management team. The project management team should also be aware that modem quality management complements modem project management.

For example, both disciplines recognize the importance of:

1) Customer Satisfaction

Understanding, managing, and influencing needs so that customer expectations are met or exceeded. This requires a combination of conformance to specifications (the project must produce what it said it would produce) and fitness for use (the product or service produced must satisfy real needs).

2) Prevention Over Inspection

The cost of avoiding mistakes is always much less than the cost of correcting them.

3) Management Responsibility

Success requires the participation of all members of the team, but it remains the responsibility of management to provide there sources needed to succeed.

4) Processes within Phases

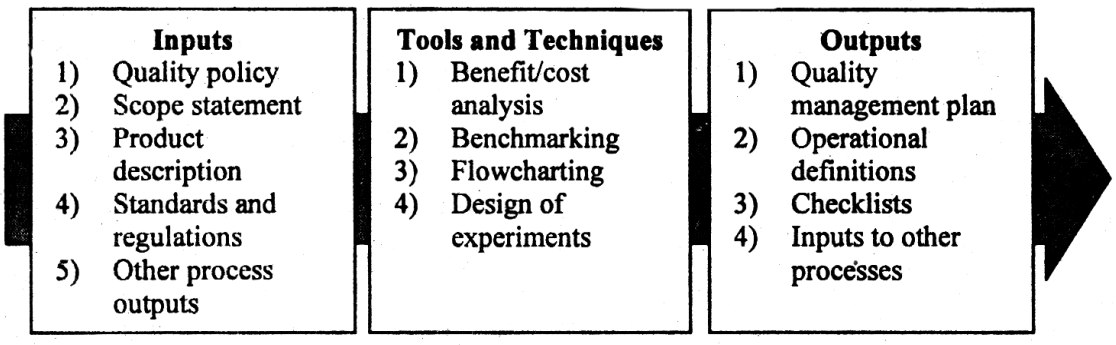
The repeated plan-do-check-act cycle described by Deming and others is highly similar to the combination of phases and processes.

In addition, quality improvement initiatives undertaken by the performing organization, (e.g., TQM, Continuous Improvement, and others) can improve the quality of the project management as well as the quality of the project product. However, there is an important difference that the project management team must be acutely aware of - the temporary nature of the project means that investments in product quality improvement, especially defect prevention and appraisal, mast often be borne by the performing organization since the project may not last long enough to reap the rewards.

Q13. What is quality planning ? Explain the tools and techniques of quality planning.

Ans :

Quality planning involves identifying which quality standards are relevant to the project and determining how to satisfy them. It is one of the key facilitating processes during project planning and should be performed regularly and in parallel with the other project planning processes. For example, the desired management quality may require cost or schedule adjustments, or the desired product quality may require a detailed risk analysis of an identified problem. Prior to development of the ISO 9000 Series, the activities described here as quality planning were widely discussed as part of quality assurance. The quality planning techniques discussed are those used most frequently on projects.



Inputs to Quality Planning

1) Quality Policy

Quality policy is "The overall intentions and direction of an organization with regard to quality, as formally expressed by top management. The quality policy of the performing organization can often be adopted "as is" for use by the project. However, if the performing organization lacks a formal quality policy, or if the project involves multiple performing organizations (as with a joint venture), the project management team will need to develop a quality policy for the project.

Regardless of the origin of the quality policy, the project management team is responsible for ensuring that the project stakeholders are fully aware of it.

2) Scope Statement

The scope statement is a key input to quality planning since it documents major project deliverables as well as the project objectives which serve to define important stakeholder requirements.

3) Product Description

Although elements of the product description may be embodied in the scope statement, the product description will often contain details of technical issues and other concerns that may affect quality planning.

4) Standards and Regulations

The project management team must consider any application-area-specific standards or regulations that may affect the project.

5) Other Process Outputs

In addition to the scope statement and product description, processes in other knowledge areas may produce outputs that should be considered as part of quality planning.

For example, procurement planning mav identify contractor quality requirements that should be reflected in the overall quality management plan.

Tools and Techniques for Quality Planning

1) Benefit/Cost Analysis

The quality planning process must consider benefit/cost trade-offs. The primary benefit of meeting quality requirements is less rework, which means higher productivity, lower costs, and increased stakeholder satisfaction. The primary cost of meeting quality requirements is the expense associated with project quality management activities. It is axiomatic of the quality management discipline that the benefits outweigh the costs.

2) Benchmarking

Benchmarking involves comparing actual or planned project practices to those of other projects in order to generate ideas for improvement and to provide a standard by which to measure performance. The other projects may be within the performing organization or outside of it, and may be within the same application area or in another.

3) Flowcharting

A flowchart is any diagram which shows how various elements of a system relate. Flowcharting techniques commonly used in quality management include:

i) Cause-and-Effect Diagrams

These are also called Ishikawa diagrams or fishbone diagrams, which illustrate how various causes and sub-causes relate to create potential problems or effects. Figure 5.19 is an example of a generic cause-and-effect diagram:

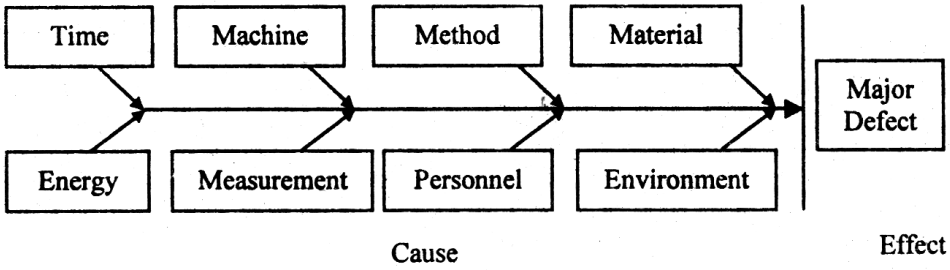


Fig. Cause-and-Effect Diagram

ii) System or Process Flowcharts

These show how various elements a system interrelate. Figure 5.20 is an example of a process flowchart for design reviews. Flowcharting can help the project team anticipate what and where quality problems might occur and thus can help to develop approaches to dealing with them:

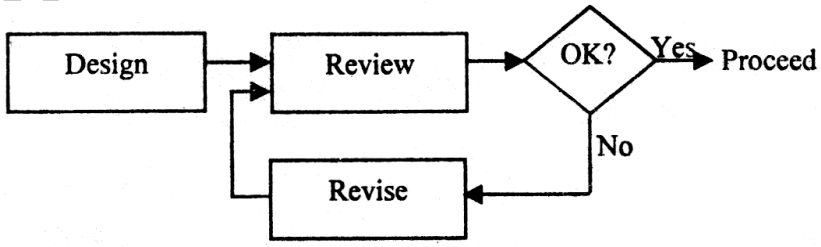


Fig: Sample Process Flowchart

4) Design of Experiments

Design of experiments is an analytical technique which helps identify which variables have the most influence on the overall outcome. The technique is applied most frequently to product of the project issues (e.g., automotive designers might wish to determine which combination of suspension and tires will produce the most desirable ride characteristics at a reasonable cost).

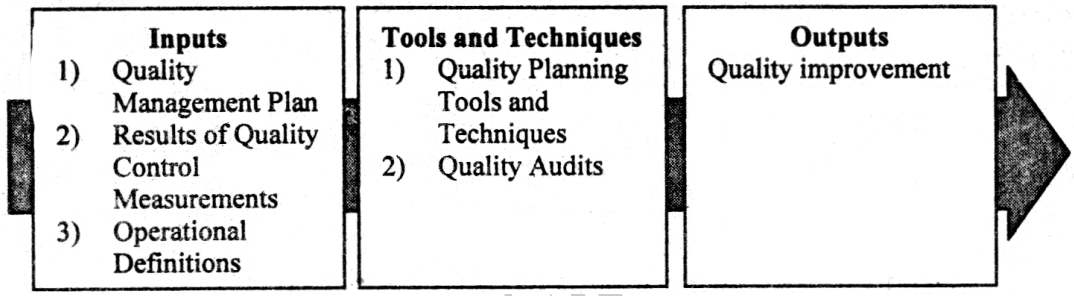
However, it can also be applied to project management issues such as cost and schedule trade-offs. For example, senior engineers will cost more than junior engineers, but can also be expected to complete the assigned work in less time. An appropriately designed "experiment" (in this case, computing project

costs and durations for various combinations of senior and junior engineers) will often allow determination of an optimal solution from a relatively limited number of cases.

Q14. What is quality assurance ?

Ans :

Quality assurance is all the planned and systematic activities implemented within the quality system to provide confidence that the project will satisfy the relevant quality standards. It should be performed throughout the project. Prior to development of the ISO 9000 Series, the activities described under quality planning were widely included as part of quality assurance. Quality assurance is often provided by a Quality Assurance Department or similarly titled organizational unit. Assurance may be provided to the project management team and to the management of the performing organization (internal quality assurance) or it may be provided to the customer and others not actively involved in the work of the project (external quality assurance).



A) Inputs to Quality Assurance

1) **Quality Management Plan:** The quality management plan is described earlier.
2) **Results of Quality Control Measurements:** Quality control measurements are records of quality control testing and measurement in a format for comparison and analysis.
3) **Operational Definitions:** Operational definitions are described earlier.

B) Tools and Techniques for Quality Assurance

1) **Quality Planning Tools and Techniques:** The quality planning tools and techniques described earlier can be used for quality assurance as well.
2) **Quality Audits:** A quality audit is a structured review of other quality management activities. The objective of a quality audit is to identify lessons learned that can improve performance of this project or of other projects within the performing organization. Quality audits may be scheduled or random, and they may be carried-out by properly trained in-house auditors or by third parties such as quality system registration agencies.

C) Outputs from Quality Assurance

Quality Improvement

Quality improvement includes taking action to increase the effectiveness and efficiency of the project to provide added benefits to the project stakeholders. In most cases, implementing quality improvements will require preparation of change requests or taking of corrective action and will be handled according to procedures for overall change control.

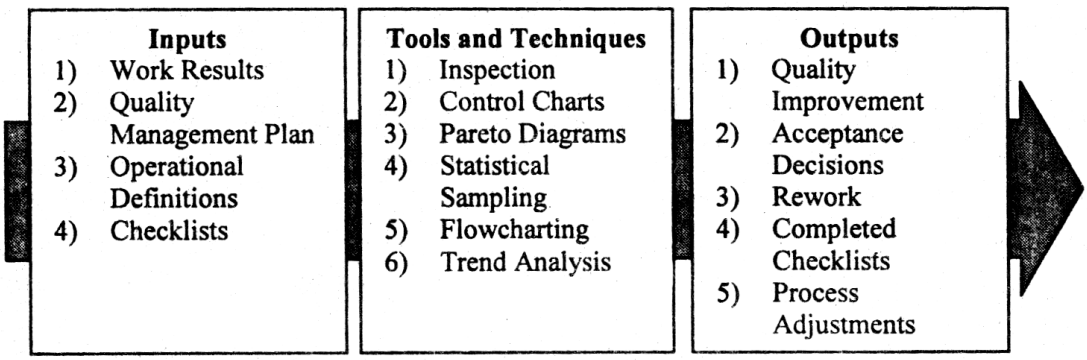
Q15. What do you understand by quality control?

Ans :

Quality Control

Quality control involves monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory results. It should be performed throughout the project. Project results include both product results such as deliverables and management results such as cost and schedule performance. Quality control is often performed by a Quality Control Department or similarly titled organizational unit. The project management team should have a working knowledge of statistical quality control, especially sampling and probability, to help them evaluate quality control outputs. Among other subjects, they should know the differences between:

1) Prevention (keeping errors out of the process) and inspection (keeping errors out of the hands of the customer).
2) Attribute sampling (the result conforms or it does not) and variables sampling (the result is rated on a continuous scale that measures the degree of conformity).
3) Special causes (unusual events) and random causes (normal process variation).
4) Tolerances (the result is acceptable if it falls within the range specified by the tolerance) and control limits (the process is in control if the result falls within the control limits).



A) Inputs to Quality Control

1) Work Results: Work results include both process results and product results. Information about the planned or expected results (from the project plan) should be available along with information about the actual results.

2) Quality Management Plan: The quality management plan is described earlier.

3) Operational Definitions: Operational definitions are described earlier.

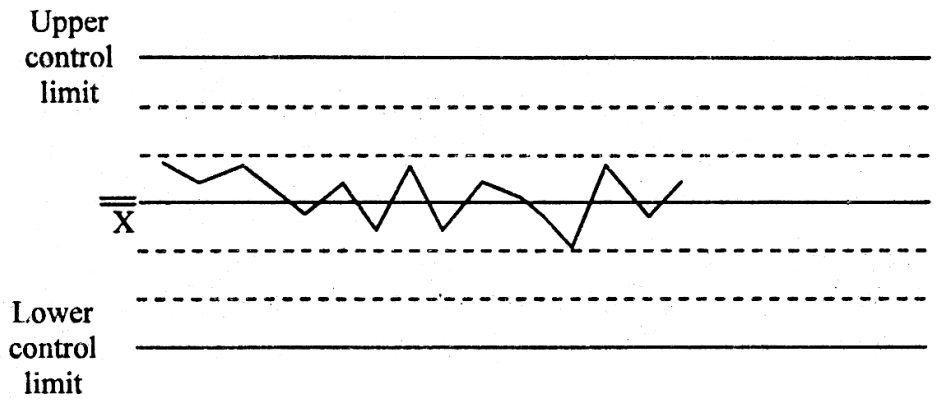
4) Checklists: Checklists are described earlier.

B) Tools and Techniques for Quality Control

1) Inspection: Inspection includes activities such as measuring, examining, and testing undertaken to determine whether results conform to requirements. Inspections may be conducted at any level (e.g., the results of a single activity may be inspected or the final product of the project may be inspected). Inspections are variously called reviews, product reviews, audits, and walk - throughs; in some application areas, these terms have narrow and specific meanings.

2) Control Charts

Control charts are a graphic display of the results, over time, of a process. They are used to determine if the process is "in control" (e.g., are differences in the results created by random variations or are unusual events occurring whose causes must be identified and corrected?). When a process is in control, the process should not be adjusted. The process may be changed in order to provide improvements but it should not be adjusted when it is in control. Control charts may be used to monitor any type of output variable. Although used most frequently to track repetitive activities such as manufactured lots, control charts can also be used to monitor cost and schedule variances, volume and frequency of scope changes, errors in project documents, or other management results to help determine if the "project management process" is in control. Figure 5.23 is a control chart of project schedule performance:



Control Chart of Project Schedule Performance

3) **Pareto Diagrams:** A Pareto diagram is a histogram, ordered by frequency of occurrence that shows how many results were generated by type or category of identified cause. Rank ordering is used to guide corrective action - the project team should take action to fix the problems that are causing the greatest number of defects first. Pareto diagrams are conceptually related to Pareto's Law, which holds that a relatively small number of causes will typically produce a large majority of the problems or defects.

4) **Statistical Sampling:** Statistical sampling involves choosing part of a population of interest for inspection (e.g., selecting ten engineering drawings at random from a list of 75). Appropriate sampling can often reduce the cost of quality control. There is a substantial body of knowledge on statistical sampling; in some application areas, it is necessary for the project management team to be familiar with a variety of sampling techniques.

5) **Flowcharting:** Flowcharting is described earlier. Flowcharting is used in quality control to help analyze how problems occur.

6) **Trend Analysis:** Trend analysis involves using mathematical techniques to forecast future outcomes based on historical results. Trend analysis is often used to monitor:

   i) **Technical Performance:** Flow many errors or defects have been identified, how many remain uncorrected.

   ii) **Cost and Schedule Performance:** How many activities per period were completed with significant variances.

C) Outputs from Quality Control

1) **Quality Improvement:** Quality improvement is described earlier.
2) **Acceptance Decisions:** The items inspected will be either accepted or rejected. Rejected items may require rework.
3) **Rework:** Rework is action taken to bring a defective or non-conforming item into compliance with requirements or specifications. Rework, especially unanticipated rework, is a frequent cause of project overruns in most application areas. The project team should make every reasonable effort to minimize rework.
4) **Completed Checklists:** When checklists are used, the completed checklists should become part of the project's records.
5) **Process Adjustments:** Process adjustments involve immediate corrective or preventive action as a result of quality control measurements. In some cases, the process adjustment may need to be handled according to procedures for overall change control.

4.3 PROJECT EXECUTION

4.3.1 Project Organization

Q16. What is Project Organization? Explain the matrix form of Project Organization.

Ans : **(May-19, Imp.)**

Project organization is the representation of the different levels of functions and responsibilities assigned to different persons involved in a project. Project organization is also referred to as an organization chart in a particular project. Project organization is represented in a tabular (matrix) form. This form is best suited for project driven companies, such as construction companies. Figure 14.1 shows a typical matrix structure. Each level in the organization has a fixed responsibility and represents a potential profit centre. The project is headed by the general manager, who holds the total authority, responsibility, and accountability for the project. This is passed on by the general manager to the respective project managers. The project manager utilizes this authority to discharge responsibility and is accountable for the success of his/her profit centre. Parallelly, the functional managers have the functional responsibility of maintaining the technical excellence of the project. Each functional manager or departmental manager has the prime responsibility of maintaining a unified technical base and exchanging information for each project. They should also keep their team aware of the latest technical accomplishments of the industry.

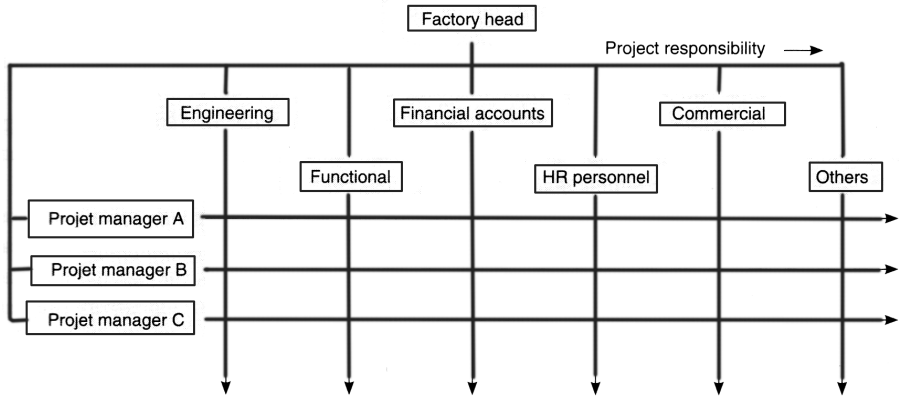


Fig. Pure matrix structure

A project organization is the effect of the collaboration of different project management tools, which in turn are coordinative functions. In this approach of project management, the work or the task assigned to an individual or a team is specific. The matrix form of the organization is purely collaborative, where information sharing is a must. One of the unique and advantageous features of this form is that the decision-making authority is within the working team.

The following ground rules are laid down for the development of an effective matrix:

1. Participants must spend full time on the project. This ensures the require: degree of loyalty.
2. Horizontal as well as vertical channels must exist for making commitments.
3. There must be good communication channels and very quick and effecter methods for conflict resolution.
4. All managers must contribute to the planning process.
5. Managers must be ready to negotiate for resources.
6. The horizontal line of the matrix must be permitted to operate as a separate entity except for the administrative process.

These ground rules are the ideal conditions that a matrix structure should possess. Each rule has its advantages and disadvantages.

The matrix form is one of the best modes of project organization. It empower the project manager to regulate project costs and exercise better control over various team members. Also, this form enables him/her to access and check various procedures and policies of the company. The matrix structure ensures careful and efficient management of the company's resources. The various conflicts, their resolutions, changes, and other project requirements can be attended to prompt/ by using this form.

Role clarity amongst team members of a project is very crucial. Any ambiguity in roles can severely impact the project outcome. Every project member has individual ambitions, aspirations, and career motivations. However, as long as they are a part of a given project, role clarity amongst them would ensure that all their efforts are aimed at achieving the project goal.

In projects, several complex procedures have to be carried out simultaneously. A matrix structure minimizes the conflicts among various personnel as they carry out their respective activities at the same time. In the process, they gain the valuable experience of handling complex situations. Overall, the matrix structure presents a balance and maximum utilization of time, capital, and human resource.

4.3.2 Project Staffing

Q17. What do you understand by Project Staffing?

