

3. Project Lifecycle

3.1 Introduction

The different phase of development in an investment proposal or project is called project life cycle.

Every programme, project or product has certain phase of development.

Every project, from conception to completion, passes through various phases of a life cycle synonym to life cycle of living beings.

3.2 Phases of Project Life Cycle:

A standard project typically has the following four major phases (each with its own agenda of tasks and issues): **initiation, planning, execution and closure.**



All the steps given in different studies can be grouped into three main phases:

1. Pre-investment phase
2. Implementation phase
3. Operational phase

Pre-investment Phase

The first phase of the cycle describes the preliminary evaluation of an idea. It consists of identification of investment opportunities, preliminary project analysis, feasibility study and decision making. Project idea emanates from the following problems; potential and the needs of the people of an area; plan priorities when planning is done by the government demand and supply various goods and services; pattern of imports and exports over a of time; natural resources.

During this phase, the following aspects of project must be carefully designed so as to enable implementation.

- Project infrastructure and enabling services
- System design and basic engineering package
- Organization and manpower
- Schedules and budgets
- Licensing and government clearances
- Finances
- Systems and procedure
- Identification of project manager
- Construction resources and materials
- Design basis, general condition for purchase and contracts
- Work packaging.

Implementation Phase

The implementation phase of an industrial project involves setting up of manufacturing facilities.

Drawings, blue prints and the sequences in which the various activities concerning the project need to be carried out.

The main activities under this phase are:

1. Project and Engineering Design: It consists of site probing and prospecting, preparation of blue prints, plant design, plant engineering, selection, of machinery, equipment.

2. Negotiations and Contractions: It covers the activities like project financing, requisition of technology, construction of building and civil works, provision of utilities supply of machine equipment, marketing arrangement etc.

3. Construction: This step involves the activities like site preparation construction of building erection and installation of machinery and equipment.

Operation Phase

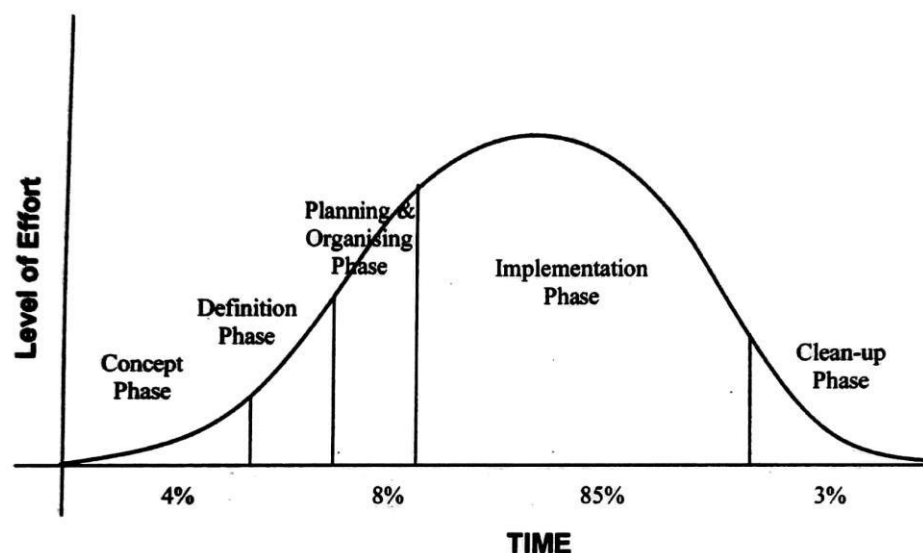
The main concern of this phase is on smooth and uninterrupted operation of machinery and plant, development of suitable form of productivity, establishment of a good quality for the product and securing the market acceptance of the product.

Project monitoring and project evaluation are two vital activities under this phase.

Project monitoring is a step towards achieving properly identified objectives through a carefully laid down strategy. Each activity in the project implementation should be carefully watched so that the progress may be measured and any deviation from the expected progress be identified in time.

Project evaluation refers to post-investment analysis. It aims at finding out whether the project has achieved the objectives for which it was taken up.

Project Life Cycle Curves



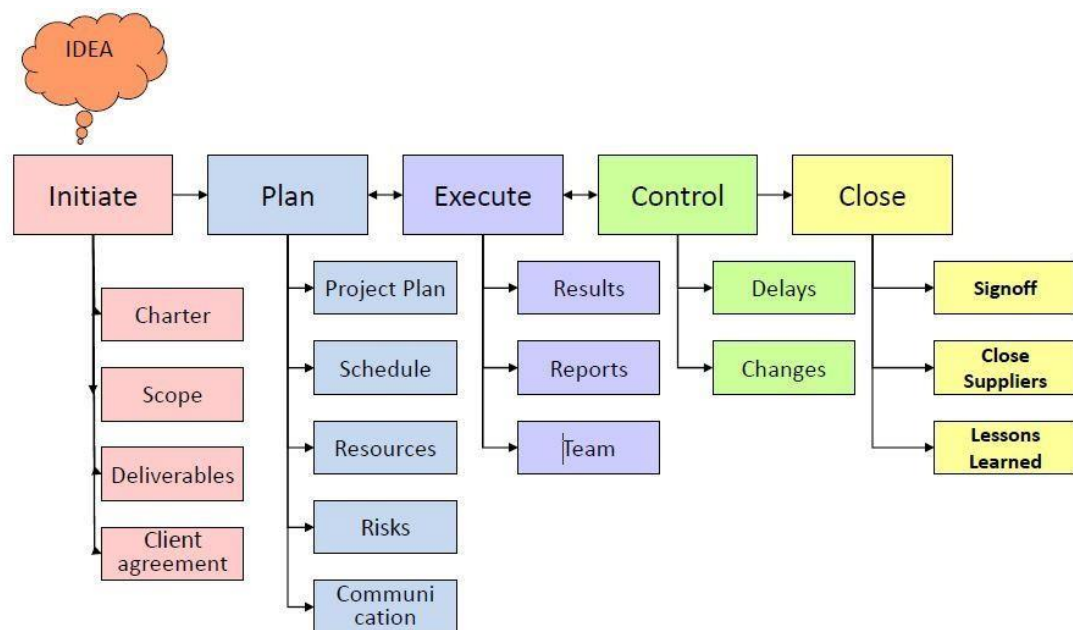
3.3 Project Management Life Cycle — General

