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Project Management

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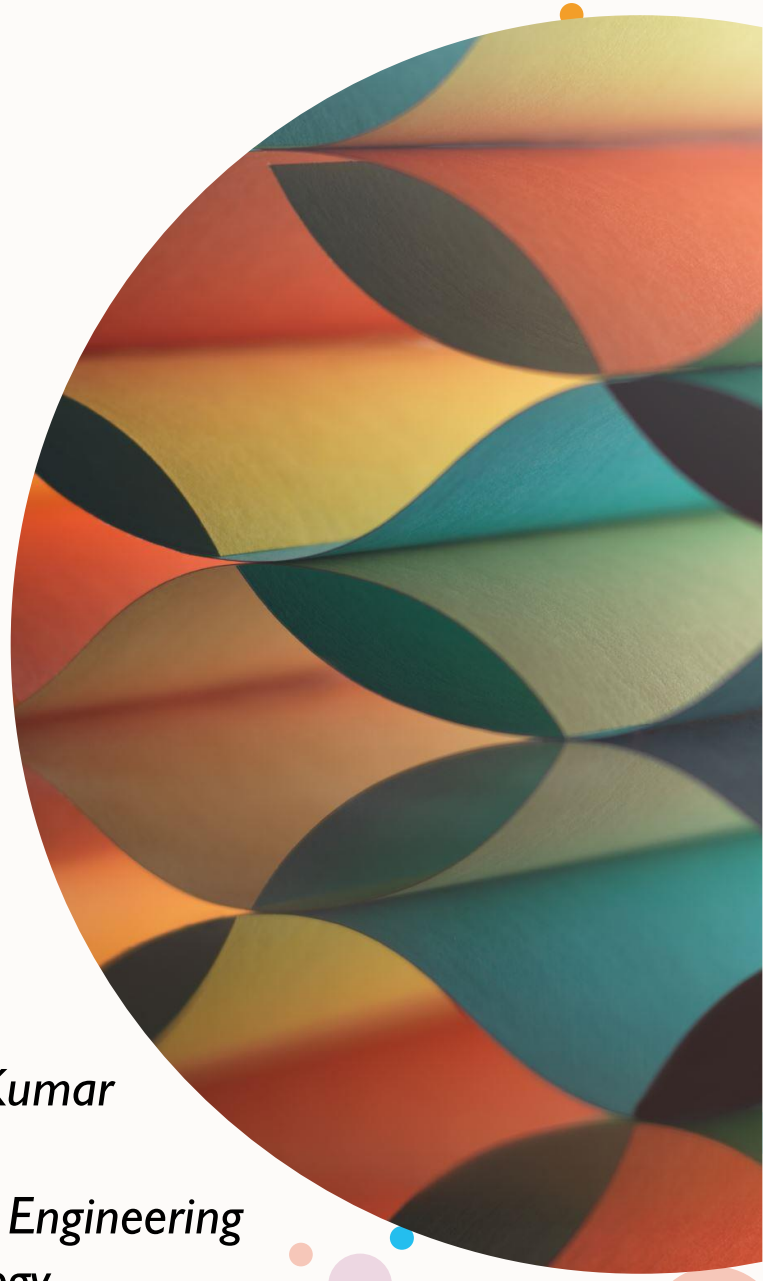

Prof. Raghavendra Kumar
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Unit – 1 Project Selection, Initiation and Performance Measurement

CONTENTS

- Factors affecting project
- Project life cycle
- Identification
- Appraisal
- Negotiation
- Approval
- Project feasibility
- Project cost estimation
- Cost-benefit analysis
- Budget planning
- Source of finance
- Performance indicators
- Performance improvement
- Project closure

Project

- Project is a set of interrelated activities undertaken to meet a defined objective, in terms of a product or service.
- It is a collection of tasks that must be accomplished.
- It has a defined timeline and an estimated cost.
- Scope, plan, and resources
- Temporary course of action that aims to deliver a distinctive result.
- Each project is unique in its nature.