Ans :

Project management can only be successful if the individuals who are in charge of the key functions meet expectations. It is not a one person affair; it requires a group of individuals dedicated to the achievement of a single goal. It includes a project manager, a project office, and a project team. Project office personnel are assigned full time to the project and report directly to the project manager; they may be attached to their line function only for administrative control. The project team also comprises members who work from outside the project office. In small projects, project team members often manage the entire show. Sometimes one person may be filling in all the project office positions.

The staff functions begin with the following five basic questions:

1. What are the requirements of an individual to become a successful project manager?
2. Who should be a member of the project team?
3. Who should be a member of the project office?
4. What are the problems that can occur during recruiting activities?
5. What can happen downstream to cause loss of a key team member?

Initially, it may appear that these questions are not so difficult to answer. But as they are placed against a project environment, they can take a very complex shape. This is true especially if the organization is not equipped with able and adequate staff. Initially, there may be a conflict between project members, which needs to be resolved first. However, the primary and the most important factor that works in project staffing is the priority that is set for the given number of staff.

4.3.3 Project Budgetting

Q18. What do you understand by Project Budgetting?

Ans :

A budget refers to a broad plan regarding quantitative utilization of resources over a period of time. In the case of a project, this process is called project budgeting. Preparing a project budget basically concerns the estimation of its net cost. Project cost is always directly proportional to time. Therefore, a project is divided into different temporal phases.

i) Time-phased budget

Cost estimates alone do not make a budget. A cost estimate takes the shape of a budget only when it is time determined. The whole project is divided into work packages, and all these work packages require a time-phased budget . The work packages generally have a duration of three weeks. At this stage it is not possible to assess the allocation of the money at every level. This work package duration, and other factors, are used to prepare the project network schedule. The time-phased budgets are then allocated according to the scheduled time period over the life of the project. In this way, the total capital need of the project can be determined. The time-phased budget should show how, when, and what amount of the real cash is needed in a project.

ii) Types of costs

The precision of cost estimates improves as one moves from the conceptual stage to the next level where individual work packages are defined. Detailed cost estimates can only be made when the work packages are defined. Costs that are usual involved in a project are direct costs, and direct and indirect project overheads The reason for breaking up the total cost estimation is to tighten the grip over the process and improve decision-making.

a) Direct costs

In cost accounting concept, direct costs are directly related to the production, or operation, or the main business of the firm. They include direct material and labour costs. In the case of project budgeting, direct costs can be defined as those costs that are related to some particular work package. It clearly depends upon the project manager, the teams, or the individuals involved in that particular work package of the concerned project. These costs are the main cash outflow that must be paid as the project starts rolling. Lower level projects usualh have only direct costs.

b) Direct project overhead costs

In management accounting, overheads are considered as the cost excluding material and labour. They can be cost for fuel, electricity, etc.

Project overhead rates more specifically show the resources of the organization that are to be used in a particular project. Direct overhead costs can be related to project work packages. Examples of direct overhead costs can be the salary of the project manager and rent for the space required by the project team. These are not immediate expenses but they are plausible and must be taken care of in the long run.

c) Indirect project overhead costs

These costs are usually those organizational costs that are not directly related to the project. These costs are borne during the project duration. These expenses are spent commonly on all the products or projects of the organization such as advertising,

accounting, administration, and other commercial pur-poses. These costs are usually a percentage of the total direct cost and generally vary for different organizations.

4.4 MONITORING AND CONTROL

Q19. What do you understand by project Monitoring and control?

Ans : **(May-19, Imp.)**

From a philosophical perspective, 'control' can never be defined in a nut shell There has been an age-old opinion that control can only be exercised where there is an authority for making decisions. In this case, it lies with the project managers, line supervisors, and design engineers. The fundamental units of control are cost estimate and project schedule.

Often, a cost and schedule engineer only provides information and does not exercise control. It actually depends on the execution and delivery of works. If a task is performed as per schedule, monitoring and control will then be an automatic and obvious process. However, reporting, trending, and analysis are the main ingredients of control.

Often, project managers jump to conclusions regarding projects, without having discussions with its functional arms. This can have an adverse effect on the project. In the case of large projects, resource requirements, control systems, and organizational arrangements should be discussed, to ensure the availability of the estimated manpower and resources during the execution of the project. Whatever may be the project size, the proposed plan and execution strategy are the most important factors for considering the basis of control.

The effectiveness of a project control programme is mainly dependent on the reliability of the following information and guidance:

- Estimating project schedules
- Manpower planning
- Determining productivity level
- Developing a cost schedule
- Trend analysis
- Evaluating the performance of the work
- Identifying the scope of the work

Figure shows the over-scheduling relationship of an EPC (engineering procurement, and construction) project. This figure contains only the execution phase; a conceptual design phase precedes this phase where the exact planning is done. The entire schedule is demonstrated with a trapezoid and the entire complex work is executed in three phases a build up (20% of overall duration), a peat period (another 20%), and a rundown (the remaining 60% of the overall duration) of the engineering schedule. The engineering schedule is the same schedule as the overall project duration. The schedule ratios are based on historical experience and specific standards.

The second part of Figure shows the trapezoid for the construction schedule To determine the peak duration (X), the following information is either known or is to be assumed :

1. Scope in man hours
2. Effective monthly hours per man

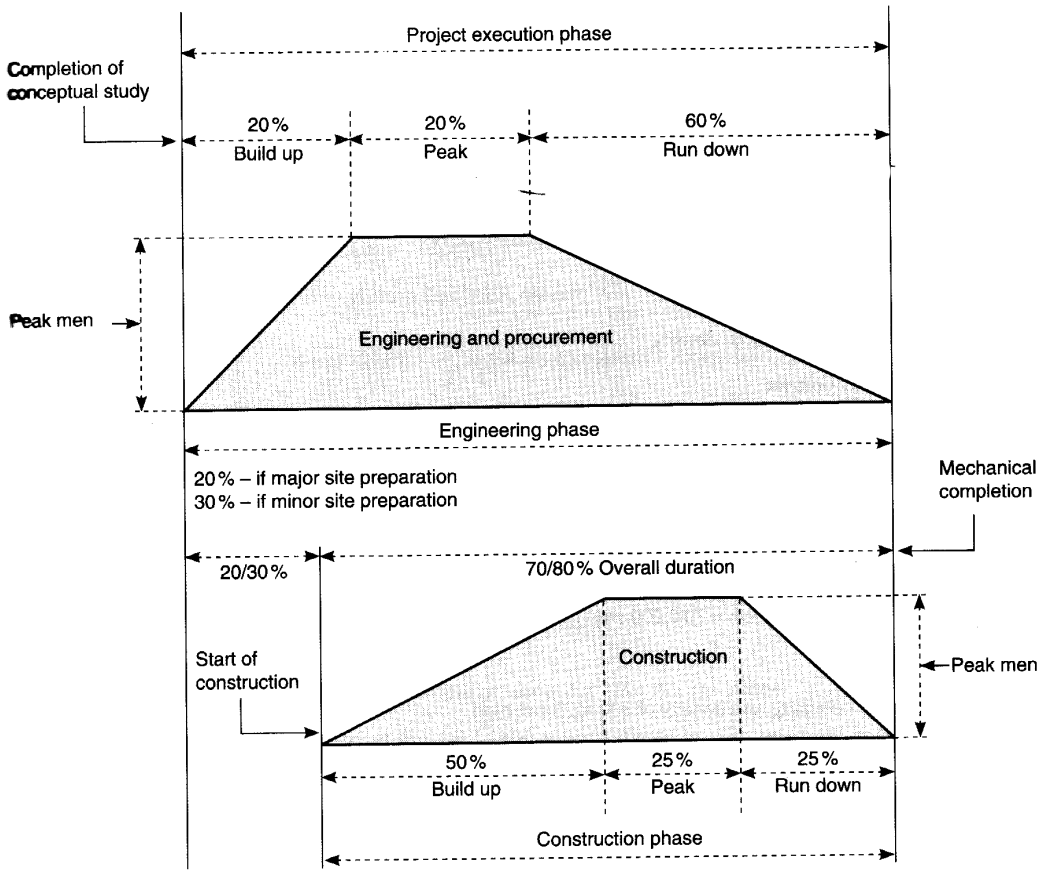


Fig. Overall project scheduling in execution phase

3. Build up (standard schedule) in months
4. Peak in months
5. Rundown (half of build up) in months
6. Peak men (explained in Example 15.1)

If the limit area or the plot plan is known, then by evaluating a labour density level (generally in the range of 150 to 300 sq. ft per man), one can determine the peak number of men (refer to Figure 15.2).

The calculation for the construction duration will be as follows (trapezoidal technique):

$$\text{Area} = \text{Scope}\left(\frac{M}{H}\right)$$

$$\frac{\text{Scope in man hours}}{\text{Effective monthly man hours}} = \left[\frac{\text{Build up}}{2}\right]$$

$$\times \text{ Peak men} + \text{X. Peak men}] + \frac{\text{Build down}}{2} \times \text{Peak men}$$

$$\text{Peak manpower} = \frac{\text{Battery limit area}}{\text{Peak density level}}$$

4.5 Agile Project Management

Q20. What is Agile project Management (APM)

Ans : **(Aug.-21, Imp.)**

Agile Project Management is one of the revolutionary methods introduced for the practice of project management. This is one of the latest project management strategies that is mainly applied to project management practice in software development. Therefore, it is best to relate agile project management to the software development process when understanding it.

From the inception of software development as a business, there have been a number of processes following, such as the waterfall model. With the advancement of software development, technologies and business requirements, the traditional models are not robust enough to cater the demands.

Therefore, more flexible software development models were required in order to address the agility of the requirements. As a result of this, the information technology community developed agile software development models.

'Agile' is an umbrella term used for identifying various models used for agile development, such as Scrum. Since agile development model is different from conventional models, agile project management is a specialized area in project management.

Q21. Explain the Scope of Agile Project Management.

Ans :

In an agile project, the entire team is responsible in managing the team and it is not just the project manager's responsibility. When it comes to processes and procedures, the common sense is used over the written policies.

This makes sure that there is no delay is management decision making and therefore things can progress faster.

In addition to being a manager, the agile project management function should also demonstrate the leadership and skills in motivating others. This helps retaining the spirit among the team members and gets the team to follow discipline.

Agile project manager is not the 'boss' of the software development team. Rather, this function facilitates and coordinates the activities and resources required for quality and speedy software development.

Q22. What are the Responsibilities of an Agile Project Manager?

Ans : **(Aug.-21, Imp.)**

The responsibilities of an agile project management function are given below. From one project to another, these responsibilities can slightly change and are interpreted differently.

- Responsible for maintaining the agile values and practices in the project team.
- The agile project manager removes impediments as the core function of the role.
- Helps the project team members to turn the requirements backlog into working software functionality.
- Facilitates and encourages effective and open communication within the team.
- Responsible for holding agile meetings that discusses the short-term plans and plans to overcome obstacles.
- Enhances the tool and practices used in the development process.
- Agile project manager is the chief motivator of the team and plays the mentor role for the team members as well.

4.6 Scrum, Lean Production and Project Management

Q23. Define scrum ? Explain the role of scrum in project management.

Ans :

Scrum is a framework for managing software development. Scrum is designed for teams of three to nine developers who break their work

into one-week to maximum four-week cycles, called "sprints", check progress daily in 15-minute stand-up meetings, and deliver workable software at the end of every sprint. Approaches to coordinating the work of multiple scrum teams in larger organizations include Large-Scale Scrum and Scrum of Scrums.

Role of Scrum

There are three core roles in the Scrum framework. These core roles are ideally co-located to deliver potentially shippable product increments every sprint. Together these three roles form the scrum team. While many organizations have other roles involved with defining and delivering the product, Scrum defines only these three.

1. Product owner

The product owner represents the product's stakeholders and the voice of the customer; and is accountable for ensuring that the team delivers value to the business. The product owner defines the product in customer-centric terms (typically user stories), adds them to the product backlog, and prioritizes them based on importance and dependencies. Scrum teams should have one product owner. This role should not be combined with that of the scrum master. The product owner should focus on the business side of product development and spend the majority of their time liaising with stakeholders and should not dictate how the team reaches a technical solution.This role is equivalent to the customer representative role in some other agile frameworks such as extreme programming (XP).

Communication is a core responsibility of the product owner. The ability to convey priorities and empathize with team members and stakeholders is vital to steer product development in the right direction. The product owner role bridges the communication gap between the team and its stakeholders, serving as a proxy for stakeholders to the team and as a team representative to the overall stakeholder community.

As the face of the team to the stakeholders, the following are some of the communication tasks of the product owner to the stakeholders:

- Demonstrates the solution to key stakeholders who were not present at a sprint review;
- Defines and announces releases;
- Communicates team status;
- Organizes milestone reviews;
- Educates stakeholders in the development process;
- Negotiates priorities, scope, funding, and schedule;
- Ensures that the product backlog is visible, transparent, and clear.

Empathy is a key attribute for a product owner to have—the ability to put one's self in another's shoes. A product owner converses with different stakeholders, who have a variety of backgrounds, job roles, and objectives. A product owner must be able to see from these different points of view. To be effective, it is wise for a product owner to know the level of detail the audience needs. The development team needs thorough feedback and specifications so they can build a product up to expectation, while an executive sponsor may just need summaries of progress. Providing more information than necessary may lose stakeholder interest and waste time. A direct means of communication is the most preferred by seasoned agile product owners.

A product owner's ability to communicate effectively is also enhanced by being skilled in techniques that identify stakeholder needs, negotiate priorities between stakeholder interests, and collaborate with developers to ensure effective implementation of requirements.

2. Development team

The development team is responsible for delivering potentially shippable increments (PSIs) of product at the end of each sprint

(the sprint goal). A team is made up of 3–9 individuals who do the actual work (analysis, design, develop, test, technical writing, etc.). Although there will be several disciplines represented in the team, its members are referred to generically as *developers*; as this can confuse with those focused on programming alone, some organizations call this a *delivery team* and its members just *team members*.

Development teams are cross-functional, with all of the skills necessary to deliver a product increment. The development team in Scrum is self-organizing, even though there may be interaction with other roles outside the team, such as a project management office (PMO).

3. Scrum master

Scrum is facilitated by a scrum master, who is accountable for removing impediments to the ability of the team to deliver the product goals and deliverables. The scrum master is not a traditional team lead or project manager but acts as a buffer between the team and any distracting influences. The scrum master ensures that the Scrum framework is followed. The scrum master helps to ensure the team follows the agreed processes in the Scrum framework, often facilitates key sessions, and encourages the team to improve. The role has also been referred to as a team facilitator or servant-leader to reinforce these dual perspectives.

The core responsibilities of a scrum master include (but are not limited to)

- Helping the product owner maintain the product backlog in a way that ensures the needed work is well understood so the team can continually make forward progress
- Helping the team to determine the definition of done for the product, with input from key stakeholders
- Coaching the team, within the Scrum principles, in order to deliver high-quality features for its product
- Promoting self-organization within the team
- Helping the scrum team to avoid or remove impediments to its progress, whether internal or external to the team
- Facilitating team events to ensure regular progress
- Educating key stakeholders in the product on Scrum principles
- Coaching the development team in self-organization and cross-functionality

One of the ways the scrum master role differs from a project manager is that the latter may have people management responsibilities and the scrum master does not. Scrum does not formally recognize the role of project manager, as traditional command and control tendencies would cause difficulties.

Q24. Define Lean Production Management. Explain different types of Lean Project Management.

Ans :

Lean project management is the comprehensive adoption of other lean concepts like lean construction, lean manufacturing and lean thinking into a project management context.

Lean project management has many ideas in common with other lean concepts; however, the main principle of lean project management is delivering more value with less waste in a project context. Lean project management has many techniques that can be applied to projects and one of main methods is standardization. Key techniques are those "inherited" from Agile software development like: blame-free employee involvement, the need for a strong facilitator, pipelining, etc.

One of the main goals of lean project management is creation and removal of bottlenecks in the production process in order to accelerate growth and increase productivity.

"Lean" is a systematic method for the elimination of waste ("Muda") within a manufacturing system. Lean also takes into account

waste created through overburden ("Muri") and waste created through unevenness in work loads ("Mura"). Working from the perspective of the client who consumes a product or service, "value" is any action or process that a customer would be willing to pay for.

Lean approach makes obvious what adds value by reducing everything else which does not add value. This management philosophy is derived mostly from the Toyota Production System (TPS) and identified as "lean" only in the 1990s.TPS is renowned for its focus on reduction of the original Toyota seven wastes to improve overall customer value, but there are varying perspectives on how this is best achieved. The steady growth of Toyota, from a small company to the world's largest auto maker, has focused attention on how it has achieved this success.

Types of Lean Production Management

Lean project management is the method used to plan and execute a lean (improvement) project. There are many ways to do this, but the two most prevalent are the :

- **6 Sigma DMAIC method or the Deming Cycle** (Called the "A3" since the steps are recorded on an A3 size paper). 6 Sigma Companies use 6 Sigma Black Belts to take an improvement project through the steps of Define, Measure, Analyze, Improve, and Control. Other companies use the A3 Problem solving Process which includes the statement of the problem, the current situation, the root cause of the problem, suggest alternative solutions, suggest a recommended solution and have a cost-benefit analysis. This information would fit all on one A3 size sheet of paper.
- **Kanban** endeavours to increase productivity by limiting multit asking, keeping work uninterrupted, urging to plan ahead, remaining focused, encouraging to tackle larger tasks first, and to actually finish projects.

Generally, all methods allow the project team to follow a disciplined method to measure the current state, define the future state, and put into place countermeasures to improve the process. Associated with the project are measurable metrics, as well as foundational lean elements that are implemented to improve those metrics. Either method is helpful in achieving better results for the project outcome.

Short Question & Answers

1. What is Project Control?

Ans :

Introduction

Project control is a necessary step to ensure that whether the project is on the right path or not and if not then to take corrective action to bring it on the track. The term control has several meanings. Those new to project management are initially dismayed by the use of the term "control", because they mistakenly equate it with the concept of authority. In the world of project management, control has very little to do with telling people what to do, dictating their actions or thoughts or trying to force them to behave in certain way - all of which are common interpretations of control.

In project management, the term "control" is much more analogous to steering a ship. It's about continually making course adjustments with one main objective in mind - bringing the ship into safe harbor, as promised at the start of the voyage. And the successful project voyage includes identifying a specific destination, carefully charting a course to get there, evaluating location throughout the voyage and keeping a watchful eye on what lies ahead.

Project controls are tools developed to diagnose the system for deviations from the actual plan and reset them back with the actual plans/ schedule. Project controls are required to check whether the project is progressing in accordance with the plans and standards set during the planning phase. In fact, project controls are measures taken by the project manager in order to minimize the gap between the planned output and the delivered output.

2. What is Network ? Explain the rules for Network construction.

Ans :

The network diagram, also referred to as the project graph, shows the activities and events of the project and their logical relationships.

Rules for Network Construction

The rules to be observed in constructing the network diagram are discussed below:

1. Each activity must have a preceding and a succeeding event. An activity is numerically denoted by the pair of preceding and succeeding events. In the dinner project, for example, the activity 'send invitations' is designated as (1-2).
2. Each event should have a distinct number. The number given to an event can be chosen in any way, provided this condition is satisfied. In practice, however, events are so numbered that the number at the head of the arrow is greater than that at its tail.

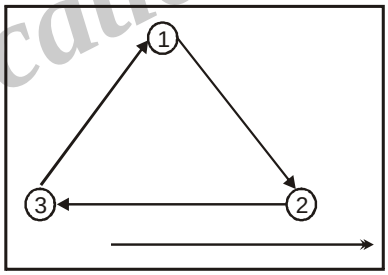


Fig. A Network Diagram

3. There should be no loops in the project network. A situation like the one shown in fig is not permissible.
4. Not more than one activity can have the same preceding and succeeding events. This means that each activity is represented by a uniquely numbered arrow and a situation like the one shown in fig is not permissible.

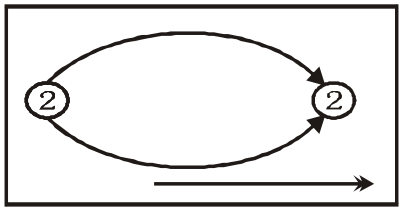


Fig. A Loop

To ensure that each activity is uniquely numbered it may be necessary sometimes to introduce dummy activities. A dummy activity is an imaginary activity which can be accomplished in zero time and which does not consume resources. It is represented by a dashed arrow. If shows a variant of with a dummy activity (3-2) introduced to conform to the rules of network construction.