Introduction

The project management life cycle has four phases which are as listed below.

1. Project initiation
2. Project planning
3. Project execution
4. Project closure

Each of the phases of the project life cycle has a number of activities.



Project Initiation

This is the first phase of the project life cycle,

In this phase, the purpose and scope, justification for initiating it and the solution to be implemented are defined.

Also, the recruitment of skilled project team, setting up of a project office and performing an end review of this phase are done in this phase:

The steps of the project initiation phase are listed below:

1. Development of a business case
2. Performing feasibility study
3. Establishment of terms of reference/project charter
4. Appointment of project team
5. Setting up of a project office
6. Performing phase review

1. Development of a Business Case

Business case is a preliminary project proposal which is submitted to a company for its consideration. Once, the business case is considered by the company then the remaining steps will be carried out.

Development of a business case will help the company to identify the detailed benefits and costs of the solution which will be recommended to the company.

The rate of return on investment will be computed for the recommended case are as follows.

1. Research the Business Problem or Opportunity
2. Identify the Alternative Solutions Available
3. Quantify the Benefits and Costs of Each Solution
4. Recommend a Preferred Solution to the Company
5. Identify any Risks and Issues while implementing the solution
6. Present the Solution for Funding Approval.

2. Performing Feasibility Study

The feasibility study is conducted within the organization for the considered business case; the feasibility study has the following steps.

- Research the Business Problem or Opportunity
- If the solution recommended in the previous step, look into the details of given solution, whether it is feasible or not.
- Document the Business Requirements for a Solution

3. Establishment of Terms of Reference/Project Charter

This step of establishment of terms of reference/project charter has in turn the following steps.

- i. Identify the project vision and objectives
- ii. Define the complete scope of the project
- iii. List all of the critical project deliverables
- iv. State the customers and project stakeholders
- v. List the key roles and their responsibilities
- vi. Create an organizational structure for the project
- vii. Document the overall implementation plan
- viii. List any risks, issues and assumptions

3. Appointment of Project Team/Job Description

The steps involved in giving the job description are as stated below.

- i. Define the real purpose of the role
- ii. List the key responsibilities of the role
- iii. Define the superior to whom this role will be reporting
- iv. Create a detailed organizational chart
- v. List the skills and experience needed
- vi. Define any relevant qualifications
- vii. Set out the key performance criteria
- viii. Identify the salary and working conditions

4. Setting up of a Project Office

This step explains the requirements of setting up of a project office within an organization. Establishing a project management office is a challenging task. The steps in setting up of a project management office (PMO) are listed below.

- i. Identify the right location for the project management office team
- ii. Ensure that the organization has the correct infrastructure
- iii. Procure the right PMO equipment and tools
- iv. Define the PMO roles and responsibilities
- v. Put in place suitable standards and processes
- vi. Offer project management services to projects

5. Performing Phase Review

At the end of each phase of the project, review will be done. At the end of the project initiation phase, phase review is to be completed to tell the sponsor of the project whether the project has achieved its objectives to date.

The items which are reviewed under this phase review are as listed below.

Whether the project is currently delivering to schedule?

Whether the budget allocated is sufficient at this point?

Whether the deliverables have been produced and approved?

Whether the risks have been controlled and mitigated?

Whether the issues were identified and resolved?

Whether the changes were properly managed?

Whether the project is on track?

3.4 Project Planning

After the project initiation phase, the next phase is project planning. It involves planning documents to guide the team throughout the project delivery. In this step, the team identifies all of the work to be done. The project's tasks and resource requirements are identified, along with the strategy for producing them.

The planning phase has the following steps.

- a) Creating a project plan
- b) Creating a resource plan
- c) Creating a financial plan
- d) Creating a quality plan
- e) Creating a risk plan
- f) Creating an acceptance plan
- g) Creating a communication plan
- h) Creating a procurement plan
- i) Contracting the suppliers
- j) Performing phase review

a. Project Plan

In project planning step, all the project management planning tasks, which are required to deliver the project on time and within budget, are performed.

The steps of creating project plan are listed

- Identify all the phases, activities and tasks
- Sum up the effort needed to complete those tasks Document all the interdependencies of the project
- List the planning assumptions and constraints
- Create a detailed project planning schedule

The above steps will ensure the following:

- Defining the project scope and milestones
- Identifying the work breakdown structure
- Setting and agreeing the target delivery dates
- Monitoring and controlling the allocation of resource
- Reporting on the progress of the project to the sponsor

b. Resource Plan

The project management resource planning identifies all the resources which are required to complete the project successfully. The types of resources required to complete a project are, viz., labour, equipment and materials.