Examples of projects

- Construction of a bridge
- Planning and execution of space shuttle to Mars
- Construct a plant to manufacture ball bearings
- Design and implement a computer system/ android /iOS application
- Development of software for a new business process
- Installation of machinery in a factory

Process

- Set procedure that involves a sequence of steps that need to be taken in order to produce a result.
- An established, repeatable procedure used for internal business purposes.

Examples of process

- Producing items every day in any factory
- Production of food items, chemicals, textiles, cement etc.
- Handlooms, fine arts etc.
- Cleaning a room
- Servicing a car

Project management

Project management is the practice of organizing and delivering a project.

a) Initiation

b) Planning

c) Execution

d) Monitoring and controlling

e) Closure

Project life cycle

Project Lifecycle: sequence of phases through in which a project progresses. Includes typically five phases

1. **Initiation**
2. **Planning**
3. **Execution**
4. **Monitoring and Controlling**
5. **Closure**

- The number of phases and sequence of the cycle may vary based on the **company** and the **type of project undertaken**.
- As part of a project, however, they should have a **definite start and end date**.
- The lifecycle provides the **foundation of the actions** that must be performed in the project.

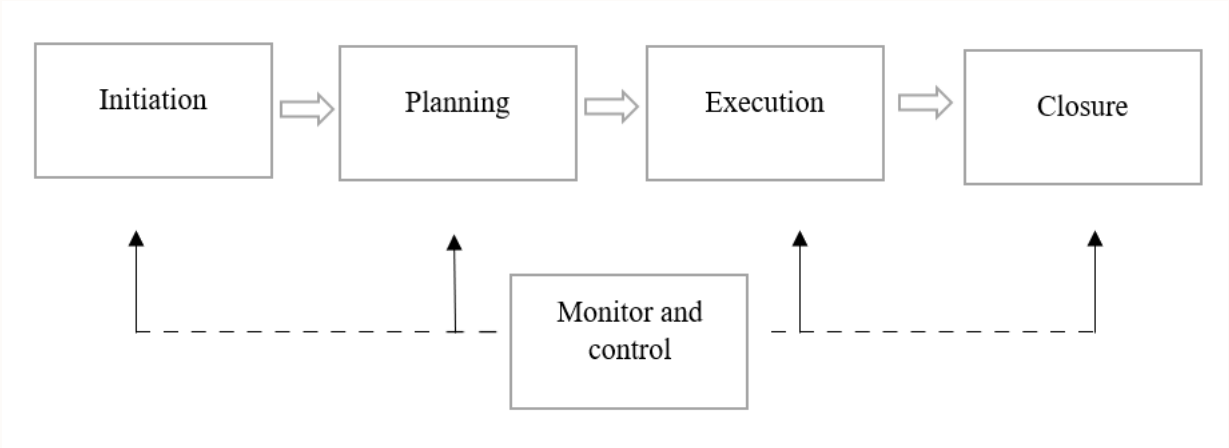
Project Initiation – Involves: a feasibility study, identifying the scope, deliverables, project stakeholders, creating a statement of work, and possibly initial costs, price, and timeline for work to be done.

Project Planning: Comprises: creating a project plan, including the tasks, schedule, resources, and constraints on the project. This phase also includes preparation of the budget for the project. In addition, risk should be anticipated and identification at this stage including its mitigation plans.

- **Project Execution –** Task owners begin work and the project manager oversee that tasks are done in a timely manner and workflow continues smoothly.

Monitoring and Controlling - Consists of the processes used to track, review, and orchestrate project progress, identify areas where changes are required, and implement those changes.

Applies to the entire life-cycle of the project.



Project Closure – Once the team has completed all the tasks, and the project owner signs off that all deliverables that are complete, the project is closed.

Any documentation is handed over to the project owner and if required to an ongoing maintenance organization.

The project is then analyzed for performance to determine whether the project's goals were met.