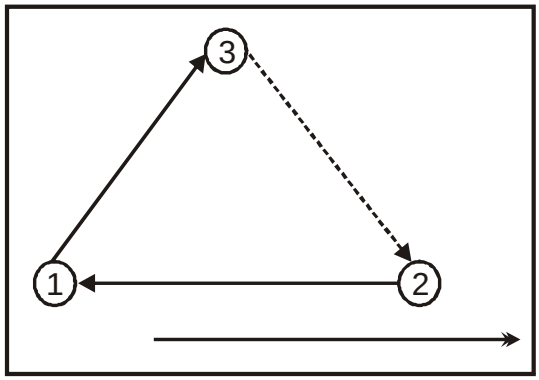


Fig. A Dummy Activity

A dummy activity may also be used to represent a constraint, necessary to show the proper relationship between activities. If shows part of a network diagram having a dummy activity.

3. Define time estimation.

Ans :

Time Estimation

Once the logic and detail of the network have been established, time estimates must be assigned to each activity. Generally, three time values are obtained for each activity :

1. Optimistic time (t_0)
2. Most likely time (t_m)
3. Pessimistic time (t_p)

The optimistic time, t_0, is the time required if no hurdles or complications arise. The most likely time, t_m, is the time in which the activity is most likely to be completed. This estimate takes into consideration normal circumstances, making allowance for some un-foreseen delays. The pessimistic time, t_p, is the time required if unusual complications and/ or unforeseen difficulties arise.

4. Explain the advantages and disadvantages of gantt chart.

Ans :

Advantages

1. It is simple to understand and easy to change.
2. It is the simplest and least complex means of portraying progress.
3. It can easily be expanded to identify specific elements that may be either behind or ahead of schedule.

Disadvantages

1. It does not show the interdependencies of the activities, and therefore does not represent a network of activities.
2. It cannot show the result of an early or a late start in activities.

5. What is quality planning ?

Ans :

Quality planning involves identifying which quality standards are relevant to the project and determining how to satisfy them. It is one of the key facilitating processes during project planning and should be performed regularly and in parallel with the other project planning processes. For example, the desired management quality may require cost or schedule adjustments, or the desired product quality may require a detailed risk analysis of an identified problem. Prior to development of the ISO 9000 Series, the activities described here as quality planning were widely discussed as part of quality assurance. The quality planning techniques discussed are those used most frequently on projects.

6. What is quality assurance ?

Ans :

Quality assurance is all the planned and systematic activities implemented within the quality system to provide confidence that the project will satisfy the relevant quality standards. It should be performed throughout the project. Prior to development of the ISO 9000 Series, the activities described under quality planning were widely included as part of quality assurance. Quality

assurance is often provided by a Quality Assurance Department or similarly titled organizational unit. Assurance may be provided to the project management team and to the management of the performing organization (internal quality assurance) or it may be provided to the customer and others not actively involved in the work of the project (external quality assurance).

7. Quality Control.

Ans :

Quality control involves monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory results. It should be performed throughout the project. Project results include both product results such as deliverables and management results such as cost and schedule performance. Quality control is often performed by a Quality Control Department or similarly titled organizational unit. The project management team should have a working knowledge of statistical quality control, especially sampling and probability, to help them evaluate quality control outputs. Among other subjects, they should know the differences between:

1) Prevention (keeping errors out of the process) and inspection (keeping errors out of the hands of the customer).

2) Attribute sampling (the result conforms or it does not) and variables sampling (the result is rated on a continuous scale that measures the degree of conformity).

3) Special causes (unusual events) and random causes (normal process variation).

4) Tolerances (the result is acceptable if it falls within the range specified by the tolerance) and control limits (the process is in control if the result falls within the control limits).

8. What is Agile project Management

Ans :

Agile Project Management is one of the revolutionary methods introduced for the practice of project management. This is one of the latest project management strategies that is mainly applied to project management practice in software development. Therefore, it is best to relate agile project management to the software development process when understanding it.

From the inception of software development as a business, there have been a number of processes following, such as the waterfall model. With the advancement of software development, technologies and business requirements, the traditional models are not robust enough to cater the demands.

Therefore, more flexible software development models were required in order to address the agility of the requirements. As a result of this, the information technology community developed agile software development models.

'Agile' is an umbrella term used for identifying various models used for agile development, such as Scrum. Since agile development model is different from conventional models, agile project management is a specialized area in project management.

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Scrum is a framework for managing software development. Scrum is designed for teams of three to nine developers who break their work into one-week to maximum four-week cycles, called "sprints", check progress daily in 15-minute stand-up meetings, and deliver workable software at the end of every sprint. Approaches to coordinating the work of multiple scrum teams in larger organizations include Large-Scale Scrum and Scrum of Scrums.

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UNIT V

Organizational Behavior in Project Management:
Organizational Structure and Integration, Role of project manager, Roles in the project team, Project stakeholder engagement, Leadership in project management, participative management, team building approach, Conflict Management in Projects, Stress Management.

5.1 Organizational Behavior in Project Management

Q1. What is Organizational Project Management?

Ans :

Organizational behavior is a combination of responses to external and internal stimuli by a person as an individual or as a part of a group. This is a brief introductory tutorial that explains the methodologies applied in the rapidly growing area of organizational behavior in an organization.

Organizational Project Management

The term **Organizational Project Management** (**OPM**) was coined by John Schlichter in May 1998 in a meeting of the Standards Committee of the Project Management Institute.

OPM was defined as the execution of an organization's strategies through projects by combining the systems of portfolio management, program management, and project management. This definition was approved by a team of hundreds of professionals from 35 countries and was published as part of PMI's Organizational Project Management Maturity Model standard in 2003 and updated later to a second edition in 2008 when it also became an ANSI standard. The standard was updated to a third edition in 2013. In the standard, the term "Organizational Project Management" is capitalized to indicate that it does not denote project management generically and that it pertains to the framework for executing strategies through projects by combining the systems of portfolio, program, and project management.

"Organizational Project Management is the systematic management of projects, programs, and portfolios in alignment with the achievement of strategic goals. The concept of organizational project management is based on the idea that there is a correlation between an organization's capabilities in project management, program management, and portfolio management, and the organization's effectiveness in implementing strategy".

5.2 Organizational Structure

Q2. What is Organizational Structure? Explain different types of Organizational Structure.

Ans :

An **organizational structure** defines how activities such as task allocation, coordi-nation and supervision are directed toward the achievement of organizational aims. Organizations need to be efficient, flexible, innovative and caring in order to achieve a sustainable competitive advantage. Organizational structure can also be considered as the viewing glass or perspective through which individuals see their organization and its environment.

Organizations are a variant of clustered entities.

An organization can be structured in many different ways, depending on its objectives. The structure of an organization will determine the modes in which it operates and performs.

Organizational structure allows the expressed allocation of responsibilities for different functions and processes to different entities such as the branch, department, workgroup, and individual.

Organizational structure affects organizational action in two ways:

- It provides the foundation on which standard operating procedures and routines rest.
- It determines which individuals get to participate in which decision-making processes, and thus to what extent their views shape the organization's actions.

Some of the organizational structures that a project manager can consider are:

1. Functional organizational structure
2. Divisional organizational structure
3. Project organizational structure
4. Matrix organizational structure
5. Task force structure

1. Functional Organizational Structure

Traditional organizational structure is developed around the functional aspects of the organization such as engineering, manufacturing, marketing, human resource and information systems. Projects in individual functional departments do not face any problems. But when different functional departments have to be co-ordinated, the project manager may have to assign, control and monitor the work through the functional manager, because of his lack of authority in the functional department. Traditional organizational structures are almost 200 years old and have undergone many changes during this period. Those changes can be attributed to the changing requirements pertaining to information, technology and the competitive environment. The increasing demands from the customers also led to changes in the traditional organizational structure.

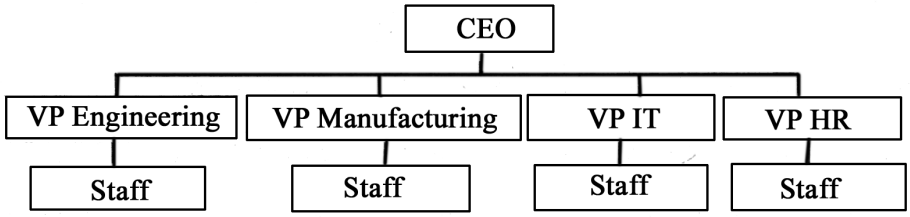


Fig. : Functional Organizational Structure

Advantages of the Functional Organization Structure A traditional organizational structure helps in:

1) Easy cost control and budgeting procedures.
2) Improving control by:
   i) Sharing knowledge and responsibility, and
   ii) Grouping specialists.
3) Using manpower in a flexible manner.
4) Working with a broad manpower base.
5) Defining the lines of responsibility in an easy and understandable manner.
6) Establishing continuity in functional disciplines, policies and procedures.
7) Taking up large scale production activities within the specifications.
8) Providing a reporting structure that gives good control over people,
9) Establishing vertical communication channels.
10) Reacting quickly to situations depending on the functional managers' priority.

Disadvantages of the Functional Organization Structure

A traditional organizational structure has the following disadvantages:

1) Lack of formal authority, i.e., no single person is responsible for the total project.'
2) It does not provide project-oriented emphasis to achieve the tasks.
3) It is a complex co-ordinating system that consumes more time in approving the decisions.
4) There may be partiality in decision-making and the strongest functional group may be favored.
5) It lacks customer focus.
6) It is slow in responding to customer needs.
7) Lack of proper project-oriented planning and authority that leads to difficulty in pinpointing responsibilities.
8) It reduces motivation and innovation.
9) Ideas are function-oriented rather than project-oriented,

2. Divisional Organization Structure

Under this form of project organization, a separate division is set up to implement the project. Headed by the project manager, this division has its complement of personnel over whom the project manager has full line authority. In effect, this form of organization implies the creation of a separate goal-oriented division of the company, with its own functional departments. While the project manager still has the problem of coordinating the inputs of other organizations involved in the project, he has total formal control over the division he heads.

A very strong form of project organization, the divisional project organization facilitates the process of planning and control, brings about better integration of efforts, and strengthens the commitment of project- related personnel to the objectives of the project. It considerably improves the prospect of fulfilling the time and budget targets.

This form of organization, however, may entail an inefficient use of the resources of the firm. It may result in an unnecessary duplication of specialists in the company, because of the necessity to allocate them in total to each project.

Organization of this type, design their structure by focusing on the specialist nature of the work or project rather than on individual expertise. This form of structure is known as the divisional structure. The aim of the divisional form is to replicate specialist characteristics, but to focus on a final product through its specialist type, size, location, customer, etc.

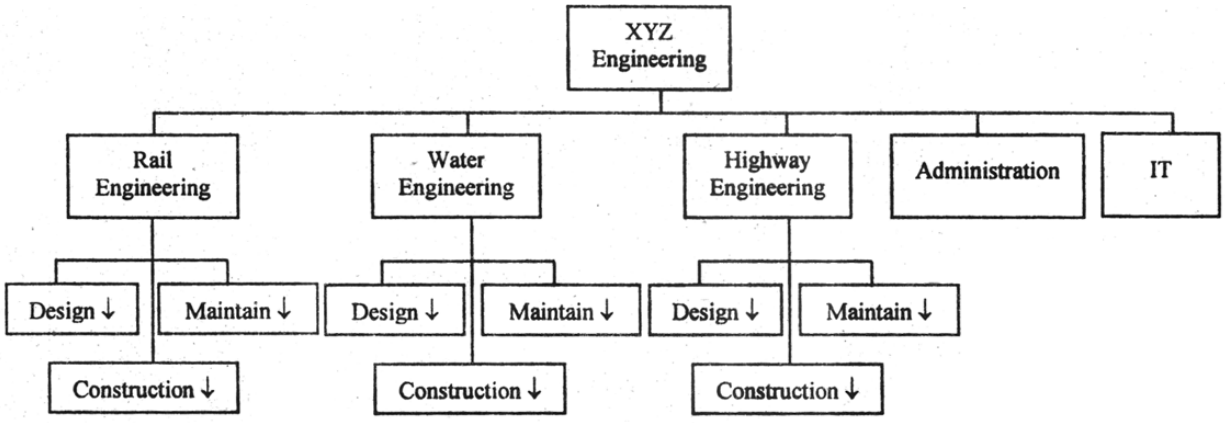


Fig. Divisional Organization Form by Type of Project

Projects are easier to facilitate within a division, as all the components within the organization are geared to meeting the division's goals. Divisional organizations are predominantly found in large companies. Moreover, the entire focus of activity is on the division, and decision-making is based on divisional requirements. Projects developing in the divisional environment require project managers to be aware of divisional and corporate priorities and how they may impact on projects.

Advantages of Divisional Structure

1) Divisional structure emphasizes on the end result, that is, on product, or customer through which revenue is generated in the organization.

2) Since a division focuses its attention on a particular product or service, its performance measurement is easier as the performance can be measured in the light of contributions made by the division.

3) There is higher level of managerial motivation because managers work in the environment of autonomy.

4) Through divisional structure, more managers with general outlook can be developed who can easily take up the job at the corporate level. Thus there is no problem in managerial succession.

5) Organizational size can be increased without any problem as new divisions can be opened without disturbing the existing system.

6) Each product or customer is able to get specialized service because the attention is focused by a division exclusively for it.

Disadvantages of Divisional Structure

There are certain disadvantages and problems of divisional structure. Some of these problems are inherent in the system while others emerge because of wrong approach of management. Following are the major shortcoming - of divisional structure:

1) Divisional structure is quite costly because all the facilities have to be arranged for each division. Therefore unless a division justifies its cost, it should not be opened but its activities should be carried out by anothe- division.

2) Since there is lack of emphasis of functional specialization, many professionals do not feel satisfied wit- this structure.

3) Often there is a lack of managerial personnel when a new division is opened because managers workir; within a division can not work with same efficiency in other division as they must have acquired tbs technical competence of that division.

4) Control system is a major problem of divisionalization. Though each unit is measured in terms of it- contributions to the organization, this system does not work properly especially if information monitorir, system is not suitable.

3. Project Organizational Structure

Organizations working on large and long-term projects usually adopt pure project organizational structure. This type of organizational structure contains functional departments within the individual projects. In this structurs all the project team members are involved in the project on a full time basis. The team members report to the project manager directly or indirectly. This is a vertical organizational structure established to avoid conflka and problems faced by traditional and product organizational structures. In this organizational structure, ne project manager can freely access all the resources required for the project in his control.

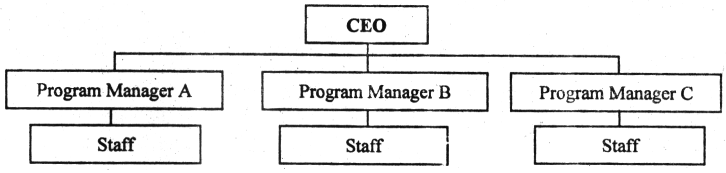


Fig. Project Organizational Structure

Advantages of Project Organizational Structure

Pure project organizational structure has the following advantages:

1) The project manager has complete authority over the project.
2) The project manager has the freedom to acquire the resources needed for the project's progress.
3) The project team reports directly to the project manager.
4) Project personnel are shared between the project and the project organization.
5) Facilitates unity of command.
6) Develops a formal communication channel between the project manager and his team.

Disadvantages of Project Organizational Structure

The disadvantages of pure project organizational structure are as follows:

1) Inefficiency in resource utilization,
2) Duplication of facilities,
3) Sourcing personnel from internal functional departments to work on the project affects work in the functional departments.

4. Matrix Organizational Structure

A matrix organizational structure is formed as a result of combining the advantages of all the aforementioned organizational structures. This structure is suitable for project driven organizations like software development firms. This structure makes the project manager totally responsible and accountable for the success of a project.

There are certain requirements for developing a matrix organizational structure:

1) Ensure commitment by making team members spend full time on the project.
2) Ensure quick conflict resolution.
3) Ensure that the resources are negotiated with function and project-oriented managers.
4) Ensure the functioning of functional departments as individual entities.

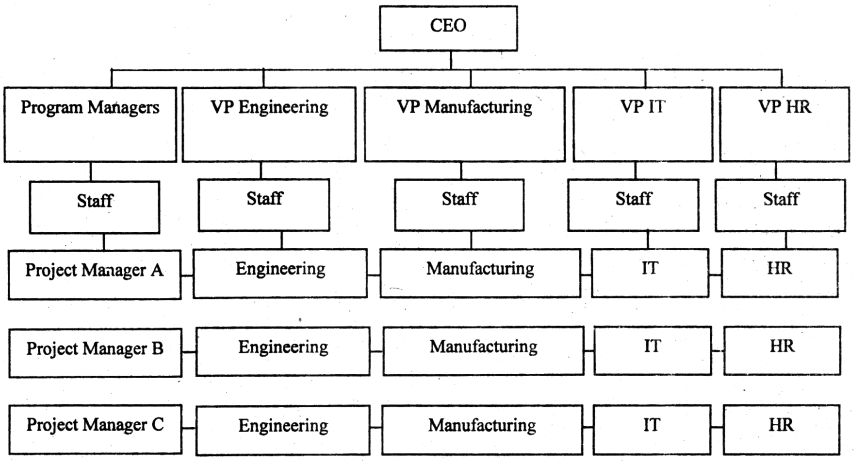


Fig. Matrix Organizational Structures

The primary objective of a matrix organizational structure is to derive synergy through shared responsibility between project and functional management. Matrix structures can be categorized into strong and weak structures depending on the influence of the project manager on functional resources. When the project manager exercises more control on functional resources than the line manager, then the matrix is said to be a strong one. But, when the line manager has more control over functional resources than the project manager, then the matrix is said to be a weak one.

Since a matrix structure is complex, it is important to note the preconditions for implementing such a structure. The following are situations in which implementation of a matrix structure is favorable:

1) When the primary output of an organization is a complex product,
2) When the organization serves multiple customers in different geographical locations,
3) When a project with complex design that requires innovation is to be finished on time,
4) When large amounts of data are required to be processed,
5) When designing, developing and testing a product requires sophisticated skills,
6) When resources have to be shared among different projects,
7) When the market conditions demand rapid changes in the product.

Advantages of Matrix Organizational Structure

The advantages of a matrix organizational structure are as follows:

1) Enables the project manager to exercise control over all the resources,
2) Each and every project has its own independent set of policies and procedures,
3) Authorizes the project manager to commit the company resources. This ensures that scheduling does not clash with other projects,
4) Facilitates quick response to conflicts, changes and other project needs,
5) Derives support of the functional department to the project,
6) Enables proper Human Resource Development by enhancing the career prospects of team members,
7) Facilitates cost minimization by sharing key-personnel,
8) Facilitates spending more time to solve complex problems,
9) Develops a strong technical base,
10) Eases solving of the problems that require top management involvement,
11) Minimizes conflicts,
12) Ensures optimum balance among time, cost and performance parameters,
13) Enables authority and responsibility sharing.

Disadvantages of Matrix Organizational Structures

1) Two-boss system is susceptible to power struggles.
2) Team meetings in the matrix are time consuming.
3) Teams may develop "Groupitis". (strong team loyalties that cause a loss of focus on larger organizational goals).
4) Requirements of adding team leaders to a matrix structure can result in increased costs.

5. Task Force Structure

A taskforce Isa variation of the taskforce structure. It is formed at the beginning of the year, completes a cycle of assigned tasks, and then disbands, Taskforces are sometimes used to review L and MD needs in light of strategic plans, succession plans, or other plans. (Some top managers favor taskforces for L and MD since they exist only long enough to complete a specific assignment. They do not contribute to the phenomenon of proliferating committees - a common problem in some corporations.)

In practice, the word project is commonly reserved for sizable clusters of activities with a clear beginning and a clear end; smaller activities or groups of activities are often referred to as tasks that do not need full project- management treatment. The main goal of task force is to perform the task assign to it. A "pure" project organization, with a taskforce structure, is typically used in those organizations where the present organization is set in a stereo type, and project is relatively small and the firm has decided to carry out the project construction itself.

5.3 Organizational Integration

Q3. Explain briefly about Organizational Integration.

Ans :

Organizational integration happens when a company's internal and external factors successfully mesh. Every company, large or small, has certain internal characteristics such as management style, systems, organizational structure, strategy, staff and organizational culture.