The steps of the resource plan are listed as follows.

- Identifying the types of labour required for the project
- Identifying the roles and key responsibilities for each labour type
- Identifying the number of persons required to fill each role
- Identifying the items of equipment to be used and their purposes
- Identifying the types and quantity of equipment needed in each type
- Identifying the total amount of material needed
- Planning the dates for using or consuming these resources
- Identifying the amount of resource required per project activity
- Creating a detailed resource utilization schedule

c. Financial Plan

This step enables to set a budget for the project against which the expenditure is measured. The total cost of the project should be within the budget of the project. This will enable the project team to deliver the project successfully.

The steps of the financial planning are listed below.

- Identifying the types of labour costs to be incurred during the project
Identifying the items of equipment needed to deliver the project
- Identifying the various materials needed by the project
- Identifying the unit costs for a labour, equipment and materials
- Identifying other costs types such as administration
- Identifying the total cost of each project activity
- Calculating the total cost involved in completing the project
- Creating a schedule expenses.

d. Quality Plan

This step will help to set quality targets for the project to ensure that the deliverables are produced and are meeting the needs of the customer.

The steps of quality planning are classified into setting the quality targets are as stated below.

- Identifying the customer's requirements
- Listing the project deliverables to be produced
- Setting quality criteria for these deliverables
- Defining quality standards for the deliverables
- Gaining customer's agreement with the target set.

e. Risk Plan

The project risk management plan will identify risk and implement a plan to reduce it. The possible risks are anticipated and accordingly the mitigating techniques are planned.

The steps of risk planning are as follows.

- Defining the risk management as it applies to the project
- Identifying the categories of risk which are relevant
- Listing all the types of risks which may occur
- Determining the likelihood of the risks occurrence
- Calculating the impact on the project if risk does occur
- Ranking the identified risks in order of priority
- Identifying actions to be taken to prevent the occurrence of risk
- Listing contingency actions to be taken in the event of occurrence of risk
- Creating a risk schedule which allocates time frames to risk actions
- Implementing a process to monitor and control risks throughout the project.

f. Acceptance Plan

Acceptance plan will help the team to gain the acceptance of the customers for the deliverables produced by the project.

The steps of the acceptance plans are as listed below:

- Identifying the acceptance milestones of the project plan
- Creating a full list of all project deliverables
- Listing the criteria for gaining customer's acceptance

- Putting the acceptance standards in place
- Identifying the acceptance testing methods
- Allocating acceptance testing resources
- Scheduling acceptance reviews with the customer
- Gaining customer's acceptance of the deliverables

g. Communication Plan

The main objective of the communication plan is to communicate the right information to the right people at the right time. Further, it will ensure that the stakeholders are always provided with the right information at the right time which will pave the ways for ensuring their continued support.

The steps of communication planning are divided into two types, viz, communication planning and using communication planning.

These are listed below:

Steps of Building Communication Plans

- List the communications to stakeholders
- Defining the communication needs of each stakeholder
- Identifying the required communication events
- Determining the method and frequency of each events
- Allocating resource to communication events
- Building a communication event schedule

h. Procurement Plan

The procurement plan is aimed to define the goods and services that will be procured project and also to decide the method and timing of such procurements, A proper procurement plan will ensure the purchase of the right products for the project at the right time,

The steps of the procurement plan are as listed below.

- Defining the procurement requirements
- Listing all the goods and services to be procured
- Creating a sound financial justification for producing them
- Researching the market to identify available products to be procured
- Confirming the current market value of each of the required products
- Listing all the tasks involved in procuring the products

- Scheduling those tasks by allocating time frames and resources
- Creating a robust procurement management process of the business.

i. Contracting the Suppliers

The procedure of contracting the suppliers is done through tendering process. A tender register keeps the track of different tender forms after releasing them to the suppliers. The tender records the current status of each of the tender forms issued by the project. The tender forms through tender register are statement of work, request for information, request for proposal and supplier contract.

The tender register maintains the current status of each of the tender forms used the project.

The following are recorded by the tender register.

- Types of tender forms released
- Release date and release details
- Status, such as approved, released and distributed
- Outcome of the release of the tender forms

These tender forms are used for the following purpose.

- Monitoring and controlling the tender processes
- Ensuring that the tender process is followed
- Identifying and resolving any issue with the tender as early as possible
- Keeping track of the overall status of the tender
- Ensuring that the tender is completed on time

j. Review of Project Planning Phase

This phase review is done at the end of the project planning phase to tell the sponsor whether the project has achieved its objectives to date.

This phase review form will contain the following question.

- Whether the project is currently delivering to schedule?
- Whether the budget allocated is sufficient at this point?
- Whether the deliverables have been produced and approved?
- Whether the risks have been controlled and mitigated?
- Whether the issues were identified and resolved?
- Whether the changes were properly managed?
- Whether the project is on track?

The answers to the above question will result into the following.

- Documenting the results of the project reviews
- Clearly communicating the progress of the project to the sponsor
- Listing any risks or issues which had impact on the project
- Showing the deliverables produced to date to the sponsor
- Seeking approval to proceed to the next phase.
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3.5 Project Execution

The third phase of the project life cycle is project execution.

In this phase, the physical deliverables are built and presented to the customer.

It is the longest phase in the project life cycle and it consumes lot of energy and resources.

A range of management processes is used to monitor and control of the project. These processes are used to manage time, cost, quality, change, risks, issues, procurement, customer acceptance and communications.

a) Cost management process

The cost management process monitors and records all costs within a project.