WHAT IS SPECIAL ABOUT A PROJECT?

The 5’C’s are the characteristics of a project management:

- **Communication**: Both internal and external communication between each member in a team and also with other stakeholders
- **Cooperation:** Group effort to reach a common goal.
- **Coordination:** Managing the relationship between different functions or departments in a company and also with other companies or stakeholders.
- **Control**: Monitor and control the project to make sure that you are meeting the project scope, schedule, and budget.
- **Closure:** Performed by personnel not involved in the day-to-day activities of the project so that he can have an objective view of all activities in a project.

Project management

Association of Project Managers:

- "Planning, organizing, monitoring and controlling of all aspects of a project and the **motivation of all involved** to achieve project objective safely and with in **well defined time, cost** and **performance** parameters."

Harold Kerzner:

- "Planning, directing and controlling of company resources for a relatively short- term project which has been established for completion of specific goals"

Objectives of Project management

The main objectives of Project management are:

(1) Completing the project within estimated budget and specified time.

(2) Developing a reputation for high quality workmanship.

(3) Providing safe and satisfactory working conditions for all personnel and workers.

(4) Taking sound decisions at the lowest practical management level delegation of authority.

(5) Motivating people to give their best within their capabilities.

(6) Creating an organisation that works as a team.

Project identification

- Project identification is a process in the initiating phase of project life cycle for identifying a need, problem, or opportunity.
- Once identified, a project is initially documented objectively defining what was identified.

Step 1: Identify & Meet Stakeholders

Step 2: Set & Prioritize Goals

Step 3: Define Deliverables

Step 4: Create the Project Schedule

Step 5: Identify Issues and Complete a Risk Assessment

Step 6: Present the Project Plan to Stakeholders

Step 1: Identify & Meet Stakeholders

- Identify all stakeholders and keep their interests while creating project plan.
- Meet key stakeholders to discuss their needs and expectations, and establish baselines for project scope, budget, and timeline.
- Then create a scope statement document to finalize and record project scope details, get everyone on the same page, and reduce the chances of miscommunication.

Step 2: Set & Prioritize Goals

- With the list of stakeholder needs, prioritize them and set specific project goals.
- These should outline project objectives, and benefits to achieve

Step 3: Define Deliverables

- Identify the deliverables and project planning steps required to meet the project's goals.

Step 4: Create the Project Schedule

- Go through the each deliverable and define the series of tasks that must be completed to accomplish each one.
- For each task, determine the amount of time it will take, the resources necessary, and who will be responsible for execution.

Step 5: Identify Issues and Complete a Risk Assessment

- Know how to manage risk in a project and consider the steps you should take to either prevent certain risks from happening, or limit their negative impact.
- Conduct a risk assessment and develop a risk management strategy.

Step 6: Present the Project Plan to Stakeholders

- Address project plan as per stakeholders' expectations, and present the solutions.
- Have an open discussion with stakeholders. Make project plan clear and accessible to all stakeholders.

Project appraisal

- Project appraisal is the process of assessing, in a structured way, the case for proceeding with a project or proposal, or the project's viability.
- Involves comparing various options, using economic appraisal or some other decision analysis technique.
- Pre investment analysis of a project with a view to determine the overall feasibility and measure its investment worth which provides a comprehensive review of all aspects of project that lays the foundation for implementation and evaluation when it is completed.