1. The Influence of External Factors

Economic conditions influence revenues in most small businesses. Politics, regulations, sociocultural trends also influence the environment in which the company operates. For example, a lumber company sells more lumber when the economy is strong and houses are being built. However, lumber companies are under increasing pressure from environmentalists and government regulations to produce lumber in an ecologically sustainable manner. The company's stakeholders - owners, employees, suppliers, customers - also have requirements, which include profitability and adequate production of lumber. To continue in business, the lumber company must organizationally integrate its internal and external factors.

2. The Responsive Business Model

The solution to organizational integration is a business model that responds to external changes. One way is through emphasizing continuous growth of internal knowledge and skills so they keep current with the changing external forces. The lumber company that constantly researches and develops new ways to harvest trees and manage forests in a manner that supports ecological sustainability is integrating its organization with the external factors that affect its business success.

3. Aligning Internal Factors

For the lumber company to achieve organizational integration, it must align its company strategy, culture, staff skills, technology, structure and management style with its goal of producing lumber in an ecologically sustainable manner. Alignment involves making sure each department and employee understands the strategic direction of the company. It also involves educating the stakeholders why the company is spending money on certain projects and why costs for its products or services are rising. This involves training employees, using public relations to educate stakeholders and maintaining communication and verification systems.

4. Achieving Organizational Integration

In the lumber company example, if the field crews aren't in total agreement with the ecologically sustainable methods of the company, they won't abide by the company's rules for cutting and planting trees. If just one sector of management, production or marketing is not in alignment with organizational strategy, then the organization is not integrated. A lumber company is an easy-to-envision example, but the same concepts of organizational integration apply to other industries, as well, including small businesses. Organizational integration is simply how responsive the company is to what is going on outside its walls and can pertain to a pizza parlor or carpet installation company as well as a large corporation.

5.4 Role of Project Manager

Q4. Explain role and responsibilities of project manager.

Ans :

The Role of a Project Manager

Project managers occupy a challenging office. They coordinate among various functional areas and integrate the diverse processes associated with them. Excel-lent communication and interpersonal skills, familiarity with the tasks, teams, and technologies associated with the project are some of the prerequisites of the project manager's position. On the downside, project managers' authority is very limited as compared to the range of responsibilities that they undertake

Reponsibilities of a Project Manager

Some of the important responsibilities of a project manager (Wilemon and Cicero 1970) are listed below:

- Project managers are responsible for completion of a specified project within allocated time, budget, and resources.
- They direct, integrate, and co-ordinate the project team. They are responsible for the management and performance of the team members.
- They must involve the most suitable candidates for a given task to ensure the best possible output.
- While operating within the guidelines of the project, they must foster cordial relationship with the customers and ensure their satisfaction.
- A project manager is the common link between various organizations working on a project. Although project management has its own set of specialized tasks, it cannot remain isolated from the processes and structures of the different organizations that it intends to manage. Therefore, a project manager must see his/her role as that of a coordinator and integrator of different forces that contribute to the project at various levels and degrees.

  Following are some examples explaining the concept of interface management :
- Managing human interrelationship in the project organization.
- Maintaining the balance between technical and managerial project functions.
- Coping with the risk associated with project management.
- Surviving organizational restraints.

5.5 ROLES IN THE PROJECT TEAM

Q5. Explain the various roles in the project team.

Ans : **(Aug.-21, May-19, Imp.)**

Role	Primary Responsibilities
i) Executive Sponsor / Business Owner	Has a vested interest in the successful outcome of the project. Secures funding and overall approval on project. Vocal and visible champion for the project throughout the University. Confirms that the project's goals and objectives are met to ensure that the project obtains the intended business objectives. Keep abreast of major project activities. Ultimate decision maker for issues that impact the business. Provides final approval for all major scope changes. Provides project direction and setting priorities when competing objectives exist overall in project. Provide approval to proceed to each succeeding project phase. Approves the Project Schedule. Provides regular feedback to the project team on performance versus expectations.
ii) Executive Stakeholder	Has vested interest in the completion of the project and how the project will impact their specific area. Provides information, as needed, to insure that the project stays on track and meets the intended goals and deliverables.
iii) Functional Lead	Provides subject matter expertise for department functions. Accurately and effectively represents the business needs of their department and the inter-relationships between departments. Provides guidance and insight for the Project's roll-out within their areas of responsibility. Makes project decisions on behalf of their respective departments. Obtains consensus within their department for broad business impactful decisions. Keeps key departmental sponsors and stakeholders abreast of major project activities. Provides and shares feedback on deliverables. Provides testing support.

iv) Enterprise SME	University-wide subject matter expert. Provide guidance and insight for the Project's roll-out. Provide subject matter expertise for various departmental functions and the inter-relationships between departments.
v) ITS Sponsor	Vocal and visible champion for the project throughout ITS and the University along with Business Sponsor. Keeps abreast of major project activities and provides additional information requested by the Business Sponsor. When necessary, addresses issues with project priorities and resource constraints as escalated by the Product Owner or Project Manager. Final escalation point for all ITS issues.
vi) ITS Product Owner	Oversight for the product's seam-less hardware and software integration within the Loyola architecture. Owner of all application integration design. Identifies needed technical resources. Escalation point for technical issues. Owner of vendor management and relationships for product support. Responsible for product versioning and upgrade decisions. Decision maker for product configuration and infrastructure design.
vii) Project Manager	Responsible for ensuring that the project team completes the project within time, scope and budget. Has ownership for all Project Management tasks and activities. Responsible for development and management of the overall project plan. Gathering approval for deliverables from Project Sponsors. Responsible for managing project risks. Responsible for communication to stakeholders. Responsible for ongoing status reporting, including project health. Responsible for overall management of the vendor relationships. Responsible for addressing issues with resource constraints. Responsible for identifying need for escalation of issues.
viii) Business Analyst	Analyzes and develops an understanding of the current state processes to ensure that the context and implications of change are understood by the department and the project team. Develops an understanding of how present and future business needs will impact the solution. Identifies the sources of requirements and understands how roles help determine the relative validity of requirements. Develops a Requirements Management Plan and shares with the Project Team and all stakeholders. Identifies and documents all business, technical, product and process requirements. Works with the department to prioritize the requirements. Helps to define acceptance criteria for completion of the solution.
ix) ITS Security Team	Provides assistance and support for developing and implementing the appropriate and required security environment.

5.6 PROJECT STAKEHOLDER ENGAGEMENT

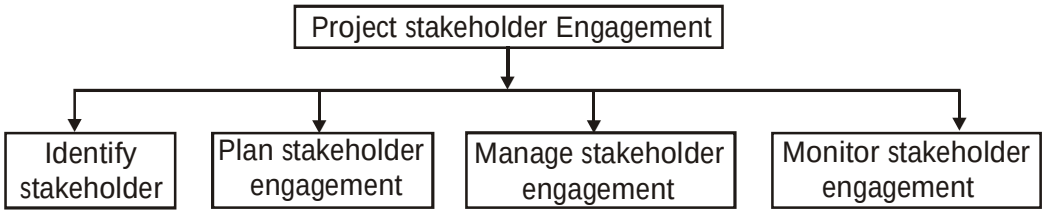
Q6. What is Project Stakeholder Engage-ment?

Ans :

The project manager must know who the stakeholders are and actively manage their expectations. You would be surprised how many project issues have arisen because of stakeholders that were ignored because they were considered minor. But those minor stakeholders can trip up a project just like a major one can.

Project Stakeholder ManagementThe Project Stakeholder Management knowledge area has four processes:

1. Identify Stakeholders
2. Plan Stakeholder Engagement
3. Manage Stakeholder Engagement
4. Monitor Stakeholder Engagement



1. Identify Stakeholders

The first step to ensuring that all stakeholders of a project are satisfied is to identify them. In fact, the Identify Stakeholders process is so fundamental to a project's existence that the PMBOK specifies only it and the Project Charter in the Project Initiation process group. In other words, the major project stakeholders are identified prior to the project being incorporated. A project is initiated with the major stakeholders in mind.

In addition to the major stakeholders, there are almost always minor ones who don't seem significant but have an outsized ability to create project issues relative to their financial stake in it.

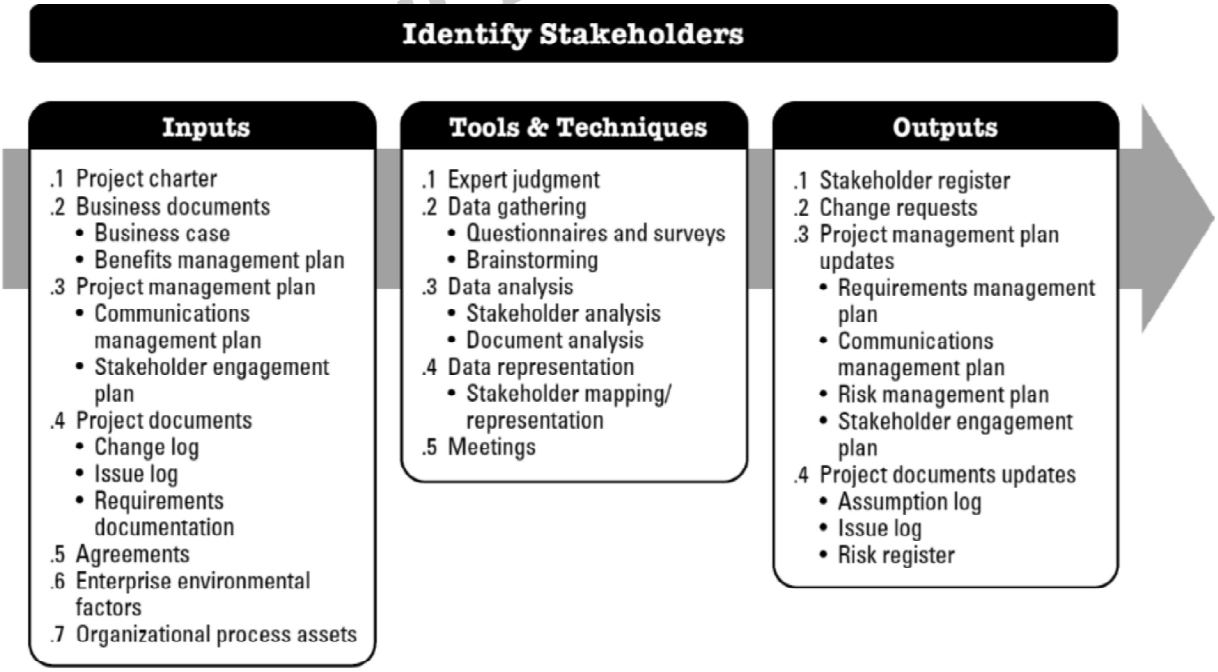


Fig. Identify Stakeholders : Inputs, Tools & Techniques and Outputs

Inputs

1. Project charter
2. Business documents
   - Business case
   - Benefits management plan
3. Project management plan
   - Communications management plan
   - Stakeholder engagement plan
4. Project documents
   - Change log
   - Issue log
   - Requirements documentation
5. Agreements
6. Enterprise environmental factors
7. Organizational process assets

Tools & Techniques

1. Expert judgment
2. Data gathering
   - Questionnaires and surveys
   - Brainstorming
3. Data analysis
   - Stakeholder analysis
   - Document analysis
4. Data representation
   - Stakeholder mapping/representation
5. Meetings

Outputs

1. Stakeholder register
2. Change requests
3. Project management plan updates
   - Requirements management plan
   - Communications management plan
   - Risk management plan
   - Stakeholder engagement plan

4. Project documents updates
   - Assumption log
   - Issue log
   - Risk register

2. Plan Stakeholder Engagement

The Stakeholder Management Plan, a component of the overall Project Management Plan, is created to specify how the project will interact with each stakeholder. It identifies and analyzes two items for each stakeholder: The level of interest the stakeholder has in the project, and their ability to control it. Also, the stakeholder's technical knowledge can be a major factor to plan for up front. All stakeholder concerns are presented and analyzed to ensure the project is set up for success.

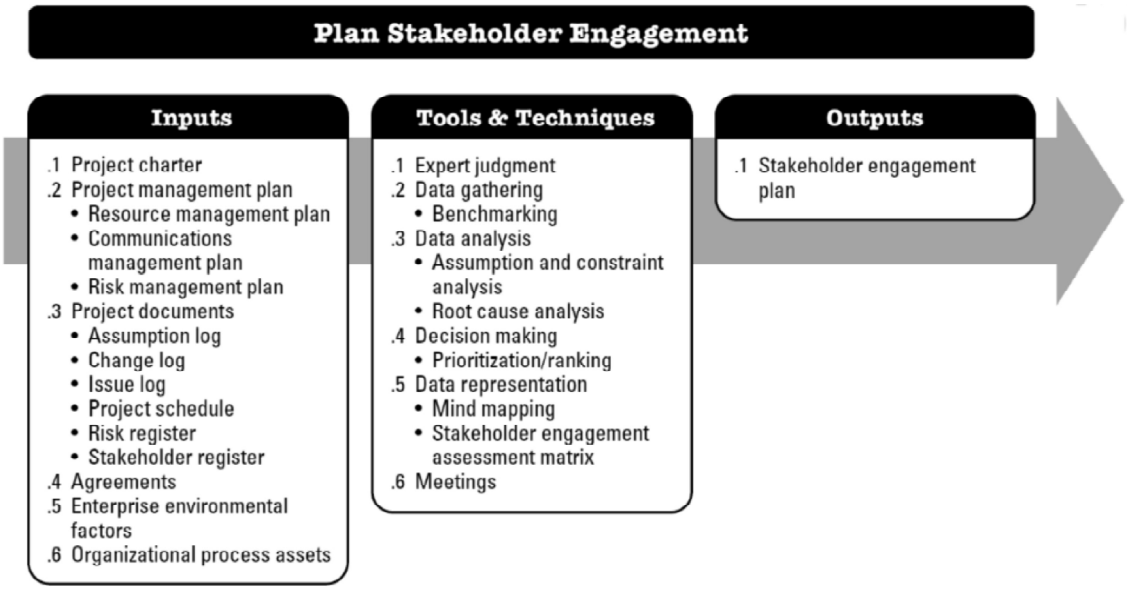


Fig. Identify Stakeholders Engagement : Inputs, Tools & Techniques and Outputs

Inputs

1. Project charter
2. Project management plan
   - Resource management plan
   - Communications management plan
   - Risk management plan
3. Project documents
   - Assumption log
   - Change log
   - Issue log
   - Project schedule
   - Risk register
   - Stakeholder register

4. Agreements
5. Enterprise environmental factors
6. Organizational process assets

Tools & Techniques

1. Expert judgment
2. Data gathering
   - Benchmarking
3. Data analysis
   - Assumption and constraint analysis
   - Root cause analysis
4. Decision making
   - Prioritization/ranking
5. Data representation
   - Mind mapping
   - Stakeholder engagement assessment matrix
6. Meetings

Outputs

1. Stakeholder engagement plan

3. Manage Stakeholder Engagement

Throughout the project the stakeholders are consulted to ensure their needs are met. Stakeholder interactions are executed according to the Stakeholder Management Plan, and changes to the plan are made as necessary.

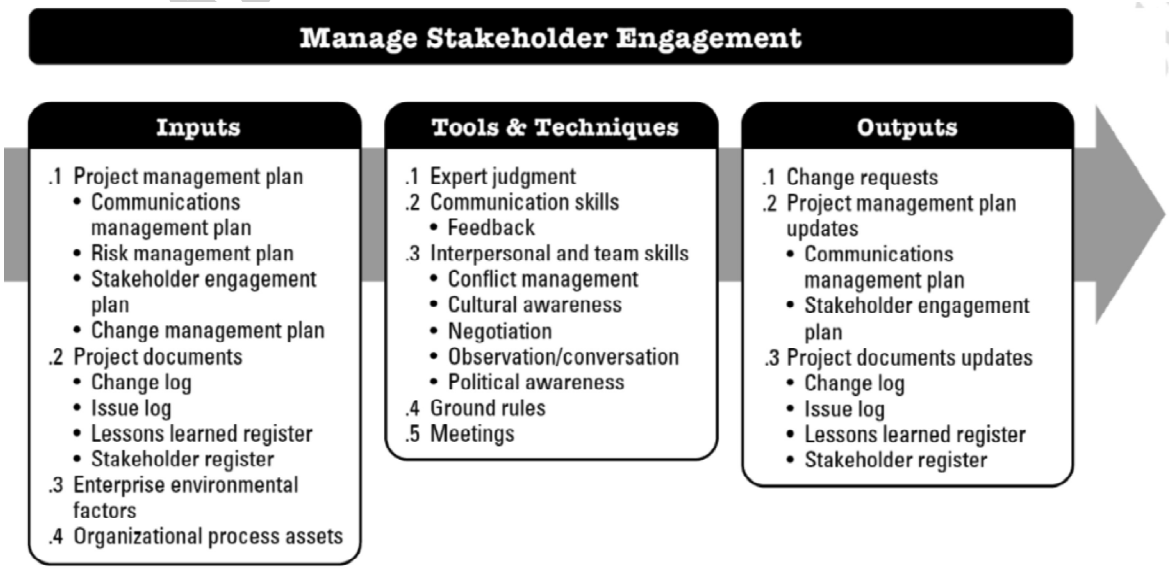


Fig. Manage Stakeholders Engagement : Inputs, Tools & Techniques and Outputs

Inputs

1. Project management plan
2. Communications management plan
   - Risk management plan
   - Stakeholder engagement plan
   - Change management plan
3. Project documents
   - Change log
   - Issue log
   - Lessons learned register
   - Stakeholder register
4. Enterprise environmental factors
5. Organizational process assets

Tools & Techniques

1. Expert judgment
2. Communication skills
   - Feedback
3. Interpersonal and team skills
   - Conflict management
   - Cultural awareness
   - Negotiation
   - Observation/conversation
   - Political awareness
4. Ground rules
5. Meetings

Outputs

1. Change requests
2. Project management plan updates
   - Communication management plan
   - Stakeholder engagement plan
3. Project documents updates
   - Change log
   - Issue log
   - Lessons learned register
   - Stakeholder register

4. Monitor Stakeholder Engagement

As part of the Monitoring & Controlling process group, this process must be executed on regular intervals throughout the project to assess the effectiveness of the Stakeholder Management Plan. Although specific actions are not as well defined as other M&C processes, this could include reviewing stakeholder communications, gathering information about them, or even asking them directly how they feel about the project and/or their specific concern.

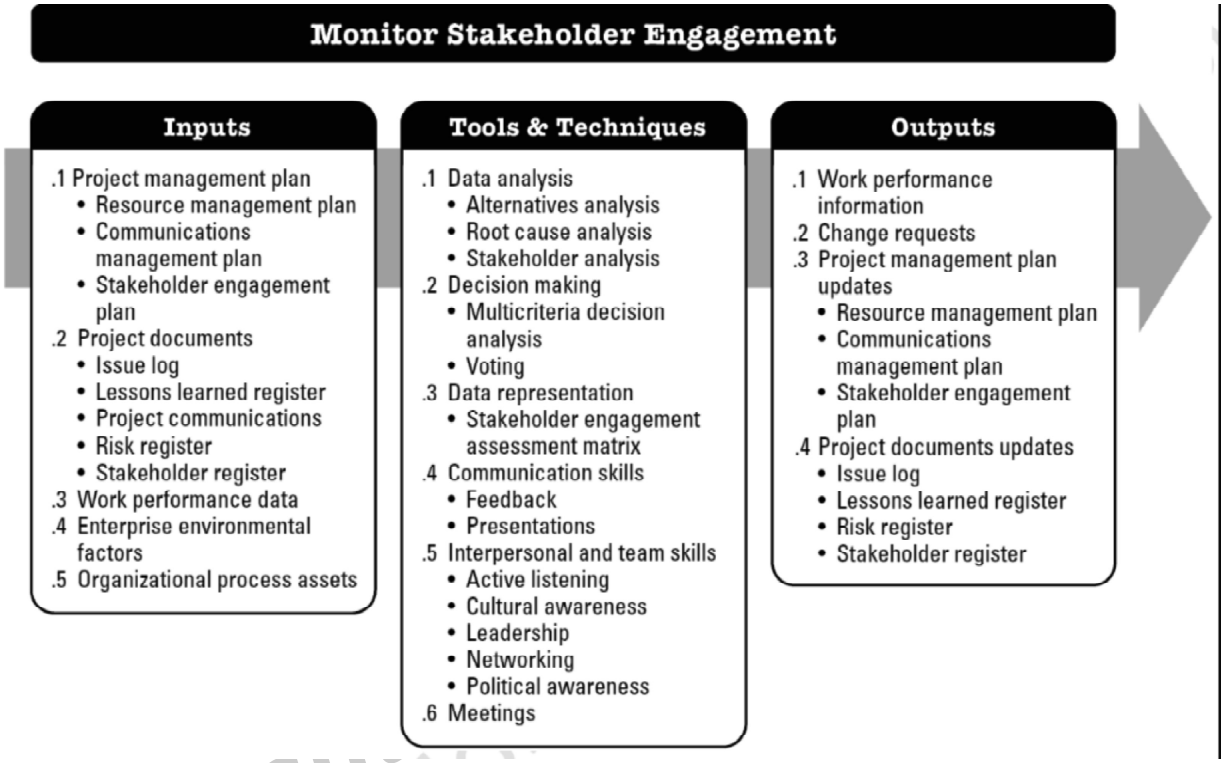


Fig. Monitor Stakeholders Engagement : Inputs, Tools & Techniques and Outputs

Inputs

1. Project management plan
2. Communications management plan
   - Risk management plan
   - Stakeholder engagement plan
   - Change management plan
3. Project documents
   - Change log
   - Issue log
   - Lessons learned register
   - Stakeholder register
4. Enterprise environmental factors
5. Organizational process assets

Tools & Techniques

1. Expert judgment
2. Communication skills
   - Feedback
3. Interpersonal and team skills
   - Conflict management
   - Cultural awareness
   - Negotiation
   - Observation/conversation
   - Political awareness
4. Ground rules
5. Meetings

Outputs

1. Change requests
2. Project management plan updates
   - Communication management plan
   - Stakeholder engagement plan
3. Project documents updates
   - Change log
   - Issue log
   - Lessons learned register
   - Stakeholder register

5.7 LEADERSHIP IN PROJECT MANAGEMENT

Q7. Explain briefly about leadership in project management.