The costs are recorded by team members using expense forms. The project manager will review and approve these forms before the expensive items are purchased.

The cost management process will help the project team to accurately record all the costs and track them in such a way that the total cost of the project is within the budget of the project.

c) Change Management Process

The change management process in project management is used to manage all requests for change within the project.

When the project is evaluated and approved at a beginning, it is with certain specifications. But, when the project is in progress, sponsor to may request certain changes in the specification of project.

As the project team it is highly essential to incorporate the changes which are suggested by the sponsor in the course of the project execution.

The activities of the change management process are as follow.

- i. Identifying the requirements for change within the project
- ii. Putting in place a process for submitting the requests for changes
- iii. Determining the feasibility of changes requested by the sponsor
- iv. Formally approving each change before they are incorporated
- v. If the changes are approved, then scheduling the changes by way of incorporating them in the original schedule of the project
- vi. Reviewing the impact of each change on the project

Change Request Form

The change request form is used by the team to raise a formal request for a change to a project. If a member of the team feels that the project requires a change, then a change request form is raised.

For example, the team may raise a request for a change to the project scope, deliverables, time frames or resources. Whatever it is, the change request form will enable them to fully document their request, the reason for it and the likely effect on the project if it is approved.

The change request form is used for the following.

- i. Formally recording all change request within the project
- ii. Identifying the business drivers behind each change
- iii. Listing the costs and benefits of adopting the change
- iv. Describing the impact on the project of approving the change
- v. Ranking the change urgency

Change Register

The change register/change log stores all information relating to the required changes in a project.

In all the projects, the change is an inevitable event. So, when a change occurs, we need to record the information relating to the change which will help us to monitor and control the effect of that change on the project.

A change register will record the following things.

- i. The nature of the change being requested by the customer
- ii. The impact of the change on the project that should be approved
- iii. Change approval details and status of the approval

- iv. Change implementation schedule and date
- v. Current status of changes

d) Risk Management

Risk management has risk management process, risk form and risk register.

Risk Management Process

The risk management process describes the steps that are required to perform risk management within the project.

The objective of this process is to identify the risks and take actions such that the occurrence of risks in the project is minimized.

The risk management process involves the following.

- i. Identifying critical and non-critical risks
- ii. Documenting each risk in depth by completing risk forms
- iii. Creating a log of all risks and notifying the management of their severity
- iv. Taking action to reduce the likelihood of occurrence of risks
- v. Reducing the impact of risk on the project by following the best practice processes

Risk Form

The risk assessment forms are used to manage risks within a project.

This risk assessment form enables us to enter all of the information of the risk, and also to list the actions to be taken to prevent it from happening.

The risk form records the following items.

- 1. Part of the project that has identified risk
- 2. Nature of the risk and which part of the project is likely to be affected
- 3. Likelihood of the occurrence of the risk
- 4. Impact of the risk on the project

Risk Register

The risk register is used to track all risks within the project. Using this risk register, we can record the current status of each risk and take necessary actions to reduce the likelihood of its occurrence.

The risk register records the following.

- i. Type of risk, who raised it and how it could affect your business
- ii. Likelihood of the occurrence of the risk and its potential impact on the project
- iii. Risk priority, based on its effect on the project
- iv. Actions which are to be taken to prevent the occurrence of risk
- v. Contingency actions taken in case it does occur

e) Issue Management

Issue management has issue management process, issueform and issue register as explained below.

Issue Management Process

In any project, time to time, there will be some issues with respect to staffing, supplier, equipment or other project issues.

For the smooth execution of the project, such issues are to be identified at the early stages before they leave any impact on the project and should be resolved at appropriate point of time which will lead to continuity in project progress and in turn, the project will be completed in conformity with the original proposal.

The actions of the issue management process are listed below.

- i. Identifying and recording all project issues clearly
- ii. Using issue forms to document project issue properly
- iii. Determining the impact of each issue on the project
- iv. Prioritizing each issue and reporting its status
- v. Reviewing all issues and deciding the courses of actions
- vi. Taking the steps needed to resolve the issues quickly

Further, the issue management process will guide the project team in the following ways.

- i. Reading the complete set of issue procedures
- ii. Assigning issue actions to staff within the team
- iii. Monitoring the outcome of the actions taken
- iv. Assigning the roles and responsibilities for issue management
- v. Reporting on the status of issues to management

Issue Form

The issue form is used to resolve the project issues quickly and efficiently. If there is an issue in a project, then there should be a mechanism to capture the details of the issue and take action to resolve it. Otherwise, it will have an undesirable effect on the project.

The project management issue form will facilitate the following.

- i. Identifying issues throughout the project life cycle
- ii. Completing a detailed description of each issue
- iii. Assessing the impact of issues on the project
- iv. Recommending the actions needed to resolve the issues
- v. Gaining management approval for these actions

Issue Register

Issue register/issue log is used to keep a record of all project management issues within a project. Then, it is used to monitor the status of all project issues and keep track of the actions which have been taken so far to resolve them.

A proper use of issue register will minimize the undesirable impact on the project which will increase the chance of delivering the project successfully.

The issue register/issue log is used to keep track of the following.

- i. List of all issues identified within the project.
- ii. Detailed description of each issue raised, and its priority
- iii. Current impact that the issue is having in the project
- iv. Actions taken to resolve the issue and the people responsible
- v. Outcome of the actions taken and the current issue status

f) Procurement Management

Procurement management has procurement management process order form and procurement register as explained bellow.