Project appraisal

It is categorized into 5 types

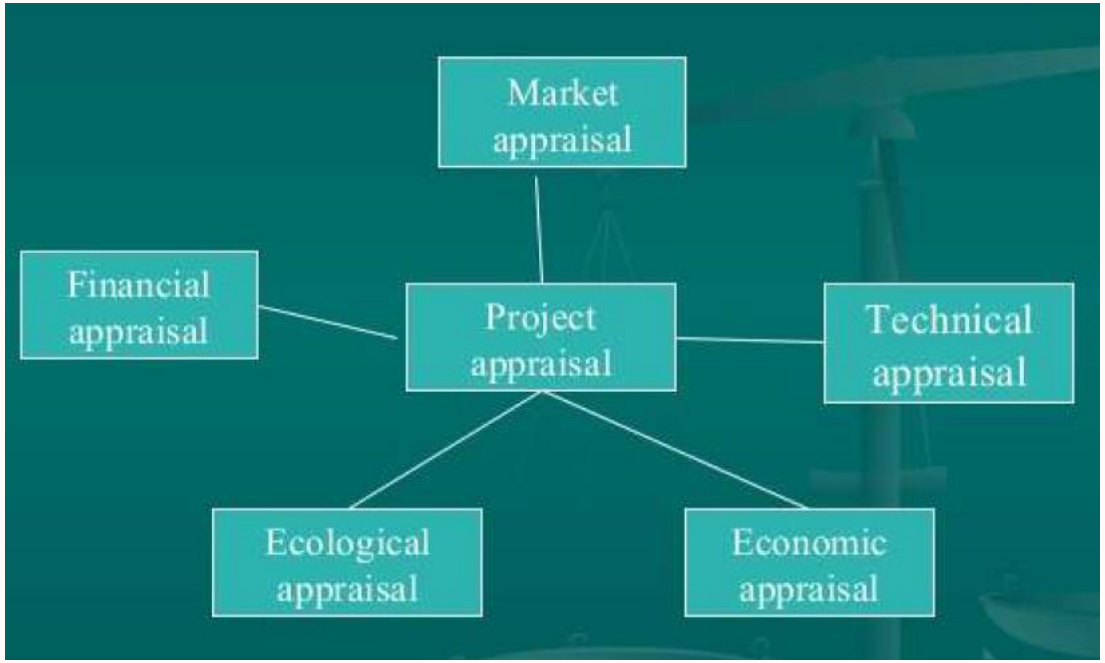
a) Market appraisal

b) Technical appraisal

c) Economic appraisal

d) Ecological appraisal

e) Financial appraisal



Market appraisal

- It is one of the major areas of introducing of any product in market.
- Aggregate demand of the proposed product or service
- Estimation of the market share of the project under appraisal

Issues

- Past and current demand trends
- Past and current supply positions
- Production possibilities and constraints
- Imports and exports
- Nature of competition
- Cost structure
- Consumer behavior

Motivation, attitude, preferences, requirements

- Distribution channels

Marketing policies

Technical appraisal

- Whether perquisites for the success of project considered are considered
- Good choices with regard to location, size, process, machines etc.

Issues

- Preliminary tests and studies
- Availability of raw materials, power and other inputs
- Optimal scale of operations
- Choice of suitable production process
- Choice of appropriate machines and equipment
- Effluents and waste disposal
- Proper layout of plant and buildings
- Realistic work schedules
- Socially acceptable technology

Economic appraisal

- Social cost – benefit analysis
- Impact on level of savings and investments in society
- Impact on fulfilment of national goals

  Self sufficiency

  Employment

  Social order

Ecological appraisal

Impact of project on quality of

- Air
- Water
- Noise
- Vegetation
- Human life
- Following major projects has the potential to cause environmental damage

a. Power plants
b. Irrigation schemes
c. Leather processing, chemicals

- likely damage and cost of restoration

Financial appraisal

- Check to find out whether the project is financially viable.
- Servicing debts
- Meeting return expectations
- Investment and phasing of total cost
- Means of financing
- Break even point
- Cash flows in the project
- Investment worthwhile

a. Net present value
b. Internal rate of return
c. Pay back period

➢Level of risk

Project appraisal

This analysis helps the decision maker in making the right choice of the project

UNIT-2

PROJECT MANAGEMENT

2CL-OE29

Dr. K.K.Tripathi

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PROJECT PLANNING AND NETWORK TECHNIQUES

CONTENT

- Work breakdown structure
- Bar chart
- CPM and PERT
- Development of network
- Time estimates and computation
- Analysis of network
- Time-cost trade off
- Updating and resource allocation
- Use of software in management
- Management information system

PROJECT

- A **project** is a set of **interrelated activities** undertaken to meet a **defined objective**, in terms of a **product or service**, which has a **defined start date**, a **defined end date** and a **defined cost**.