Ans : **(Aug.-21, Imp.)**

It examines the common causes of project failure and explores the contribution that strong leadership makes to successful delivery. Based on a series of linked lectures and group exercises that give participants the opportunity to assess, analyse and practice the diff-erent aspects of leadership style required to build confidence and credibility by:

- Managing stakeholder relationships, through open communication.
- Creating a good project reputation, through public relations.
- Crisis management, when projects do not go strictly to plan.

It recognises the importance of tools and techniques for project management and covers:

- Risk Assessment and Management
- Portfolio Management of Programmes and Projects
- Prince Project Management
- Professionalism in Practice

The successful completion of projects is the primary responsibility and goal of the Project Manager, who will have a lot of weight on their shoulders, when it comes to making the right decisions. While some people possess natural leadership qualities, other leadership skills must be learned and adapted to ensure that each individuals approach to leadership is tailored to suit their own individual style and personality.

So, what are the fundamental qualities of a good project manager?

- Excellent communication and interpersonal skills
- The ability to share a clear vision and inspire others
- Positive attitude and enthusiasm
- Integrity
- Competence
- Cool, calm disposition
- Problem solver
- Team builder
- Excellent delegator
- Excellent decision maker

1. Communication

Excellent communication skills are vital, to enable a project manager to communicate effectively with a broad spectrum of people at different levels within an organization and externally. In order to lead a project, you must be able to clearly communicate your vision, goals, guidelines and expectations to others.

The ability to deliver and receive constructive feedback and listen to others is another important part of leading a team of individuals. Essentially, being a great communicator is a key element to working well with others in any work environment.

2. Sharing a Vision

The ability to see the 'bigger picture' behind a project and effectively convey that vision to others is an incredibly valuable and important quality in a Project Manager. Successfully articulating the vision of a project ensures the team can experience it in their mind and helps to get them on board without delay.

3. Positive Attitude

A leader with an eternally full cup and a positive mental attitude is a pleasure to engage with and their enthusiasm automatically rubs off on others. Being committed to a project and displaying confidence in it impacts positively on the team and forms the basis of a happy, productive work environment.

4. Integrity

Part of being a great team leader is the ability to gain the trust of your team. By demonstrating that you are committed to adhering to both your values and ethical practices in general, team members will soon recognize that you are an honest leader whom they are happy to put their trust and faith in.

5. Competence

When a leader is unable to demonstrate that they are competent and capable, they will be unable to gain the respect and trust of their team and colleagues. A team must always feel confident that their leader is in control and knows exactly what they are doing.

6. Cool, Calm and Collected

Regardless of how well a project is planned there will always be obstacles of some sort to overcome along the way. A good Project Manager will never panic or lose their head when things go wrong; instead they will remain calm, assess the problem and find the best way to resolve it, in order to put the project back on the right track. If things become too stressful at any point, any flapping or excessive sweating should be done in private!

7. Problem solver

A great project manager should possess excellent problem solving skills and be resourceful and creative in their general approach to problems. On many occasions when working on a project, this may be as a simple case of identifying the right person(s) within the team to help you resolve the problem quickly and effectively. Sometimes, the real skill here is in truly grasping the issues behind the problem as this is always a fundamental element of the problem solving process.

8. Team Builder

A strong, happy team is a productive one and for the project to reach a successful conclusion the team need to be working well together for a common purpose. Within any team of individuals, you will find a variety of personalities that will need to somehow gel together to form a positive dynamic. Part of successfully leading a team will involve learning about each individual's skills and personality in order to get the best out of the team as a whole. Spotting areas of conflict within the team early on and managing conflict is crucial.

9. Delegator

Having a good understanding of your team members allows you to delegate tasks to the right individuals for the best possible results. Team members will respond well to a manager who delegates appropriate tasks that are well suited to their skill set and subsequently trusts them to get on with it. Encourage staff to approach you to discuss any queries or difficulties if they need to rather than undermine them by constantly checking up on them and they will feel more valued.

10. Decision Maker

The personal decisions you make as a Project Manager have a direct impact on the success of a project and ultimately the success of the business itself. In order to be strong in this area it is essential that you arm yourself with all of the information you need from the outset so that when the time comes, informed decisions can be made quickly.

At times, however, it is inevitable that mistakes will be made – after all it is impossible to make the best decisions all of the time! If and when the wrong decision is made, an excellent leader will be able to put their hands up and take responsibility. There is nothing worse than a leader who points the finger when things go wrong instead of taking responsibility for their own decisions.

A Project Manager with the Right Ingredients

Project managers who not only have strong technical skills, but also consistently demonstrate competence in the key skills and qualities listed above are a huge asset to any organization and significantly increase the success of the projects they lead. A strong, dedicated team leader goes hand in hand with consistently successful project management.

5.8 PARTICIPATIVE MANAGEMENT

Q8. What is Participative Management? Explain the advantages and disadvantages of Participative Management.

Ans : **(Oct.-22, Imp.)**

Participative Management refers to as an open form of management where employees are actively involved in organization's decision making process. The concept is applied by the managers who understand the importance to human intellect and seek a strong relationship with their employees. They understand that the employees are the facilitators who deal directly with the customers and satisfy their needs. To beat the competition in market and to stay ahead of the competition, this form of management has been adopted by many organizations. They welcome the innovative ideas, concepts and thoughts from the employees and involve them in decision making process.

Participative Management can also be termed as 'Industrial Democracy', 'Co-determination', 'Employee Involvement' as well as 'Participative Decision Making'. The concept of employee participation in organization's decision making is not new. However, the idea couldn't gain that much popularity among organizations. Studies have shown that only 3-5 percent of organizations have actually implemented this concept in their daily operations. Though the theory of participative management is as old as the institution of employees and employers still it is not applied by a large proportion of organizations.

The idea behind employee involvement at every stage of decision making is absolutely straight. Open and honest communication always produces good results both for organization as well as workers. Freedom and transparency in company's operations take it to the next level and strengthens the basis of the organization. On the other hand, there are several companies that straightway rule out the possibility of participative decision making process. According to them, employees misuse their freedom of expression and participation in decision making as it provides higher status to employees and empowers them.

Advantages of participative Management

1. Increase in Productivity

An increase say in decision making means that there is a string feeling of association now. The employee now assume responsibility and takes charges. there is lesser new or delegation or supervision form the manager.working hours may get stretched on their own without any compulsion or force from management.All this leads to increase the Productivity

2. Job Satisfaction

In lots of organizations that employ participative management,Most of the employees are satisfied with their jobs and the level of satisfaction is very high.This is

specially when people see their suggestions and recommendations being implemented or put to practice.psychologically,this tells the individual employee that,he too has a say in decision making and that 'he too is an integral component of the organization and not a mere worker"

3. Motivation

Increased productivity and job satisfaction cannot exist unless there is high level of motivation in the employee. The vice versa also holds true! Decentralizes decision making means that everyone has a say and everyone is important.

4. Improved Quality:

Since the inputs or feedback comes from people who are part of the processes at the lowest execution level. this means that even the minutest details are taken care of and reported. No Flaw or loophole goes unreported. Quality Control is thus begins and is ensured at the lowest level.

5. Reduced Costs

There is a lesser need of supervision and more emphasis is laid on widening of skills, Self management. This and quality control means that the costs are controlled automatically

Disadvantages of Participative Management

1. Decision making slows down

Participative management stands for increased participation and when there are many people involved in decision making, the process definetly slows down, inputs and feedback starts pouring down from each side.it takes time to verify the accuracy of meassurements which means that decision making will be slowed down.

2. Security Issue

The security issue in participative management also arise from the fact that since early stages too many people are known to lots of facts and informatio0n.This information may transform into critical information in the later stages. There is thus a greater apprehension of information being leaked out.

5.9 TEAM BUILDING APPROACH

Q9. Define Team Building. What are the benefits of team building.

Ans : **(Oct.-22, Aug.-21, Imp.)**

Team building is the process of taking a collection of individuals with different needs, backgrounds and expertise and transforming them by various methods into an integrated, effective work unit. In this transformation process, the goals and energies of individual contributors merge and support the objectives of the team.

The concept of team building becomes critically important as bureaucratic hierarchies decline and horizontally-oriented teams and work units become increasingly important. In most cases, team building involves relationships among peers with a wide diversity of expertise.

The benefits of Team Building at the start of projects are:

- greater collaboration, where information is shared freely among team members, and team members feel that they have invested themselves in the outcome
- enhanced communication
- more effective use of resources, talents, and strengths, while minimizing individual weaknesses and/or gaps
- improved decision making, while reducing lead times in implementing team actions
- greater commitment to team results
- higher quality results

Q10. What are the major barriers in project team development?

Ans :

1. Lack of Team Definition and Structure

One of the most frequently mentioned barriers of all was the lack of a clearly delineated team to undertake a project. We found this barrier to be most likely to occur among computer system managers and R&D project leaders. A common pattern was that

a work unit (not a project team) would be charged with a task but no one leader or team member was clearly delegated the responsibility. As a consequence, some work-unit members would be working on the project but not be entirely clear on the extent of their responsibilities.

In other cases, a poorly defined team will result when a project is supported by several departments but no one person in these departments is designated as a team member and departmental coordinator. Such an approach results in the project leader being unclear on whom to count for support. This often occurs, for example, when a computer systems project leader must rely on a "programming pool."

2. Team Personnel Selection

Another barrier was centered on how team members were selected. In some cases, project personnel are assigned to the teams by functional managers, and the project manager has little or no input into the selection process. This, of course, can impede team development efforts, especially when the project leader is given available personnel versus the best, hand-picked team members. The assignment of "available personnel" can result in several problems, e.g., low motivation levels, discontentment and uncommitted team members. We have found, as a rule, that the more power the project leader has over the selection of his/her team members, the more likely team-building efforts will be fruitful.

3. Credibility of the Project Leader

Team-building efforts were hampered when the project leader suffered from poor credibility within the team or from important managers external to the team. In such cases, team members are often reluctant to make a commitment to the project or the leader. Credibility problems may come from poor managerial skills, poor technical judgments or lack of experience relevant to the project.

4. Lack of Team Member Commitment

Lack of commitment to the project was cited as one of the most common barriers. Lack of commitment can come from several sources, such as; the team members' professional interests lie elsewhere; the feeling of insecurity being associated with projects; the unclear nature of the rewards which may be forthcoming upon successful project completion; and from intense interpersonal conflicts within the team.

Q11. Explain overcoming barriers in team building approach.

Ans :

1. Role Conflicts

As early in a project as feasible, ask team members where they see themselves fitting into the project. Determine how the overall project can best be divided into subsystems and subtasks (e.g., the work breakdown structure). Assign/ negotiate roles. Conduct regular status review meetings to keep team informed on progress and watch for unanticipated role conflicts over the project's life.

2. Dynamic Project Environments

The major challenge is to stabilize external influences. First, key project personnel must work out an agreement on the principal project direction and "sell" this direction to the total team. Also educate senior management and the customer on the detrimental consequences of unwarranted change. It is critically important to forecast the "environment" within which the project will be developed. Develop contingency plans.

3. Competition Over Team Leadership

Senior management must help establish the project manager's leadership role. On the other hand, the project manager needs to fulfill the leadership expectations of team members. Clear role and responsibility definition often minimizes competition over leadership.

4. Project Personnel Selection

Attempt to negotiate the project assignments with potential team members. Clearly discuss with potential team members the importance of the project, their role in it, what rewards might result upon completion, and the general "rules-of-the-road" of project management. Finally, if team members remain uninterested in the project, then replacement should be considered.

5.10 Conflict Management in Projects

Q12. What is Conflict Management? Explain various sources of conflict

Ans :

Conflict Management is the practice of recognizing and dealing with disputes in a rational, balanced and effective way. Conflict management implemented within a business environment usually involves effective communication, problem resolving abilities and good negotiating skills to restore the focus to the company's overall goals.

Sources of conflict

1. **Conflict over project priorities :** View of project participants will differ over sequence of activities and tasks
2. **Conflict over administrative procedures:** Managerial and Administrative oriented conflict over how the project will be managed.
3. **Conflict over technical options and Performance trade-offs:** Disagreements over the technical issues, performance specifications and trade-offs.
4. **Conflict over man power resources :** Conflicts concerning staffing of project team with personnel from other areas.
5. **Conflict over cost :** Conflict over cost estimates from support areas regarding work breakdown structures.
6. **Conflict over schedules:** Disagreements about the timing, sequencing, and scheduling of project related tasks
7. **Personality conflict :** Disagreements on interpersonal issues

Q13. Explain the various techniques for resolving conflict.

Ans : **(Oct.-22, May-19, Imp.)**

There are five general techniques for resolving conflict. Each technique has its place and use:

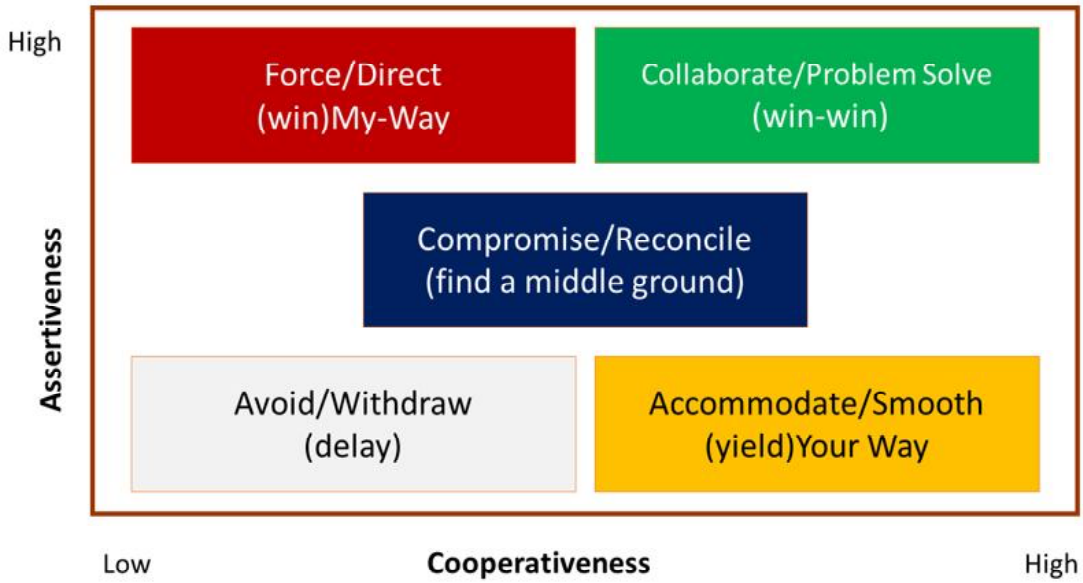
1. Withdraw/avoid:

- (Avoidance, denial or retreat) involves giving up, pulling out or retreating. It also refers to refusal to deal with the conflict. It involves ignoring conflict as much as possible.
- This style is appropriate when a "cooling off" period is needed to gain better understanding of the conflict situation and also when the others party involved in the conflicts is both unassertive and uncooperative.
- Withdrawal is a passive, stopgap way of handling conflict and generally fails to solve the problem. Therefore, this style should not be used if the conflicts deals with an issue that is of immediate concern or is important to the successful completion of the project

2. Smooth/accommodate:

- Smoothing, or accommodating, is an appeasing approach. It involves emphasizing areas of agreement while avoiding points of disagreement.
- Smoothing is appropriate to keep harmony and avoid outwardly conflictive situations. It works when the issues are more important than personal positions and aspirations of the parties involved. Since smoothing tends to keep peace only in the short terms, it fails to provide a permanent tends to keep peace only in the short term, it fails to provide a permanent long-term solution to the underlying conflicts. Generally, conflict reappears again in another form.
- Both smoothing and withdrawing styles incline towards ignoring or delaying tactics, which do not resolves conflict but will temporarily slow down the situation.

Project managers must remember that if the conflict is not handled and the resolved in a timely manner it will likely leads to more severe and intense conflict in the future.



3. Compromise/reconcile:

- Compromising is primarily "bargaining" – receiving something in exchange for something else. It involves considering various issues, bargaining, using tradeoff negotiations and searching for solutions that bring some degree of satisfaction to both parties involved in the conflict. In this mode, neither party wins but both get some degree of satisfaction out of the situation.
- Temporarily, both parties may feel hurt because they had to give up something that was important to them, but compromising usually provides acceptable solutions. A definitive resolution to the conflict is achieved when a compromise is reached and accepted as a just solution by both parties involved in the conflict. The only problem with compromising in a project situation is that, sometimes, important aspects of the project might be compromised in order to achieve personal objectives.

4. Force/direct:

- Forcing (using power or dominance) implies the use of position power to resolve the conflict. It involves imposing one viewpoint at the expense of another and is characterized by a win-lose outcome in which one party overwhelms the other.
- It is used when there is no common ground on which to bargain or negotiate, and when both parties are uncooperative and strong-willed. Project managers may use it when time is of the essence, an issue is vital to the well-being of the project, and they feel they are right based on the information available. Under such circumstances project managers take the risk and simply dictate the action to move things forward.
- This approach is appropriate when quick decisions are required or when unpopular issues such as budget cuts, fast-tracking or staff cutbacks are essential in a project.
- Forcing usually takes less time than compromise and negotiation but it leaves hard feelings because people dislike having others' views imposed on them. Conflict resolved by force may develop again and haunt the enforcers at a later date. Although forcing definitely resolves the conflict quickly, it should be used only as a late resort.

5. Collaborate/problem solve

- Collaborating is an effective technique to manage conflict when a project situation is too important to be compromised. It involves incorporating multiple ideas and viewpoints from people with different perspectives. It offers a good opportunity to learn from others. Active collaboration by both parties in contributing to the resolution makes it easier to get their consensus and commitment. Collaboration is not very effective when more than a few players are involved and their viewpoints are mutually exclusive.
- Confronting or problem solving (negotiating) implies a direct confrontation where disagreement is addressed directly. Conflict is treated as a problem in this process and both parties are interested in finding a mutually acceptable solution.
- This approach requires a give-and-take attitude between the parties, meaning that both parties are somewhat assertive and somewhat cooperative. It involves pinpointing the issue and resolving it objectively by defining the problem, gathering necessary information, generating and analyzing alternatives and selecting the best alternative under the circumstances. Confrontation requires open dialogue between participants, who must be mature, understanding, and competent – both technically and managerially.
- In most cases, confronting or problem solving may take longer than other techniques, but they provide final solutions by ultimately resolving the underlying problems. In most cases, confronting or problem solving may take longer than other techniques, but they provide final solutions by ultimately resolving the underlying problems.