Procure Management Process

In project management, mostly the goods and services are purchased/availed from the external sources.

Under such situation, the procurement management process will help the project team to purchase goods and services from the external suppliers more efficiently.

This process will give a complete set of guidelines to issue purchase orders, receive and approve deliveries, endorse supplier payments and manage supplier against their contracts.

The essence of procurement process is as outlined below.

- i. Identifying the goods and services that the project team wishes to procure
- ii. Completing purchase orders and issuing them to the suppliers
- iii. Agreeing on delivery time frames and methods
- iv. Receiving goods and services from the suppliers
- v. Reviewing and accepting the items procured
- vi. Approving suppliers' payments

Further, it enables the following.

- i. Identifying supplier contract milestone
- ii. Reviewing supplier's performance against contract
- iii. Identifying and resolving supplier's performance issues
- iv. Communicating the procurement status to the management

Purchase Order Form

The purchase order forms will inform the supplier exactly about the goods/services that will be purchased from that supplier.

This will contain delivery details, billing information and order details for the supplier.

The Purchase Order Form records the following information.

- i. Purchase details and requested delivery date
- ii. Delivery details for the items to be purchased
- iii. Billing and supplier information
- iv. List of products and services to be procured
- v. Quantity and unit price of each item ♦Total price of the purchase

Procurement Register

The procurement register keeps records of all goods and services purchased from suppliers throughout the project life cycle. By recording the project procurement information in one place, we can easily identify and report the status of the project procurement at any time.

The procurement register records the following information,

- i. Purchase order number and purchasing date
- ii. Name and description of all items purchased
- iii. Quantity and unit price of purchased items
- iv. Details of the suppliers and orders made
- v. Payment status and payment details

g) Acceptance Management

Acceptance management has a acceptance process, acceptance form and acceptance register which are as explained below.

Acceptance Management Process

In project management, the acceptance management process is a vital step because it gives feedback from the customer about the suitability of the deliverables to them.

Each of the deliverables is reviewed by the customer and formally acceptance in of meeting their requirements, the success of the project is ensured.

The acceptance management process does the following.

- i. Determining when the deliverables are complete and ready for subjecting them for acceptance testing
- ii. Involving the user and the project team in user acceptance tests
- iii. Scheduling and completing user acceptance testing activities
- iv. Using acceptance forms to document the results
- v. Obtaining the acceptance decision of the customers Communicating the acceptance testing results

Acceptance Form

The acceptance form is used to gain agreement from the customer that the project deliverable meet their exact requirements.

The Acceptance Form records the following information.

- i. Identifying which acceptance tests need to be completed
- ii. Planning each acceptance test and deciding on the participants
- iii. Completing each acceptance test with the customer
- iv. Determining whether the results meet the acceptance criteria
- v. Deciding whether the results are up to standard
- vi. Gaining the customers formal sign off

Acceptance Register

Acceptance register/acceptance log is used to keep track of the acceptance testing results within the project. The acceptance log or register allows us to track the results of each test and to quickly resolve the issues which arise.

The Acceptance Register records the following information.

- i. Listing the deliverables which require acceptance tests
- ii. Identifying the ready time of each of the deliverables tests
- iii. Scheduling each of the tests and involving the customers, whenever needed in the tests
- iv. Monitoring the status of each of the acceptance tests and determining its completion time

h) Communication Management

Communication management has management process; project status report and communication register which are explained below.

Communication Management Process

The communications management process is aimed to inform the right people by giving them the right information at the right time.

It may be through project status reports, regular project meetings or informal emails. But, one should ensure that right messages are distributed about the progress of the project.

Such exercise will help the project team and external stakeholders to remain focused on the delivery and to provide with all necessary support to complete the project.

The essence of Communication Management process is as outlined below.

- i. Identifying the messages that need to be sent
- ii. Determining the target audience for communication
- iii. Deciding on the message format and timing
- iv. Drafting the message and gaining approval where required
- v. Communicating the message through communication events
- vi. Gathering feedback and improving communication process

Project Status Report

The project status report will communicate the status of the project to the staff members and Stakeholders of the project. Also, it enables to raise any items for their attention.

It tells the team whether the project is on track and probability of completing the project within the schedule.

This report will communicate the status of the following.

- i. Whether the project schedule is on time? When is it likely to finish?
- ii. Whether the expenses of the project are within their budget?
- iii. What is the extent of usage of the project staffing to date?
- iv. Have the project deliverables met the quality targets set?
- v. Will any of the risks probably affect the project?
- vi. Will any of the issues impact the project?

Communication Register

The communication register/communication log is used to track all the communication activities within the project which will provide a formal record for auditing purposes.

This register will be useful to get feedback and to improve the communication processes of the project.

Using this communication register, we can keep a record of each communication event, viz. meeting of a project team, project status report, conduct of board meeting with the sponsors, etc.

The communication register is used to record the following.

- i. Current status of all communication events within the project
- ii. Details of the events held and the feedback gained afterwards
- iii. Date, name and approver of each communication event
- iv. Type of event held and the key messages given

Review Form in Project Execution Phase

This review form at the end of the project execution phase is done to inform the sponsor the project has achieved its objectives to date.

The answers to the following questions of the phase review form will help the project management team to document the results of the execution phase:

- i. Whether the project is currently delivering to schedule?
- ii. Whether the budget allocated was sufficient at this point?
- iii. Whether the deliverables have been produced and approved?
- iv. Whether the risks have been controlled and mitigated?
- v. Whether the issues were identified as resolved?
- vi. Whether the changes properly managed? ❖ Whether the project is on track?