- **Project** is a **temporary endeavor**.

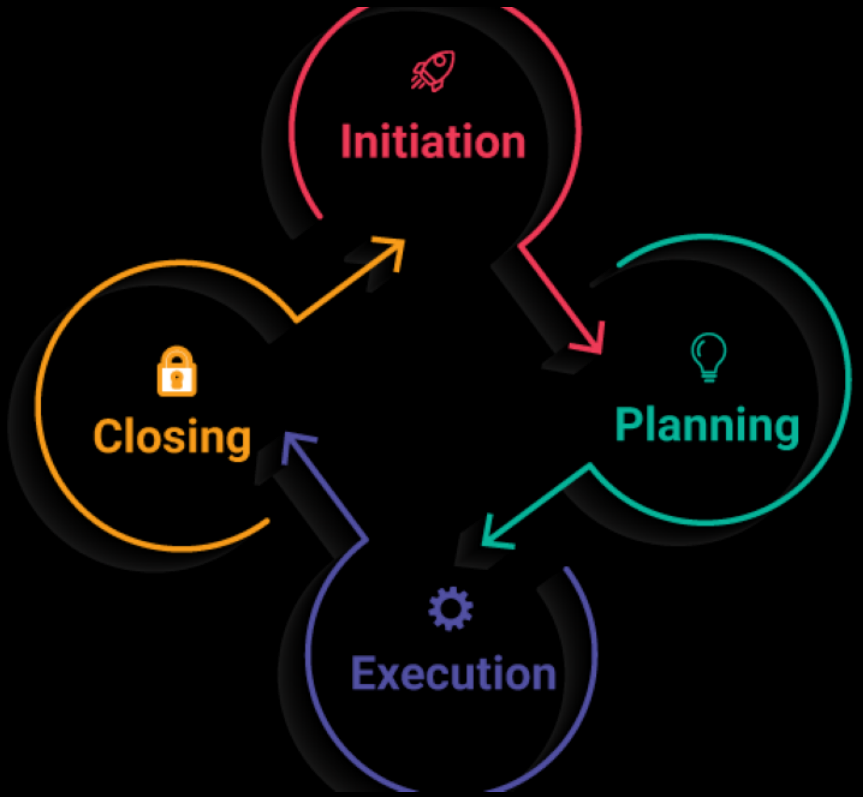
- Each **project** is **unique in its nature**.

EXAMPLES OF PROJECTS

- Hosting a College Annual Function
- Plan a Space Shuttle to Mars
- Construct a Plant to Manufacture Ball Bearings
- Plan for Wedding
- Designing and Implement a Computer System
- Designing a Anti-lock Breaking System (ABS)
- Executing Environmental Clean-up of a Contaminated Site
- Erect a New Lab in the Dept. of Civil Engineering