5.11 STRESS MANAGEMENT

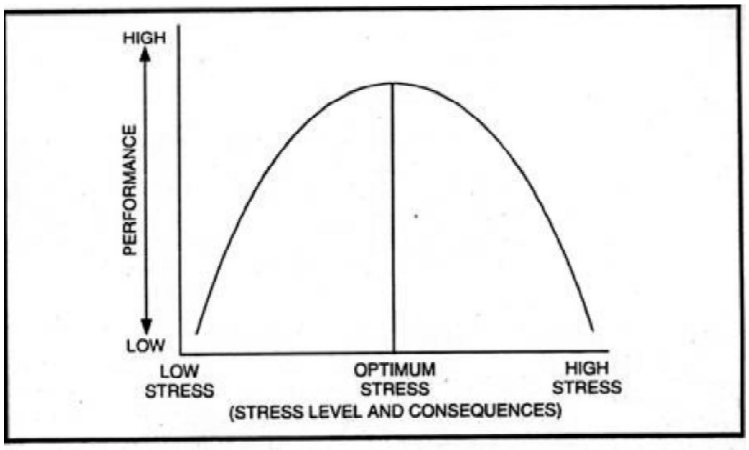
Q14. What is stress ? Explain the causes of stress.

Ans : **(May-19, Imp.)**

Meaning

Stress is a growing concern for organizations today. Stress can be explained as a lively circumstance in which people face constraints, opportunities, or loss of something they desire and for which the consequence is both unpredictable as well as crucial. Stress is the response of people to the unreasonable/ excessive pressure or demands placed on them.

Stress is not always negative. It may also bring out the best in individuals at times. It may induce an individual to discover innovative and smarter way of doing things. This positive dimension of stress is called as enstress. But usually, the term stress has a negative implication and this negative aspect of stress is termed as distress. For instance - When a subordinate is harassed or warned by his superior, unhappiness of unsuitable job, etc. We can say that "Stress causes some people to break, and other to break records."



Stress Levels	Low Stress	Optimum Stress	High Stress
Reactions	Boredom/Apathy	High Energy	Exhaustion
Behaviours	Low motivation carelessness Psychological withdraw Physical withdrawal Inactivity	High Motivation Heightened perception High involvement	Anxiety Nervousness Indecisiveness Bad Judgement
Performance	Low Performance	High Performance	Poor Performance
Health effects	Dull Health	Good Health	Insomnia psycho- matic linesses

Definitions

According to Ivancevich and Matterson, "Stress is the interaction of the individual with the environment. It is an adaptive response, mediated by individual differences and/or psychological process; that is a consequence of any external (environmental) action, situation or event that places excessive psychological and/or physical demands upon a person"

According to Beehr and Newman, "Job stress is a condition arising from the interaction of the people and their jobs, and characterised by changes within people that force them to deviate from their normal functioning."

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The Causes of Stress

The following are the various causes of work stress found in individuals :

1. Extra organizational stressors

Employees of organizations are affected by extra organizational stressors like social and technological changes, family problems, relocation to new place, economic and financial conditions, race, class, residential and community conditions, etc. For instance, employees might find it difficult to concentrate on their work and meet the deadline, if they are facing family problems or crises.

2. Organizational stressors

According to Fred Luthans, administrative policies and strategies, organizational structure and design, organizational processes and working conditions act as macro-level organizational stressors. Other organizational behaviorists like Curtis W. Cook, Philip L. Hunsaker, and Robert E. Coffey suggest the following organizational stressors :

- High-stress jobs
- Dissatisfaction regarding job role
- Poor working conditions
- Organizational politics
- Poor work relationships

3. Individual stressors

The influence of individual stressors differs from person to person, since no two individuals undergo the same perceptual process. A person may be affected by the following individual stressors:

4. Role conflict and ambiguity

Role conflicts and ambiguity occur when employees do not have the required information and knowledge regarding their job. This in turn affects their performance and causes work stress.

5. Type A characteristics

Meyer Friedman and Ray Rosenman first categorized individuals into two profiles based on their personality characteristics. These are known as Type A and Type B personalities. The Type A individual is very competitive, highly involved in his work, aggressive, motivated, ambitious and very conscious of time.

Type B personalities have a relaxed and balanced approach to work and life. They are not very competitive and show lesser dedication towards their work as compared to Type A individuals. It has been observed that those with Type A characteristics are more prone to high levels of stress because they tend to have heavy work loads, put in long hours of work, and are under constant pressures to meet the deadlines.

6. Locus of control

It is believed that individuals who believe that they do not have control over their job and work environment are prone to higher stress levels than those who believe that they have a control over their work and work environment.

7. Learned helplessness

Sometimes individuals learn to accept certain stressors as a part of their work life, and believe that nothing they do can alter these stressors.

8. Self-efficacy

People with high self-efficacy believe that they are capable of coping with any situation. Such individuals are less prone to work stress than people with low self-efficacy.

9. Psychological hardiness

Refers to a person's ability to cope with stress. Therefore, people with high levels of psychological hardiness are capable of withstanding tremendous amounts of stress.

Q15. Explain briefly about individual differences of stress.

Ans :

One of the biggest difficulties in managing stress lies in the fact that stress begins as an individual experience. There are individual differences which directly influence the point at which an individual begins to experience stress. Each person's experience of stress differs and must be dealt with on an individual basis. These individual differences are not always within the control of the person and may arise at different stages in each person's life. Being

Individual differences in experiencing stress

There are many individual differences which may influence the onset of stress. The majority of these individual stress will fall into one of 4 categories.

1. Life Stage

There are a number of different stages of life - childhood, adolescence, early adulthood, midlife, pre-retirement and post-retirement. Each of these stages brings its own pressures e.g. trying to find your identity in adolescence, having children in early adulthood, dealing with the life adjustments of retirement. Also, with time the age at which people changes stages changes e.g. people are now having children later than.

2. Major personal events

There are many major events which can occur during a person's life. These include deaths, births, marriage, divorce, redundancies etc. To make matters worse many of these events lie outside of the control of the individual which makes them harder to manage.

3. The daily grind

No 2 people will have exactly the same day. There are many small events which may occur during the regular day. These events may be small on their own but the cumulative impact can be too much to cope with.

4. Personal resilience

A person's ability to manage their energy and release pressure and tension has a massive influence on their ability to avoid, or cope with, stress.

Q16. What are the various consequences of stress.

Ans :

Stress shows itself in a number of ways, such as high blood pressure, ulcers, irritability, difficulty making routine decisions, loss of appetite, accident proneness, and the like. These symptoms fit under three general categories: physiological, psychological, and behavioural symptoms.

1. Physiological consequences

Stress influences the biological system of the human being. Certain visible forms of stress are increased blood pressure, proneness to heart diseases, cancer sweating, dry mouth, hot and flashes cold, frustration, anxiety, depression, increased level of cholesterol, ulcer, arthritis, etc. physical stress increases the body metabolic rate. This results to manulfuctioning of internal and consequently the body disorder. This is felt in the form of increasing heart beating, increase in breathing rate and headache. This creates biological illness. The physical stress also creates psychological problems. In fact, physical stress and psychological disorders are interrelated. However, physical disorders and stress always need not associate positively. This is because of complexity of symptoms of physical stress and lack of objective measurement of impact of stress on bodily disorders.

2. Psychological Consequences

Psychological consequences are interrelated to biological consequences. They are invisible, but the employees' job performance. Psychological stress creates a pressure on human brain. This is expressed in terms of certain psychological symptoms such as anger. Anxiety, depression, nervousness, irritation, tensions, anxiety and emotions lead to procrastination. Psychological stress produces interpersonal aggressions, misunderstanding in communication, poor job performance, lowered self esteem, increased resentment, low concentration on the job and increased dissatisfaction. Psychological stress produces harshness in the behavior and may lead to assumption of authoritarian leadership style by the superior executive.

3. Behavioural Consequences

Stress has an impact on employee's behaviour. An abnormal behavior is observed in those individuals who are prone to stress. A change in eating habits, sleep disorder, increased smoking alcoholism, fidgeting and aloofness are some of the behavioural changes observed in stressful employees. Sometimes leads to anxiety, apathy, and depression and emotion disorder. This leads to impulsive ad aggressive behaviour and frequent interpersonal conflicts. Under eating, overeating, drug abuse ad sleeplessness are some of behavioural consequences. The following are some propositions relating to stress and behaviour.

i) **Perception:** Stressful individuals develop tension and anxiety. As a result, their level of understanding considerably decreases. When perceptual distortions occur in the employees, it may adversely affects decision making process, interpersonal understanding, inter-personal communication and capacity to work with groups. They become stress intolerable. All these lead to increased levels of interpersonal conflicts.

ii) **Attitudes:** Continued stressful environment creates certain permanent negative impressions in the mind of employees. These permanent impressions adversely influence their work performance. For example, an employee developing a negative attitude on work, superior, working conditions, organizational climate and culture intentionally decreases his output. He also becomes demoralized and the motivation level decreases.

iii) **Learning:** Employees in organizations continuously learn new skills and techniques. Learning new methods and techniques to adapt themselves and discharge their jobs effectively is inevitable to employees. Stressful employees cannot learn the things quickly.

4. Organizational Consequences

Stress has negative impact on the performance of the job. Organizations face the problems of poor performance and other negative consequences. Some of them are described below:

i) **Absenteeism:** Employees subject to stress were found to addict to drugs and alcohol. Thus, they abstain from the jobs frequently. This creates discontinuity in the jobs and adversely effect performance of other employees.

ii) **Turnover:** Turnover and stress have shown some relationships. An employee experiencing continued stress develops disgust and frustration. Therefore, they are likely to change their jobs.

iii) **Decision-Making:** Excessive stress distorts perception of managers. This adversely affects their capacity to take decision. Thus, stressful executives become irrational in the decision making. This leads to loss of organizational resources and reputation.

iv) **Disturbed Customer Relationship:** Employees experiencing excessive stress develop irritation, looses emotional tolerance. Intolerance impels them to pick up conflicts easily due to misunderstandings. Employees dealing with the customers and the public disturb relationship due to their impatient behaviour. For instance sales persons, bank employees, otherwise, customers dealing with them will have trouble in dealing with the company. This also creates poor impression on the corporate image of the organization.

Short Question and Answers

1. Organizational Project Management.

Ans :

The term Organizational Project Management (OPM) was coined by John Schlichter in May 1998 in a meeting of the Standards Committee of the Project Management Institute.

OPM was defined as the execution of an organization's strategies through projects by combining the systems of portfolio management, program management, and project management. This definition was approved by a team of hundreds of professionals from 35 countries and was published as part of PMI's Organizational Project Management Maturity Model standard in 2003 and updated later to a second edition in 2008 when it also became an ANSI standard. The standard was updated to a third edition in 2013. In the standard, the term "Organizational Project Management" is capitalized to indicate that it does not denote project management generically and that it pertains to the framework for executing strategies through projects by combining the systems of portfolio, program, and project management.

"Organizational Project Management is the systematic management of projects, programs, and portfolios in alignment with the achievement of strategic goals. The concept of organizational project management is based on the idea that there is a correlation between an organization's capabilities in project management, program management, and portfolio management, and the organization's effectiveness in implementing strategy".

2. Disadvantages of the Functional Organization Structure.

Ans :

A traditional organizational structure has the following disadvantages:

1) Lack of formal authority, i.e., no single person is responsible for the total project.'

2) It does not provide project-oriented emphasis to achieve the tasks.

3) It is a complex co-ordinating system that consumes more time in approving the decisions.

4) There may be partiality in decision-making and the strongest functional group may be favored.

5) It lacks customer focus.

6) It is slow in responding to customer needs.

7) Lack of proper project-oriented planning and authority that leads to difficulty in pinpointing responsibilities.

8) It reduces motivation and innovation.

9) Ideas are function-oriented rather than project-oriented,

3. Advantages of Divisional Structure.

Ans :

1) Divisional structure emphasizes on the end result, that is, on product, or customer through which revenue is generated in the organization.

2) Since a division focuses its attention on a particular product or service, its performance measurement is easier as the performance can be measured in the light of contributions made by the division.

3) There is higher level of managerial motivation because managers work in the environment of autonomy.

4) Through divisional structure, more managers with general outlook can be developed who can easily take up the job at the corporate level. Thus there is no problem in managerial succession.

5) Organizational size can be increased without any problem as new divisions can be opened without disturbing the existing system.

6) Each product or customer is able to get specialized service because the attention is focused by a division exclusively for it.

4. Plan stakeholder engagement.

Ans :

The Stakeholder Management Plan, a component of the overall Project Management Plan, is created to specify how the project will interact with each stakeholder. It identifies and analyzes two items for each stakeholder: The level of interest the stakeholder has in the project, and their ability to control it. Also, the stakeholder's technical knowledge can be a major factor to plan for up front. All stakeholder concerns are presented and analyzed to ensure the project is set up for success.

5. What is participative management?

Ans :

Participative Management refers to as an open form of management where employees are actively involved in organization's decision making process. The concept is applied by the managers who understand the importance to human intellect and seek a strong relationship with their employees. They understand that the employees are the facilitators who deal directly with the customers and satisfy their needs. To beat the competition in market and to stay ahead of the competition, this form of management has been adopted by many organizations. They welcome the innovative ideas, concepts and thoughts from the employees and involve them in decision making process.

6. Define team building.

Ans :

Team building is the process of taking a collection of individuals with different needs, backgrounds and expertise and transforming them by various methods into an integrated, effective work unit. In this transformation process, the goals and energies of individual contributors merge and support the objectives of the team.

The concept of team building becomes critically important as bureaucratic hierarchies decline and horizontally-oriented teams and work units become increasingly important. In most cases, team building involves relationships among peers with a wide diversity of expertise.

7. What us conflit management?

Ans :

Conflict Management is the practice of recognizing and dealing with disputes in a rational, balanced and effective way. Conflict management implemented within a business environment usually involves effective communication, problem resolving abilities and good negotiating skills to restore the focus to the company's overall goals.

Sources of conflict

1. **Conflict over project priorities :** View of project participants will differ over sequence of activities and tasks
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7. **Personality conflict :** Disagreements on interpersonal issues

Objective Types

Unit - I

CHOOSE THE CORRECT ANSWER

1. Which stage of project management life cycle requires the maximum time of completion [c]
   (a) Conceptualization (b) Planning
   (c) Execution (d) Estimation
2. In Project management when does planning take place? [c]
   (a) Before the project (b) During the project execution
   (c) At the start of the project (d) After the project
3. In the initial stage of the project the probability of completing the project is _____. [c]
   (a) Zero (b) High
   (c) Low (d) Medium
4. A thermal power project plant can't be located near sanctuary. Such guidelines are prescribed by [c]
   (a) Project financer. (b) Client.
   (c) Government Policy. (d) Project beneficiaries.
5. _____ is external stakeholder of a project. [a]
   (a) Trade Association (b) Project Team
   (c) Project Promoter (d) All of them.
6. Who creates the project team? [c]
   (a) Factory manager (b) Operation manager
   (c) Project manager (d) Purchase Manager
7. Mumbai Metro-I project is an example of [c]
   (a) Private Project (b) Public Project
   (c) PPP Project (d) None of above
8. New project idea can be received by a company from [d]
   (a) Internal sources only (b) External sources only
   (c) Project Team only (d) A & B
9. Specialization is a feature of which organizational structure? [d]
   (a) Matrix (b) Divisional
   (c) Multi-divisional (d) Functional

10. Who is named as Father of Value Analysis ? [a]

(a) Lawrence D. Miles (b) George Terborgh

(c) Michael Jucius (d) Edwin B. Flippo

FILL IN THE BLANKS

1. A _____ is a group of unique, interrelated activities that are planned and executed in a certain sequence to create a unique product and/or service.
2. _____ is a process that determines how work for an assignment is to be distributed.
3. _____ is the point at which the customer, i.e., the individual or the organization is willing to provide funds, identifies a need that is to be met.
4. _____ this is the last stage of the project.
5. _____ is the systematic development of a project idea for arriving at an investment decision.
6. _____ A formal audit of the organization focused on exploring the strengths and weaknesses of their current project management practices.
7. The _____ of a construction project is when the labour, equipment and materials needed to complete the project successfully are purchased.
8. Government organizations are using project management to enhance _____ and demonstrate their own _____.
9. _____ include the required material, equipment, land, and capital.
10. _____ include management methods, external and internal information, and objectives set for the project.

ANSWERS

1. Project
2. Project Management
3. Concept phase
4. Termination phase
5. Project formulation
6. Maturity assessment
7. Procurement stage
8. Efficiency, viability
9. Physical resources
10. Conceptual resources

Unit - II

CHOOSE THE CORRECT ANSWER

1. "Risk" usually _____ as the project progresses. [b]

   (a) Increases (b) Reduces

   (c) Remains same (d) Becomes negligible

2. Assembling project team and assigning their responsibilities are done during which phase of a project management? [a]

   (a) Initiation (b) Planning

   (c) Execution (d) Closure

3. Business Value = [d]

   (a) Tangible Elements

   (b) Intangible Elements

   (c) Tangible Elements – Intangible Elements

   (d) Tangible Elements + Intangible Elements

4. Which from the following represents the correct project cycle? [c]

   (a) Planning → Initiating → Executing → Closing

   (b) Planning → Executing → Initiating → Closing

   (c) Initiating → Planning → Executing → Closing

   (d) Initiating → Executing → Planning → Closing

5. The strategy used to correct resource over-allocations by balancing demand for resources and the available supply is known as [b]

   (a) Resource assignment (b) Resource levelling

   (c) Resource splitting (d) Resource scheduling

6. Which of the following is a factor that influences project selection? [d]

   (a) Perceived and real needs (b) List of potential and ongoing projects

   (c) Current organizational environment (d) All of the above

7. When classifying and ranking projects, which of the following refers to the amount and type of resources the project requires and their availability? [c]

   (a) Value chain availability (b) Business placement

   (c) Resource availability (d) Potential benefits

8. When classifying and ranking projects, which of the following refers to the extent to which the project is viewed as helping the organization achieve its strategic objectives and long-term goals? [c]

   (a) Resource availability (b) Business placement

   (c) Strategic alignment (d) Potential benefits

9. Which is the first stage in the project management model? [a]
   (a) Understanding the project environment
   (b) Project definition
   (c) Project control
   (d) Project planning
10. Which of the following is not correct about initial phase of a project? [a]
   (a) The cost associated at the beginning of the project is highest.
   (b) Stakeholders have maximum influence during this phase
   (c) The highest uncertainty is at this stage of the project.
   (d) All the above statements are correct.

FILL IN THE BLANKS

1. _____ may be described as the establishment of course of action for the project, within the forecasted environment.
2. _____ is concerned with the collection, compilation and analysis of economic data for the eventual purpose.
3. _____ is made for both proposed and executed projects.
4. _____ this reviews the technological aspects of projects, such as location, size processes, site selection.
5. _____ constitutes a set of techniques that use bill of material, inventory data, and the master production schedule to calculate the requirements for materials.
6. _____ is network analysis plays an important role in project management By analysis a network, which is a graphic depiction of 'activities' and 'events', the planning, scheduling and control of a project becomes much easier.
7. _____ The procedure for dividing the overall project into subelements is called work breakdown structure.
8. _____ are the deliverables, end-items or end-results and associated requirements and specifications for the task.
9. The entry, process and exit conditions to which the task must confirm; these are specified in the quality plan is called _____.
10. The _____ estimates the size of the potential market, patterns of consumption, level of competition and market composition.