3.6 Project Closure

Project closure is the last phase of the project life cycle, which formally closes the project and reports the overall achievements of the project in terms of defined performance measures to the sponsor of the project.

The activities of the project closure include handling over the deliverable to the customer, passing the documentation to the business, cancelling the supplier contracts, releasing staff and equipment which were used in the project and informing stakeholders of the closure project.

After certain period from the closure of the project, a post-implementation review is conducted to determine the level of success of the project. This will also help the project record new lessons that are learned during the course of the project.

The major activities of the project closure phase, viz. project closure using project closure and reviewing project completion using post-implementation review are explained in the following sections.

3.6 (a) Project Closure Report

While performing project closure, a project closure report will be created. This helps the team to complete a project closure process by way of formally winding up the project.

All the tasks to complete the project will be documented, and deliverables will be handed over to the customer.

- i. The project closure report will contain the following.
- ii. Identifying the project completion criteria
- iii. Listing any outstanding activities or deliverables
- iv. Creating plan for passing deliverables to the customer
- v. Planning the handling over a project documentation
- vi. Ceasing supplier contracts and agreements

- vii. Releasing staff and equipment which were used in the project
- viii. Handing over the deliverables of the project to the customer
- ix. Communicating the closure of the project

3.6 (b) Reviewing Project Completion

After some period, performance of the project is to be reviewed. It is done, using post implementation review.

It does the job of reviewing and reporting the success of the project, achievements and lessons learnt.

The post-implementation review has the following tasks

- i. Measuring the benefits and objectives
- ii. Deciding whether the project was within the scope
- iii. Assessing the final deliverables produced
- iv. Reviewing the project against schedule
- v. Comparing the expenditure against budget
- vi. Starting the final outcome of the project

3.7 Project Risks

Risk is defined as the possibility of an outcome being different from the expected outcome.

In the case of big projects of longer duration, it is necessary to conduct a 'risk analysis'.

All projects are exposed to various types of risks like technical risks, economic risks, social risks, production risks, financial risks and human risks.

Risk management methodology that normally consists of four processes: Risk identification, Risk quantification, Risk response and Risk control.

Project Risks

- Risks are uncertainties attendant in any venture. They can adversely affect the desired outcome of the venture, unless they are hedged.
- Risk increases with
 - i. Time
 - ii. Project with no antecedents
 - iii. Technological complexity

iv. Price sensitiveness of project inputs and outputs

- Risk does not disappear. It is always managed or mitigated through allocation between project participants
- Risk is allocated to the party best placed to manage the risk

Risks Across Sectors

Types of risks

- a. Promoter
- b. Implementation
- c. Operations
- d. Financial
- e. Political, legal, regulatory

a. Promoter Risks

- i. Expertise and capability
- ii. Commitment and resourcefulness
- iii. Conflict of interest Insolvency

b. Implementation Risks

- i. Delay in completion
- ii. Cost over-run
- iii. Failure to meet performance standards
- iv. Abandonment

c. Operation Risks

- i. Revenue risks
- ii. Demand
- iii. Supply
- iv. Associated infrastructure development
- v. Technical Risks
- vi. Management
- vii. Abandonment

d. Financial risks

- i. Interest rate
- ii. Exchange rate
- iii. Inflation
- iv. Currency inconvertibility

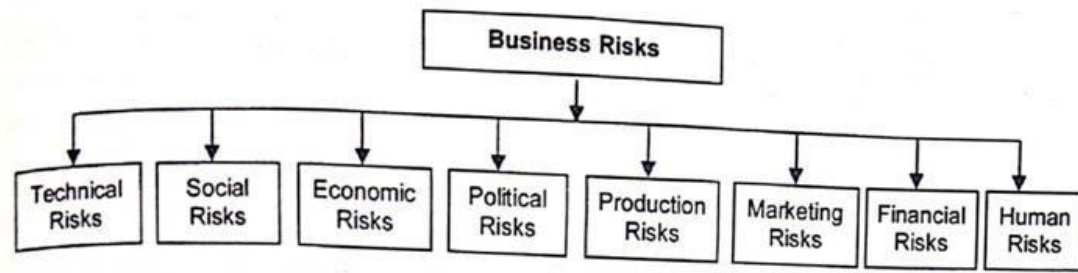
e. Political, Legal, Regulatory

- i. Change in law, tax, duties
- ii. Environmental
- iii. Failure to honour commitments
- iv. Failure to obtain/renew permits, larcenies, concessions
- v. Tariff revision
- vi. Exportation, nationalization
- vii.

Activity A:

- (a) Where do the project risks come from?
- (b) Is it possible to tackle them? How?
- (c) Give examples of three major risk factors you have observed in the projects you visited^{as} mentioned in the beginning of this book.

3.8 Types of Risks: Some Illustrations



(Source: Project Management, ICFAI Publication)

Technical Risks

Technical risks refer to changes in technical specifications of the product result in loss.

Social Risks

Social risks refer to risks arising from changes in the needs and preferences of target customers.

Lack of necessary natural resources, labor unrest, agitations and social movements against the project also constitute social risks.

Economic Risks

Economic risks refer to an increase in the rate of inflation, changes in the economic policies of governments, and distribution of income. Since the project manager does not have any control over these risks, he should carefully assess such risks and should ensure that the project is not going to suffer because of these risks.

Political Risks

Nationalization or privatization of a particular industry, political instability, and trade restriction are some examples of political risks. The project manager should ensure that the project does not go against the political interests of the country.