ANSWERS

1. Project planning
2. Project identification
3. Project appraisal
4. Technological appraisal
5. Material requirements planning
6. Network analysis:
7. Work breakdown structure
8. Outcomes
9. Quality assurance
10. Market analysis

Unit - III

CHOOSE THE CORRECT ANSWER

1. What is a cash flow table in project management?[c]
   (a) A table portraying inflow of cash in a project
   (b) A table portraying outgoing expenses of a project
   (c) It is the tool that is used to study such cash flows by breaking inflows and outflows down, usually on a monthly basis
   (d) A table portraying debts taken for a project
2. A project has a Profitability Index of 1.30. What does it mean? [c]
   (a) The NPV is less than zero
   (b) The payback period is more than one year
   (c) That the project returns Rs 1.30 for every Re 1 invested in the project
   (d) That IRR is 1.30 times that of the Hurdle Rate
3. Equivalent Annuity method is given by [a]
   (a) NPV ÷ PV of Annuity Factor (b) NPV × PV of Annuity Factor
   (c) NPV of Inflows x NPV of Outflows (d) Net Present Value – Capital Invested
4. Interest Coverage ratio is given by : [b]
   (a) Nominal Rate × Interest rate,
   (b) Earnings Before Interest and Tax ÷ Interest expense,
   (c) Interest Expense – Interest Income,
   (d) Earnings before Interest and Tax + Interest expense
5. The criteria for acceptance of a project on the basis of Profitability Index (PI) is [d]
   (a) PI = 0 (b) PI > 0
   (c) PI < 0 (d) PI > 1
6. Independent float is the amount of time by which: [a]
   (a) Start of the activity can be delayed without affecting the EST of subsequent activity
   (b) Reduces the float of subsequent activities
   (c) Completion of an activity can be delayed beyond EFT without affecting EST
   (d) Completion of an activity can be delayed beyond earliest possible finishing time
7. The cash inflows and (outflows) associated with a project are as follows: [b]
   At start (120000), Year1-40000, Year2-50000, Year3-60000, Residual Value(at the end of 3rd year) - 20000. The payback period for this project would be:
   (a) 2 years and 3 months. (b) 2 years and 6 months.
   (c) 3 years. (d) 2 years.
8. A Firm is considering undertaking a project that would yield annual profits (after depreciation) of Rs 68,000 for 5 years. The initial outlay of the project would be Rs 800,000 and the project's assets would have a residual value of Rs 50,000 at the end of the project.
   What would be the accounting rate of return for this project? [a]
   (a) 16% (b) 8.5%
   (c) 8.0% (d) 9.1%

9. A firm is about to undertake a project and has decided to purchase a equipment costing Rs 45000. The expected cash inflows from the purchase are Year 1- Rs 15000 , Year 2- Rs 20,000, Year 3- : Rs 25000, Year4- Rs 10000, Year 5- Rs 5000. What is the Net present Value of the project if the cost of capital is 10% [a]

(a) Rs 13881 (b) Rs 15444

(c) Rs 15667 (d) Rs 12998

10. The Debt service coverage ratio refers to [b]

(a) Measurement of Total cash inflows

(b) Measurement of firm's available cash flow to pay their Debt obligation

(c) Measurement of Firms total Income

(d) Measurement of firms total Equity and Debt

FILL IN THE BLANKS

1. _____ is the long-term financing of infrastructure and industrial projects based upon the projected cash flows of the project rather than the balance sheets of its sponsors.
2. _____ is the contribution made by the owners of business, the equity shareholders, who enjoy the rewards and bear the risks of ownership.
3. _____ which represent secured borrowings are a very important source for financing new projects as well as expansion, modernisation, and renovation schemes of existing units.
4. _____ uses historical data from similar projects as a basis for the cost estimate.
5. _____ is used to determine how much contingency reserve, if any, should be allocated to the project.
6. _____ can be used to estimate what the project should cost by comparing the bids submitted by multiple vendors.
7. _____ uses the estimates of individual work packages which are then summarized or "rolled up" to determine an overall cost estimate for the project.
8. _____ uses statistical modeling to develop a cost estimate.
9. Investment criteria, classified into two broad categories _____ and _____ .
10. The _____ is defined as the number of years required for the proposal's cumulative cash inflows to be equal to its cash outflows.

ANSWERS

1. Project finance
2. Equity Capital
3. Rupee term loans
4. Analogous estimating
5. Reserve analysis
6. Vendor analysis
7. Bottom-up estimating
8. Parametric estimating
9. Discounting criteria, Non-discounting criteria
10. Payback period

Unit - IV

CHOOSE THE CORRECT ANSWER

1. The particular task performance in CPM is known [c]
   (a) Dummy (b) Event
   (c) Activity (d) Contract
2. The critical path [c]
   (a) Is a path that operates from the starting node to the end node
   (b) Is a mixture of all paths.
   (c) Is the longest path
   (d) Is the shortest path
3. Free float for any activity is defined as the difference between [a]
   (a) Its earliest finish time and earliest start time for its successor activity
   (b) Its latest start time and earliest start time
   (c) Its latest finish time and earliest start time for its successor activity
   (d) Its earliest finish time and latest start time for its successor activity
4. The time required by an activity when performed without any crashing [b]
   (a) Crash time (b) Normal time
   (c) Optimistic time (d) Standard time
5. Project crashing is the method for [a]
   (a) Shortening the project duration by reducing the time of one or more critical activities
   (b) Adding resources at critical points
   (c) Doing technical analysis of the finished work for review
   (d) Adding duration to each activity
6. The time corresponding to minimum total project cost is [c]
   (a) Crash time (b) Normal time
   (c) Optimal time (d) Between normal time and crash time
7. In Project crashing, rent and overheads are treated as [d]
   (a) Significant Cost (b) Insignificant costs
   (c) Direct Costs (d) Indirect Costs
8. For an activity in CPM analysis, the early Finish time is 13 and the late Finish time is13, Duration of activity is 6. Which of the following statements is true? [d]
   (a) The early start is 6 (b) The duration of the activity is 13
   (c) The slack of this activity is 13 (d) The activity is on the critical path

9. PERT (Project Evaluation and Review Technique) analysis is based on [a]
   (a) Optimistic time, Pessimistic time and Most likely time
   (b) Pessimistic time, Optional time, Maximum time
   (c) Optimistic time, Efficient time, Most likely time
   (d) Minimax time, Optimistic time and harmonic time
10. Which of the following is not an activity on site [c]
   (a) Critical activity (b) Normal activity
   (c) Dummy activity (d) Urgent activity

FILL IN THE BLANKS

1. _____ is a necessary step to ensure that whether the project is on the right path or not and if not then to take corrective action to bring it on the track.
2. _____ is like a steering in an automobile that enables the controller to keep the project on track.
3. _____ are the control systems that are applied after the completion of the project.
4. _____ also referred to as the project graph, shows the activities and events of the project and their logical relationships.
5. _____ it assumes that the time required to complete an activity can be predicted accurately.
6. _____ identifying which quality standards are relevant to the project and determining how to satisfy them.
7. _____ includes the processes required to ensure that the project will satisfy the needs for which it was undertaken.
8. _____ involves comparing actual or planned project practices to those of other projects in order to generate ideas for improvement.
9. _____ involves monitoring specific project results to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory results.
10. In an _____ the entire team is responsible in managing the team and it is not just the project manager's responsibility.

ANSWERS

1. Project control
2. Cybernetic control
3. Post controls
4. Network diagram
5. CPM
6. Quality planning
7. Project quality management
8. Benchmarking
9. Quality control
10. Agile project

Unit - V

CHOOSE THE CORRECT ANSWER

1. How can organizational structures that are characterized by democratic and inclusive styles of management be described? [c]

   (a) Hierarchical (b) Bureaucratic

   (c) Flat (d) Functional

2. What is the term for organizational development through a formally designed organizational structure? [b]

   (a) Organic (b) Mechanistic

   (c) Formal (d) Structured

3. What is not a purpose of an organizational structure? [d]

   (a) To coordinate people and resources (b) To organize lines of communication

   (c) To formalize authority (d) To limit workers' right

4. What is the term for an autonomous business entity within an overall corporate enterprise which is set apart from other areas of the business? [d]

   (a) Subsidiary (b) Strategic partnership

   (c) Strategic alliance (d) Strategic business unit

5. During the _____ of a project, the project manager focuses on developing the project infrastructure needed to execute the project and developing clarity around the project charter and scope. [c]

   (a) Completion (b) start-up

   (c) Execution (d) Evaluation

6. There is _____ correlation between project complexity and project risk. Select one: [b]

   (a) An unknown (b) A positive

   (c) No (d) A negative

7. Which one of the following is captured in the Work Breakdown Structure (WBS)? [c]

   (a) The life cycle phases (b) The logical order of tasks

   (c) The scope of the project (d) Project costs

8. Feasibility study determines _____ [a]

   (a) Whether the project is possible with resources

   (b) Comparing the project with world class manufacturing norms

   (c) Calculate the cost crashing each unit

   (d) Add duration to each unit

9. Detailed Project Report (DPR) is extremely essential for [b]

   (a) Future project operations (b) Financial Institution like Bank

   (c) Project Vendors (d) Government Agencies

10. Which of the following is the process of understanding the knowledge, skills, and abilities needed to manage a task and then matching the team members with the right skills to do that work? [d]

(a) Benchmarking (b) Expediting

(c) Procurement (d) Delegation

FILL IN THE BLANKS

1. Organizations are a variant of _____ entities.
2. _____ a separate division is set up to implement the project. Headed by the project manager, this division has its complement of personnel over whom the project manager has full line authority.
3. A _____ structure is formed as a result of combining the advantages of all the aforementioned organizational structures.
4. _____ coordinate among various functional areas and integrate the diverse processes associated with them.
5. _____ has vested interest in the completion of the project and how the project will impact their specific area.
6. _____ university-wide subject matter expert.
7. _____ refers to as an open form of management where employees are actively involved in organization's decision making process.
8. _____ is the process of taking a collection of individuals with different needs, backgrounds and expertise and transforming them by various methods into an integrated, effective work unit.
9. _____ is the practice of recognizing and dealing with disputes in a rational, balanced and effective way.
10. "Stress causes some people to break, and other to break records."

ANSWERS

1. Clustered
2. Divisional Organization Structure
3. Matrix organizational
4. Project managers
5. Executive stakeholder
6. Enterprise SME
7. Participative Management
8. Team building
9. Conflict Management

Internal Assessment (Mid Examinations)

In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each MidTerm examination consists of two parts i) **Part – A** for 10 marks, ii) **Part – B** for 15 marks with a total duration of 2 hours as follows:

1. Mid-Term Examination for 25 marks:
   (a) Part - A: Objective/quiz paper/Short Note for 10 marks.
   (b) Part - B: Descriptive paper for 15 marks.

   Student shall have to earn 40%, i.e. 10 marks out of 25 marks from average of two mid-term examinations (I Mid-Term & II Mid-Term).

   The remaining 15 marks of Continuous Internal Assessment (out of 40) are distributed as:
2. Assignment for 5 marks. (Average of 2 Assignments each for 5 marks)
3. PPT/Poster Presentation/ Case Study/Video presentation/Survey/Field Study/Group discussion /Role Play on a topic in the concerned subject for 5+5 =10 marks before II MidTerm Examination.

- The objective/quiz paper is set with multiple choice, fill-in the blanks, match the following type of questions and short notes for a total of 10 marks. The descriptive paper shall contain 5 full questions out of which, the student has to answer 3 questions, each carrying 5 marks. The student has to get minimum of 40% (on 25 marks allocated for Mid-Term examinations) on average of two Mid-Term examinations.
- While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.
- Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination.
- The average of the two assignments shall be taken as the final marks for assignment (for 5 marks). PPT/Poster Presentation/ Case Study/ Video presentation/ Survey/ Field Study/ Group discussion / Role Play on a topic in the concerned subject for 5+5 = 10 marks before II Mid-Term Examination.

UNIT - I

Part - A

Multiple Choice Questions

1. Which stage of project management life cycle requires the maximum time of completion [c]
   (a) Conceptualization (b) Planning
   (c) Execution (d) Estimation
2. In Project management when does planning take place? [c]
   (a) Before the project (b) During the project execution
   (c) At the start of the project (d) After the project

3. In the initial stage of the project the probability of completing the project is _____. [c]
   (a) Zero (b) High
   (c) Low (d) Medium

Fill in the Blanks

4. _____ this is the last stage of the project. **(Termination phase)**
5. _____ is a process that determines how work for an assignment is to be distributed. **(Project Management)**
6. _____ include the required material, equipment, land, and capital. **(Physical resources)**

Short Notes

7. Define Project Management. **(Unit-I, SQA - 2)**
8. What is Project Identification? **(Unit-I, SQA - 4)**
9. Stages of Project Formulation. **(Unit-I, SQA - 6)**
10. Features of system approach to project management. **(Unit-I, SQA - 8)**

Part - B

1. Define Project Management. What are the objectives of project management. **(Unit-I, Q.No. 3)**
2. Explain the Characteristics of Project. **(Unit-I, Q.No. 6)**
3. Explain the stages of project life cycle. **(Unit-I, Q.No. 7)**
4. Explain the role of project in constru- ction sector. **(Unit-I, Q.No. 12)**
5. Explain the role of project in Govern- ment sector. **(Unit-I, Q.No. 15)**

UNIT - II

Part - A

Multiple Choice Questions

1. "Risk" usually _____ as the project progresses. [b]
   (a) Increases (b) Reduces
   (c) Remains same (d) Becomes negligible
2. Assembling project team and assigning their responsibilities are done during which phase of a project management? [a]
   (a) Initiation (b) Planning
   (c) Execution (d) Closure
3. Business Value = [d]
   (a) Tangible Elements
   (b) Intangible Elements
   (c) Tangible Elements – Intangible Elements
   (d) Tangible Elements + Intangible Elements

Fill in the Blanks

4. _____ may be described as the establishment of course of action for the project, within the forecasted environment. **(Project planning)**
5. _____ is concerned with the collection, compilation and analysis of economic data for the eventual purpose. **(Project identification)**
6. _____ is made for both proposed and executed projects. **(Project appraisal)**

Short Notes

7. Project Planning. **(Unit-II, SQA - 1)**
8. Explain briefly about Technical feasibility. **(Unit-II, SQA - 7)**
9. What is Project Feasibility ? **(Unit-II, SQA - 6)**
10. Social Appraisal **(Unit-II, SQA - 5)**

Part - B

1. Explain the tools and techniques involved in project planning. **(Unit-II, Q.No. 6)**
2. What is Project Appraisal? Explain importance of Project Appraisal. **(Unit-II, Q.No. 8)**
3. What is Project Feasibility? Explain the content of Project Feasibility Study. **(Unit-II, Q.No. 10)**
4. What is Social Cost Benefit Analysis ? **(Unit-II, Q.No. 15)**
5. What do you understand by Incorporating of Risk in Decision Making? **(Unit-II, Q.No. 31)**

UNIT - III

Part - A

Multiple Choice Questions

1. Equivalent Annuity method is given by [a]

   (a) NPV ÷ PV of Annuity Factor (b) NPV × PV of Annuity Factor

   (c) NPV of Inflows x NPV of Outflows (d) Net Present Value – Capital Invested

2. The criteria for acceptance of a project on the basis of Profitability Index (PI) is [d]

   (a) PI = 0 (b) PI > 0

   (c) PI < 0 (d) PI > 1

3. The cash inflows and (outflows) associated with a project are as follows: [b]

   At start (120000), Year1-40000, Year2-50000, Year3-60000, Residual Value(at the end of 3rd year) - 20000. The payback period for this project would be:

   (a) 2 years and 3 months. (b) 2 years and 6 months.

   (c) 3 years. (d) 2 years.

Fill in the Blanks

4. _____ uses historical data from similar projects as a basis for the cost estimate. **(Analogous estimating)**

5. _____ uses statistical modeling to develop a cost estimate. **(Parametric estimating)**

6. Investment criteria, classified into two broad categories _____ and _____ . **(Discounting criteria, Non-discounting criteria)**

Short Notes

7. What is Project Financing? **(Unit-III, SQA - 4)**

8. Foreign Currency Loans. **(Unit-III, SQA - 3)**

9. Unsecured Loans and Deposits. **(Unit-III, SQA - 2)**

10. What is Project Finance? **(Unit-III, SQA - 1)**

Part - B

1. Define power. Explain different types of power. **(Unit-III, Q.No. 1)**

2. List the similarities and dissimilarities between authority, power and influence. **(Unit-III, Q.No. 4)**

3. Explain about mechanstic organizat-ional structure? State & disadvantages **(Unit-III, Q.No. 8)**

4. What are the Contemporary Organizational Design ? **(Unit-III, Q.No. 10)**

5. Define controlling? Explain the nature & objectives of controlling. **(Unit-III, Q.No. 13)**

UNIT - IV

Part - A

Multiple Choice Questions

1. The particular task performance in CPM is known [c]

   (a) Dummy (b) Event

   (c) Activity (d) Contract

2. The time corresponding to minimum total project cost is [c]

   (a) Crash time (b) Normal time

   (c) Optimal time (d) Between normal time and crash time

3. For an activity in CPM analysis, the early Finish time is 13 and the late Finish time is13, Duration of activity is 6. Which of the following statements is true? [d]

   (a) The early start is 6 (b) The duration of the activity is 13

   (c) The slack of this activity is 13 (d) The activity is on the critical path

Fill in the Blanks

4. _____ is a necessary step to ensure that whether the project is on the right path or not and if not then to take corrective action to bring it on the track. **(Project control)**
5. _____ is like a steering in an automobile that enables the controller to keep the project on track. **(Cybernetic control)**
6. _____ are the control systems that are applied after the completion of the project. **(Post controls)**

Short Notes

7. What is Project Control? **(Unit-IV, SQA - 1)**
8. Explain the advantages and disadvan- tages of gantt chart. **(Unit-IV, SQA - 4)**
9. What is quality assurance ? **(Unit-IV, SQA - 6)**
10. Quality Control. **(Unit-IV, SQA - 7)**

Part - B

1. What is Project Control? Explain the need for Project Control. **(Unit-IV, Q.No. 1)**
2. Outline the steps involved in Project Control. **(Unit-IV, Q.No. 4)**
3. What is Network ? Explain the rules for Network construction with an example. **(Unit-IV, Q.No. 6)**
4. What do you understand by project quality management? **(Unit-IV, Q.No. 12)**
5. What is Project Organization? Explain the matrix form of Project Organization. **(Unit-IV, Q.No. 16)**

UNIT - V

Part - A

Multiple Choice Questions

1. What is the term for organizational development through a formally designed organizational structure? [b]

   (a) Organic (b) Mechanistic
   (c) Formal (d) Structured

2. Which one of the following is captured in the Work Breakdown Structure (WBS)? [c]

   (a) The life cycle phases (b) The logical order of tasks
   (c) The scope of the project (d) Project costs

3. Detailed Project Report (DPR) is extremely essential for [b]

   (a) Future project operations (b) Financial Institution like Bank
   (c) Project Vendors (d) Government Agencies

Fill in the Blanks

4. _____ is the process of taking a collection of individuals with different needs, backgrounds and expertise and transforming them by various methods into an integrated, effective work unit. **(Team building)**

5. _____ a separate division is set up to implement the project. Headed by the project manager, this division has its complement of personnel over whom the project manager has full line authority. **(Divisional Organization Structure)**

6. Organizations are a variant of _____ entities. **(Clustered)**

Short Notes

7. Organizational Project Management. **(Unit-V, SQA - 1)**

8. Plan stakeholder engagement. **(Unit-V, SQA - 4)**

9. Define team building. **(Unit-V, SQA - 6)**

10. What us conflit management? **(Unit-V, SQA - 7)**

Part - B

1. What is Organizational Structure? Explain different types of Organizational Structure. **(Unit-V, Q.No. 2)**

2. Explain role and responsibilities of project manager. **(Unit-V, Q.No. 4)**

3. Explain the various roles in the project team. **(Unit-V, Q.No. 5)**

4. What is Project Stakeholder Engagement? **(Unit-V, Q.No. 6)**

5. What is Participative Management? Explain the advantages and disadvantages of Participative Management. **(Unit-V, Q.No. 8)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.B.A I Year I Semester Examination **R22**

MODEL PAPER - I

PROJECT MANAGEMENT

Time : 3 Hours] **[Max. Marks : 60**

Note : This question paper contains two parts **A** and **B**.
Part A is compulsory which carries 10 marks. Answer all questions in **Part A.**
Part B consists of 5 Units. Answer any **One** full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (10 × 1 = 10 Marks)

ANSWERS

1. (a) Explain the Meaning & Definition of Management. **(Unit-I, SQA. 1)**
   (b) What are the Managerial Skills? **(Unit-I, SQA. 6)**
   (c) Project Planning. **(Unit-II, SQA. 1)**
   (d) What is Project Feasibility ? **(Unit-II, SQA. 6)**
   (e) What is Project Financing? **(Unit-III, SQA. 4)**
   (f) What is cashflows? **(Unit-III, SQA. 9)**
   (g) What is quality planning ? **(Unit-IV, SQA. 5)**
   (h) What is Project Control? **(Unit-IV, SQA. 1)**
   (i) Advantages of Divisional Structure. **(Unit-V, SQA. 3)**
   (j) What us conflit management? **(Unit-V, SQA. 7)**

PART - B (5 × 10 = 50 Marks)

2. (a) Explain various functions of manage-ment. **(Unit-I, Q.No. 7)**

(OR)

   (b) Explain the salient features of F.W. Taylor's scientific management. **(Unit-I,Q.No. 17)**

3. (a) Explain the rationale for Social Cost Benefit Analysis. **(Unit-II, Q.No. 16)**

(OR)

   (b) What are the different techniques involved in Measurement of Risk? **(Unit-II, Q.No. 30)**

4. (a) The following details related to 3 mutually exclusive projects. Find PBP for all the 3 projects. The std PBF is 3 years. Suggest the Management which project should be acceptable. The initial cash outlay of each project is `1,00,000/- **(Unit-III, Prob. 4)**

Year	Cash Inflows		
	A	B	C
1	30,000	30,000	40,000
2	30,000	50,000	50,000
3	30,000	40,000	10,000
4	30,000	20,000	20,000
5	30,000	10,000	20,000

(OR)

(b) Define risk ? Explain the nature / scope of risk. **(Unit-III, Q.No. 22)**

5. (a) The following table lists the jobes of a network along wiht the time estimates. **(Unit-IV, Prob. 1)**

Jobs	Optimistic	Duration in Days Most Likely	Pessimistic
1-4	3	9	27
1-3	3	6	15
1-2	6	12	30
4-5	1	4	7
3-5	3	9	27
3-6	2	5	8
5-6	6	12	30
2-6	4	19	28

(i) Draw the project network.

(ii) What is the approximate probability that jobs on the critical path will be completed by the due date of 35 days ?

(iii) What is your estimate of the probability that the entire project will be completed by the due date? Explain.

(iv) What due date has 90% of chance of being met ?

(OR)

(b) What do you understand by project quality management? **(Unit-IV, Q.No. 12)**

6. (a) Explain the various roles in the project team. **(Unit-V, Q.No. 5)**

(OR)

(b) What is Participative Management? Explain the advantages and disadvantages of Participative Management. **(Unit-V, Q.No. 8)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.B.A I Year I Semester Examination **R22**

MODEL PAPER - II

PROJECT MANAGEMENT

Time : 3 Hours] **[Max. Marks : 60**

Note : This question paper contains two parts **A** and **B**.

Part A is compulsory which carries 10 marks. Answer all questions in **Part A.**

Part B consists of 5 Units. Answer any **One** full question from each unit.

Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (10 × 1 = 10 Marks)

ANSWERS

1. (a) What are the objectives of Management? **(Unit-I, SQA. 2)**
   (b) Decisional Roles **(Unit-I, SQA. 5)**
   (c) What is Project Appraisal? **(Unit-II, SQA. 2)**
   (d) Social Appraisal **(Unit-II, SQA. 5)**
   (e) What is Cost of Capital? **(Unit-III, SQA. 10)**
   (f) Disadvantages of Payback Method **(Unit-III, SQA. 5)**
   (g) What is quality assurance ? **(Unit-IV, SQA. 6)**
   (h) What is Agile project Management **(Unit-IV, SQA. 8)**
   (i) Define team building. **(Unit-V, SQA. 6)**
   (j) Disadvantages of the Functional Organization Structure. **(Unit-V, SQA. 2)**

PART - B (5 × 10 = 50 Marks)

2. (a) Explain briefly about the classification of manager. **(Unit-I, Q.No. 8)**

(OR)

   (b) Explain the Challenges of Management. **(Unit-I,Q.No. 11)**

3. (a) Explain briefly about market feasibility. What are the factors affecting market feasibility. **(Unit-II, Q.No. 13)**

(OR)

   (b) What is Project Feasibility? Explain the content of Project Feasibility Study. **(Unit-II, Q.No. 10)**

4. (a) Define Net Present Value. Explain advantages and disadvantages of NPV. **(Unit-III, Q.No. 10)**

(OR)

   (b) What are the basic principles of cashflow estimation? **(Unit-III, Q.No. 14)**

5. (a) What is Project Organization? Explain the matrix form of Project Organization. **(Unit-IV, Q.No. 16)**

(OR)

(b) Explain the different types of Project Control. **(Unit-IV, Q.No. 5)**

6. (a) What is Organizational Structure? Explain different types of Organizational Structure. **(Unit-V, Q.No. 2)**

(OR)

(b) What is Project Stakeholder Engagement? **(Unit-V, Q.No. 6)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.B.A I Year I Semester Examination **R22**

MODEL PAPER - III

PROJECT MANAGEMENT

Time : 3 Hours] **[Max. Marks : 60**

Note : This question paper contains two parts **A** and **B**.
Part A is compulsory which carries 10 marks. Answer all questions in **Part A.**
Part B consists of 5 Units. Answer any **One** full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART - A (10 × 1 = 10 Marks)

ANSWERS

1. (a) Managers based on Management Levels. **(Unit-I, SQA. 3)**
   (b) Salient features of F.W. Taylor's scientific management. **(Unit-I, SQA. 8)**
   (c) What is Social Cost Benefit Analysis ? **(Unit-II, SQA. 8)**
   (d) Define sensitivity analysis. **(Unit-II, SQA. 12)**
   (e) Define Profitability Index. **(Unit-III, SQA. 8)**
   (f) Foreign Currency Loans. **(Unit-III, SQA. 3)**
   (g) Define scrum ? **(Unit-IV, SQA. 9)**
   (h) Quality Control. **(Unit-IV, SQA. 7)**
   (i) Plan stakeholder engagement. **(Unit-V, SQA. 4)**
   (j) What is participative management? **(Unit-V, SQA. 5)**

PART - B (5 × 10 = 50 Marks)

2. (a) Briefly explain the evolution of management. **(Unit-I, Q.No. 12)**

(OR)

   (b) Define management process. What are its elements? **(Unit-I,Q.No. 6)**

3. (a) Explain the techniques of project appraisal. **(Unit-II, Q.No. 9)**

(OR)

   (b) What do you understand by Incorporating of Risk in Decision Making? **(Unit-II, Q.No. 31)**

4. (a) What is cashflow ? Explain the elements of cashflow. **(Unit-III, Q.No. 13)**

(OR)

   (b) A project requires an investment of ` 11,11,111 and is expected to generate cash in flows of ` 3,33,333, ` 4,44,444, ` 5,55,555, ` 4,44,444 and ` 3,33,333 for the next five years. The risk free cost of capital is 11 percent. Evaluate the project using IRR method. If a risk premium of 9 percent is considered how do you evaluate the project and do you observe any change in your earlier decision? **(Unit-III, Prob. 10)**

5. (a) What is CPM ? Discuss forward and backward pass methods. **(Unit-IV, Q.No. 9)**

(OR)

(b) What do you understand by Project Budgetting? **(Unit-IV, Q.No. 18)**

6. (a) Explain role and responsibilities of project manager. **(Unit-V, Q.No. 4)**

(OR)

(b) Explain briefly about leadership in project management. **(Unit-V, Q.No. 7)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

MBA I - Semester Examinations

April / May - 2019

R17

PROJECT MANAGEMENT

Time : 3 Hours] **[Max. Marks : 75**

Note : This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question, from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A [5 × 5 = 25 Marks]

ANSWERS

1. (a) Discuss tools and techniques of Project Management.

Ans :

There are various tools and techniques used in project management to accomplish successful project. These tools and techniques are given below :

1. Process Modeling and Management tools

Process modeling simply means to model software processes. At first, developers need to fully understand process and work of software, then only they can be able to model process. This tool represents key elements of process that are important. So, it makes it easier to perform work tasks in efficient and proper manner.

2. Project Planning tools

Project planning simply means to plan and set up project for successful development within time frame. It includes defined stages or steps to define objectives of project with designated resources, clarify scope of what should be done, and then develop list of tasks that are needed to be done to complete it. Tools used for project planning can be CPM (Critical Path Method) and PERT (Program Evaluation and Review Technique). Both of them are used for finding parallelism, eliminating bottlenecks in projects, and scheduling activities of project. Some tools that make planning of project in efficient way are Trello, Nifty, Asana, TeamGantt, etc.

3. Risk Analysis tools

Risk analysis simply means to identify and analyze errors or defects or any issue that can cause negative impact and result in the changed outcome and objectives of project. The analysis is done so that organization can fix issue or remove error to avoid effect caused by them. These tools help in identifying risks and are useful for binding risk table.

These provide detailed guidance in the identification and analysis of risks. The risks identified can be categorized into catastrophic, critical, marginal, or negligible. A cost is associated with each risk which can be calculated at each stage of development. Some tools and techniques are Delphi technique, Information gathering technique, Checklist analysis, etc.

4. Project Management tools

Project management simply means to track or control progress and tasks of project. These tools are extension of project planning tools.

These tools are generally used to update pans if require and schedule project. These tools make Project Management more effective and efficient. Some tools are Gantt chart, mind map, WBS chart (Work Breakdown Structure), etc.

5. Metrics and Management tools

Metric management tools are very good for software as they provide very quick and easy way to track software development, set goals, and measure performance. These tools help in capturing and finding out specific metrics that are useful and provide overall measure of quality. These tools focus more on process and product characteristics.

For example, "defects per function point", "Line Of Code/person-month".

6. Quality Assurance tools

Quality assurance in software engineering simply means to maintain level of quality of software product by focusing on each step of process of development or production and delivery. It prevents mistakes and any defects or errors in manufactured products.

These are actually metrics tools that audit source code to ensure compliance with language standards. Some tools that are used for both Quality management plan and to control quality process are Pareto Diagrams, control charts, histograms and scatter diagrams, etc.

(b) Write a note on Social Cost Benefit Analysis. **(Unit-II, SQA.8)**

(c) Discuss different Project Evaluation Techniques. **(Unit-III, Q.No.8,9)**

(d) Explain Agile Project Management. **(Unit-IV, SQA.8)**

(e) Write short notes on participative management in Project. **(Unit-V, SQA.5)**

PART - B [5 × 5 = 25 Marks]

2. Discuss the need and benefits of Project Management and brief on project management in different sectors. **(Unit-I, Q.No.12,13,14,15)**

Ans :

1. Better Planning

Project management allows the team to see the big picture. When requirements are captured, budgets are planned, timelines are mapped out and there are realistic, achievable targets, the project can get off on the right foot and stay on track.

2. Collaboration and communication

Project management smoothens channels of communication, directing the team to get together at regular intervals to discuss progress, iron out obstacles and brainstorm on the way forward. The whole team collaborates and works together as a cohesive unit to achieve end goals, and this improves team morale and enhances productivity.

3. Optimized resource allocation

Without proper project management, resource allocation would go haywire. When project management techniques are implemented, people of different skill levels and with expertise in

diverse domains are optimally used, so that their talents are brought to the fore and they can make meaningful contributions to the project. This is made possible through smart planning and resource allocation.

4. Reduced costs and timely deliveries

When processes are in place and resources are optimized, budgets and timelines can stay on track and within limits. There will be no delays, and the project goals can be rolled out in a timely manner.

5. Enhanced quality

Project managers are always under pressure to perform better than their best. Budgets are inevitably tight and timelines are short, but with the right project planning quality control can be achieved. Methodologies like Scrum and Kanban facilitate planning and ensure that the quality standards are met.

6. Higher customer satisfaction

With the cutthroat competition in the market today, retaining a loyal customer base is of greater importance than ever before. Thoughtful project planning and implementation increases the chances of being able to meet and exceed the end-user's requirements. Greater customer satisfaction will lead to increased word-of-mouth referrals, and consequently more projects will come your way.

7. Increased productivity

Proper planning of time, budget and resources, and having efficient systems and processes in place, leads to the team being able to roll out products faster and with enhanced quality. This increases team productivity and boosts the organization's bottom-line.

8. Increased flexibility

Today's projects must be able to adapt to changing requirements, and without the right project management this will become impossible. With flexibility at the core, project managers can navigate their way around volatile market needs and course correct as needed to meet customer expectations.

9. Happy employees

As the team works with heightened efficiency, greater communication and more collaboration, team morale is bound to increase. With the rollout of a successful project, the team will gain confidence and stay engaged, looking to perform even better the next time round. Project managers can inspire and motivate teams by incentivizing top performers and this will further increase employee engagement.

10. Continuous learning

Introspections at the end of each project cycle allow for continuous improvement, where the team can look back on the completed work and try to list out what went wrong and what could have been improved. Agile frameworks factor in regular reviews and retrospectives where the main agenda is to find out how the team can collectively better themselves.

OR

3. Explain the different phase of project life cycle. **(Unit-I, Q.No.7)**

4. (a) What are the objectives of Project Appraisal? **(Unit-II, Q.No.8)**

   (b) Describe the feasibility report for establishing a new project. **(Unit-II, Q.No.11)**

OR

5. Discuss various steps involved in Project Management Planning process with an illustration. **(Unit-II, Q.No.4)**

6. Explain the methods of project evaluation. Also write how a project is audited. **(Unit-III, Q.No.8,9,10,11,12)**

OR

7. Discuss the concept of cost estimation and cost improvement in project finance. **(Unit-III, Q.No.13)**

8. Explain the networking process during uncertainty and risk in scheduling a project. **(Unit-IV, Q.No.6,9,10)**

OR

9. Define Project Execution? What are the various techniques in monitoring an controlling? **(Unit-IV, Q.No.16,19)**

10. Enumerate the pitfalls of ineffective project team and brief on stress management. **(Unit-V, Q.No.5,14)**

OR

11. Describe the methods of resolving conflicts in project management. **(Unit-V, Q.No.13)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

MBA I - Semester Examinations

July / August - 2021

R19

PROJECT MANAGEMENT

Time : 3 Hours] **[Max. Marks : 75**

Answer any Five questions

All questions carry equal marks

ANSWERS

1. Explain project management in public sector. **(Unit-I, Q.No.14)**
2. What is social cost benefit analysis? What is its relevance to projects involving public utility? What are the approaches to social cost benefit analysis? **(Unit-II, Q.No.15,16,18)**
3. What is economic and financial feasibility of a project? What is its significance? What are the other aspects to be considered in project feasibility? **(Unit-II, Q.No.9,14)**
4. Describe the NPV and IRR method of project evaluation. What are the merits and limitations of each of them? **(Unit-III, Q.No.10,11)**
5. How do you estimate project cost? What are the means of financing the project? **(Unit-III, Q.No.14)**
6. Describe agile project management. What arc its characteristics? **(Unit-IV, Q.No.20,22)**
7. Explain the importance of leadership in project management? What role does leadership play in conflict resolution? **(Unit-V, Q.No.7)**
8. What are the roles performed by the project team? What are the steps in building project team? **(Unit-V, Q.No.5,9)**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

MBA I - Semester Examinations

October / November - 2022

R19

PROJECT MANAGEMENT

Time : 3 Hours] **[Max. Marks : 75**

Answer any Five questions

All questions carry equal marks

ANSWERS

1. (a) Write a note on Project Implementation and project life cycle with illustration. **(Unit-I, Q.No.11,7)**

   (b) Discuss the process involved in Project Identification. **(Unit-I, Q.No.8)**

2. (a) How do projects are managed in Construction Sector and Service Sector? **(Unit-I, Q.No.12,13)**

   (b) Narrate the Systems approach to project management. **(Unit-I, Q.No.17)**

3. (a) What is Project Planning? Discuss the steps involved in Project Planning. **(Unit-II, Q.No.1,4)**

   (b) Discuss the economic feasibility of a Project and examine the process of project appraisal. **(Unit-II, Q.No.9)**

Ans :

1. Concept Analysis

The first step requires you (as a project appraiser or analyst) to conduct a range of analyses in order to determine the concept of the future project and provide the Decision Package for the senior management (project sponsors) for approval. It means you need to carry out the problem-solution analysis that determines the problem/need to be addressed and the solution to be used to handle the problem. The solution should analyzed by cost-effectiveness and feasibility (various project appraisal methods and techniques can be used). Also you will need to identify stakeholders (those people and organizations involved in or affected by the problem and/or solution) and analyze their needs (how they relate to the problem and/or solution). After all, you must develop a decision package that includes the problem statement, the solution proposal, the stakeholder list, and the funding request. This package will then be submitted to the sponsor for approval (or rejection). If the sponsor approves the project concept then you can proceed to the next step.

2. Concept Brief

At this step you must develop a summary of the project concept to define the goals, objectives, broad scope, time duration and projected costs. All this data will be used to develop the Concept Brief. You need to develop a project statement document that specifies the project mission, goals, objectives and vision. Then you create a broad scope statement that specifies the boundaries, deliverables ad requirements of your endeavor. Finally you make a preliminary schedule template that determines an estimated duration of the project, and then develop a cost projection document based on cost estimates and calculations.

3. Project Organization

You use the Concept Brief to determine an organizational structure of your project. This structure should be developed and explained in the Project Organizational Chart. The document covers such issues as governance structure (roles and responsibilities), team requirements and composition, implementation approach, performance measures, other info. The idea behind the Project Organizational Chart is to create a visual representation of the roles, responsibilities and their relationships and what people/organizations are assigned to what roles and duties within the project.

4. Project Approval

The final stage requires you to review all the previous steps and gather them into a single document called the Project Appraisal. This document summarizes all the estimations and evaluations made, to justify the project concept and verify that the proposed solution addresses the identified problem. The financial, the cost-effectiveness and the feasibility analyses will serve as the methods of project appraisal to approve the project.

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4. (a) What is Social Cost Benefit Analysis? Discuss its benefits. **(Unit-II, Q.No.15)**

Ans :

1. Market Instability: A private corporation would evaluate a deal based on productivity and relevant market prices. However, the government must consider additional variables. Determining social costs in the event of market inefficiency and when market pricing cannot specify them. These hidden social costs are referred to as shadow prices.

2. Investments & Savings: A venture that results in increased savings is considered an investment in a market.

3. Income is distributed and redistributed: The initiative should not lead to revenue accumulation in the control of a few and the distribution of income.

4. Career and Living Standards: The impact of a program on employment and level of livelihood will also be considered. Therefore, the contract should result in a rise in employment and living standards.

5. Externalities: Externalities can be detrimental and advantageous to an enterprise. As a result, both impacts must be considered before approving a deal. For example, positive externalities can take the shape of technological advances, while negative externalities might take the form of rapid urbanization and ecological degradation.

6. Subsidy and Taxation: Taxation and subsidies are treated as expenses and revenue, respectively. However, taxation and subsidy are regarded as transfer payments for social cost-benefit analysis.

(b) Explain about Project Risk Analysis and Project Planning. **(Unit-II, Q.No.20,1)**

5. (a) Explain about Project Financing and project evaluation techniques. **(Unit-III, Q.No.6,8,9,10,11,12)**

(b) Calculate Net Present Value and Profitability Index from the information related to Project XYZ whose cash outflows are Rs.12 Lakhs with an estimated Life Time of five years. Yearly cash inflows for five years are Rs.3,00,000 per annum. Cost of Capital is

(Table. values of Present value at 10% for five years are 0.909, 0.826, 0.751, 0.683 and 0.621)

Sol :

Year	Cash in flow	Discounting factor @ 10%	PVCF
1	3,00,000	0.909	2,72,700
2	3,00,000	0.826	2,47,800
3	3,00,000	0.751	2,25,300
4	3,00,000	0.683	2,04,900
5	3,00,000	0.621	1,86,300
			11,37,000

NPV = Cash in flow – Cash out flow

11,37,000 – 12,00,000

= –63,000

$$\text{Profitability Index} = \frac{\text{Cach in flow}}{\text{Cash out flow}} = \frac{11,37,000}{12,00,000}$$

= 0.94

6. (a) Define the term Investment the criteria for Investment and brief on cash flow estimation for new project. **(Unit-III, Q.No.6,13)**

(b) Explain any two Project evaluation techniques. **(Unit-III, Q.No.10,11)**

7. (a) Write briefly about Quality Management and describe the methods of network analysis. **(Unit-IV, Q.No.12,8,9)**

(b) Define the term Planning and explain steps in Project Planning. **(Unit-II, Q.No.4)**

Ans :

Planning is the fundamental management function, which involves deciding beforehand, what is to be done, when is it to be done, how it is to be done and who is going to do it. It is an intellectual process which lays down an organisation's objectives and develops various courses of action, by which the organisation can achieve those objectives. It chalks out exactly, how to attain a specific goal.

8. (a) What is Conflict? How is Conflict Management carried on in Projects? **(Unit-V, Q.No.13)**

Ans :

Conflict management is the use of techniques to resolve disagreements or control the level of discord. Conflict resolution techniques include facilitating meetings for the conflicting parties to identify the problem, discuss resolutions and create superordinate goals that require cooperation from conflicting parties.

(b) Examine the participative management, team building approach in project management. **(Unit-V, Q.No.8,9)**