Production Risks

Production risks refer to the shortage of necessary raw materials, sudden breakdown of key machinery and huge rise in installation and maintenance costs. As these risks can be controlled to some extent, the project manager should try to reduce the effect of these risks on the project.

Marketing Risks

Marketing risks refer to failure of the developed product or service in the market due to changes in demand, errors in forecasting of demand, or difficulties in distribution.

Financial Risks

Financial risks refer to bad debts, change in the interest rate, wrong choice of investments and mistakes in the accounting procedures.

Human Risks

Human risks refer to the sudden demise of key employee, limited availability of component employees, inter-group politics, etc.

3.9 Risk Assessment Techniques with Illustrations**a. Evaluation of Sensitivity Analysis**

A very popular method for assessing risk, sensitivity analysis has certain merits:

- i. It shows how robust or vulnerable a project is to changes in values of the underlying variables.
- ii. It indicates where further action be taken. 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/minimized/removed/stopped.
- iii. It reflects/articulates the concerns that project evaluators normally have.

Shortcomings of Sensitivity analysis:

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

b. Scenario Analysis

In sensitivity analysis, typically one variable is changed at a time. If variables are interrelated as they are most likely to be changed.

Procedure

The steps involved in scenario analysis are as follows:

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

Illustration

Zen Enterprise is evaluating a project for introducing a new product. Depending on the response of the market-the factor which is the largest source of uncertainty for the success of the project-the management of the firm has indentified three scenarios:

Scenario I: The product will have a moderate appeal to customers across the board at a modest price.

Scenario 2: The product will have a strong appeal to a large segment of the market, which is highly price-sensitive.

Scenario 3: The product will appeal to a small segment of the market, which will be willing to pay a high price.

(c) Best and Worst Case Analysis

Firms often do another kind of scenario analysis called the best case and worst-case analysis. In this kind of analysis the following scenarios are considered:

Best Scenario	High demand, high selling price, low variable cost, and so on.
Normal Scenario	Average demand, average selling price, average variable cost and so on.
Worst Scenario	Low demand, low selling price, high variable cost, and so on.

Scenario analysis has its own limitations:

It is based on the assumption that there are a few well-delineated scenarios. This may not be true in many cases.

For example, the economy does not necessarily lie in three discrete states, viz. recession, stability, and boom. It can, in fact, be anywhere on the Continuum between the extremes. When a continuum is converted into three discrete states some information is lost.

d. Simulation Analysis

Sensitivity analysis indicates the sensitivity of the criterion of merit (NPV, IRR, or any other) to variations in basic factors and provides information of the following type: If the quantity produced and sold decreases by I percent, other things being equal, the NPV falls by 6 percent. Such information, though useful, may not be adequate for decision making.

Procedure

The steps involved in simulation analysis are as follow:

- i. Model the project showing how the net present value is related to the parameters and the exogenous (originating outside) variables. (Parameters are input variables specified by the decision maker and held constant over all simulation runs. Exogenous variables are input variables, outside the control of the decision maker.)
- ii. Specify the values of the parameters and the probability distributions of the exogenous variables.
- iii. Select a value, at random, from the probability distributions of each of the exogenous variables.
- iv. Determine the net present value corresponding to the randomly generated values of the exogenous variables and the pre-specified parameter values.
- v. Repeat steps (3) and (4) a number of times to get a large number of simulated net present values.
- iv. Plot the frequency distribution of the net present value.

Illustration

In real life situations, simulation is done only on the computer because of the tedious computations involved. However, to give you an idea of what goes on in simulation. Many uses Of simulation technique are described later.

Advantages:

- Its principal-strength lies in its versatility. It can handle problems characterised by (a) numerous exogenous variables following a kind of distribution, and (b) complex interrelationships among parameters, exogenous variables, and endogenous (originating inside the project) variables. Such problems often defy the capabilities of analytical methods.
- It compels the decision maker to explicitly the interdependencies and uncertainties characterising the project.

Shortcomings:

- It is difficult to model the project and specify the probability distributions of exogenous variables.
- Simulation provides only a rough approximation of the probability distribution of the net present value (or any other criterion of merit)
- A difficult model to understand for a common decision maker, as he is not a management scientist.

Activity B

- a. Why do we need three different methods to calculate almost the same risk perception?
- b. Describe how Sensitivity analysis, Scenario analysis and Simulation analysis are related on one another.

3.10 Project Cost Risk Analysis

Future estimate are not facts but statements of probabilities about how things will turn out. Hence, actual costs may be higher or lower than estimates made by even experts.

Objective of Project Cost Risk Analysis

Cost risk analysis can answer some questions that the traditional estimating method cannot.

Include are:

What is the most likely cost?

How likely is the baseline estimate to be overrun?

What is the cost risk exposure?

How much contingency do we need on this project?

Where is the risk in this project?' This is the same as: 'Which cost elements cause the most need for the contingency?' Risk analysis principles can be used to answer this question.

The method involves estimating the

- (i) The pessimistic cost estimate,
- (ii) The optimistic cost estimate, and
- (iii) the most likely cost estimate, along with the rational for each estimate that points to risk mitigation.

3.11 Estimating Time and Cost Overrun Risks

Time and cost overrun are the most common and most serious risks in project completion in especially the complex and big projects.

Over estimating the time requirements or providing contingencies are the remedies commonly used to take care of the situation.

However, statistical tools are available to simulate the project time more accurately.

In PERT/CPM the techniques, the project completion activities are identified, probable best-guess-completion time estimate worked out for each activity, the sequential and parallel activities are segregated, and Critical Path (CP) is plotted that enables you to get the estimate the time required to complete the project.

In a **Deterministic method**, only one best-guess time value is estimated for each parallel (and CP) activity and the CP gives the overall projection completion time estimate based on them.

By using the deterministic method (best guess estimate for each activity with 50% probability of being correct), statistically, we have only 14% chance of achieving the time schedule. The more the number of parallel tasks, the lesser is the probability of correct estimation of project completion time.

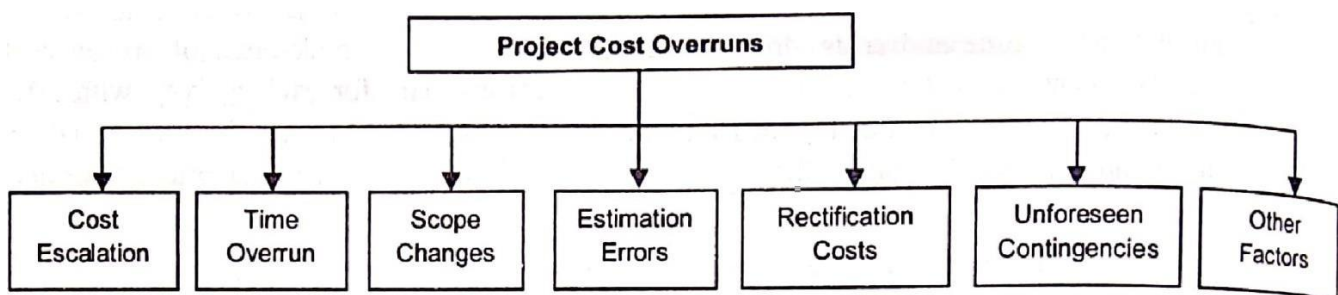
Monte Carlo simulation method: The simulations give the overall time for project completion and rank order them as per time, giving related probabilities. Here, you get the lowest and highest estimate as well. If you have correlations of time and costs already worked out, you get the rank order of project cost estimates also.

Activity C

- (a) What are the reasons for undertaking Project Cost Risk Analysis?
- (b) What is the purpose of estimating Time & Cost Overrun Risks?
- (c) What additional factors considered in Simulation techniques and software like Crystal Ball give better predictability to cost and time estimates to these techniques?

3.12 Organisation/Procedural/Systemic Reasons for Project Cost Overruns

Reasons for Project Cost Overruns



Incorrect cost estimations arise out of a variety of reasons:

- i. Incomplete, careless or over optimistic guesses.
- ii. Deliberate understatement of obtaining sanction
- iii. Choice of untested designs/processes
- iv. Choice of collaborators
- v. Choice of wrong equipment or incompetent suppliers
- vi. Faulty engineering data/specifications
- vii. Escalation and adverse changed in foreign currency exchange rates and incorrect interpretation of past data and judgments

The cost overruns can occur at various stages in the execution of projects. The various stages are

- a. Pre-feasibility stage
- b. Evaluation stage
- c. Technology choice and engineering stage
- d. Contraction and procurement stage
- e. Construction stage
- f. Commissioning and start-up stage

Cost overruns Analysis Sheet for Monitoring Overrun on an on-going Basis

Project Name:

Month:

Project Code:

Year:

Project Manager:

Sl.No.	Project cost	Cost Overruns	Analysis of Cost Overruns						
			Price increase	Scope changes	Increase in tax	Exchange rate fluctuation	Time overruns	Rectification costs	Others (Specify)
1	Land Developing								
2	Building and Civil works								
3	Machinery								
4	Detailed Engineering								
5	License Fees								
6	Preliminary Expense								
7	Working Capital Margin								
8	Contingencies								

Cost escalations occur for many external reasons. Some of these are;

- i. An increase in the unit price of materials, machinery, labor costs and overheads
- ii. Change in scope of the project
- iii. Increase in statutory taxes and duties like sales tax, customs tax, and excise duty
- iv. The impact of the adverse exchange rate variations on import of machinery and equipment
- v. An increase in the cost of capital when the project is not completed in the estimated time

The project manager must arrange for forward contracts with importers of machinery and equipment to take care of cost overruns due to unfavorable exchange fluctuations. The project manager should prepare contingency plans to effectively deal with when the cost overruns occur.

3.13 Time Overruns

Poor planning and failure to meet time schedules result in time overruns.

The project manager prepares a 'time overruns analysis sheet' to understand where delays have occurred and the reasons for delays.

Time overrun analysis sheet.

Sl. No.	Event Name	Scheduled Time	Actual Time	Time Overrun	% of time Overrun	Reasons for Time Overrun
1						
2						
3						
4						
5						
6						
7						

Reasons for Time overrun:

- i. A change in the scope of the project
- ii. Ineffective project time management (which itself is the result of improper planning and scheduling)
- iii. Delays in starting and executing some of the project activities
- iv. Delays in subsequent projects as a result of a delay in one project
- v. Use of outdated technology
- vi. Bureaucratic/political interference, and poor administration

To complete the project on schedule, the project manager must prepare realistic time schedules, select capable vendors, carryout periodical monitoring of project activities, and take quick decisions.

Activity D:

- a. Give arguments to support a statement that organizational processes and systems contribute quite a lot to cost and time overruns in a project.
- b. Identify at least five such reasons causing delays.
- c. How can you monitor such delays in the implementation stage of project?