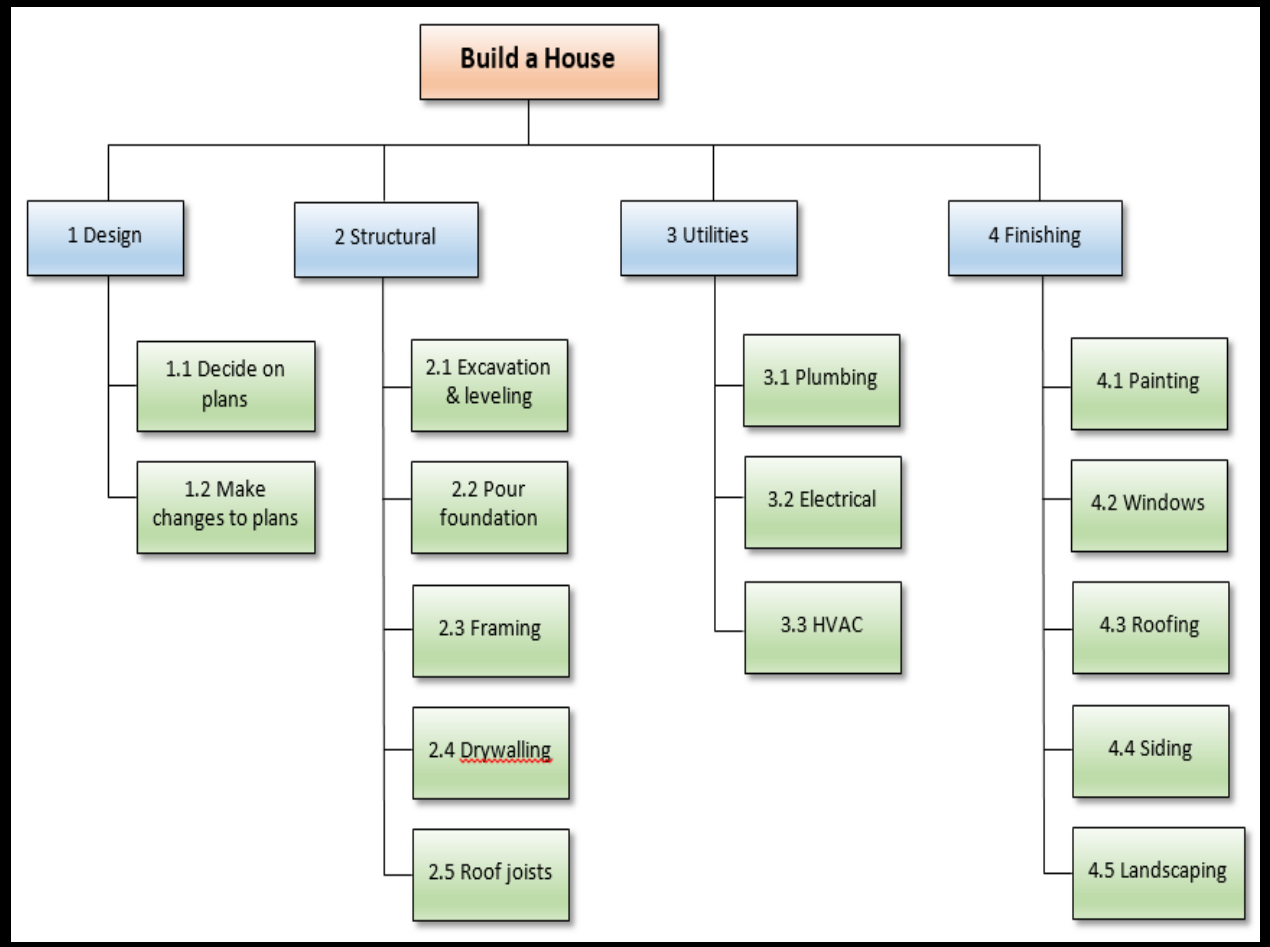
PROJECT LIFE CYCLE

- The **Project Lifecycle** is the sequence of phases through which a project progresses. It includes typically four phases
  1. **Initiation,**
  2. **Planning,**
  3. **Execution, and**
  4. **Closure.**
- The number of phases and sequence of the cycle may vary based on the **company** and the **type of project undertaken**.
- As part of a project, however, they should have a **definite start and end date**.
- The lifecycle provides the **basic foundation of the actions** that has to be performed in the project.



WORK BREAKDOWN STRUCTURE (WBS)

- A work breakdown structure (WBS) is **a project management tool** that divide the *project deliverable into several manageable work packages with sequence of the their execution.*
- By breaking down the project into smaller components, a WBS can integrate scope, cost and deliverables into a single tool.
- A typical WBS of a house construction is shown in the figure



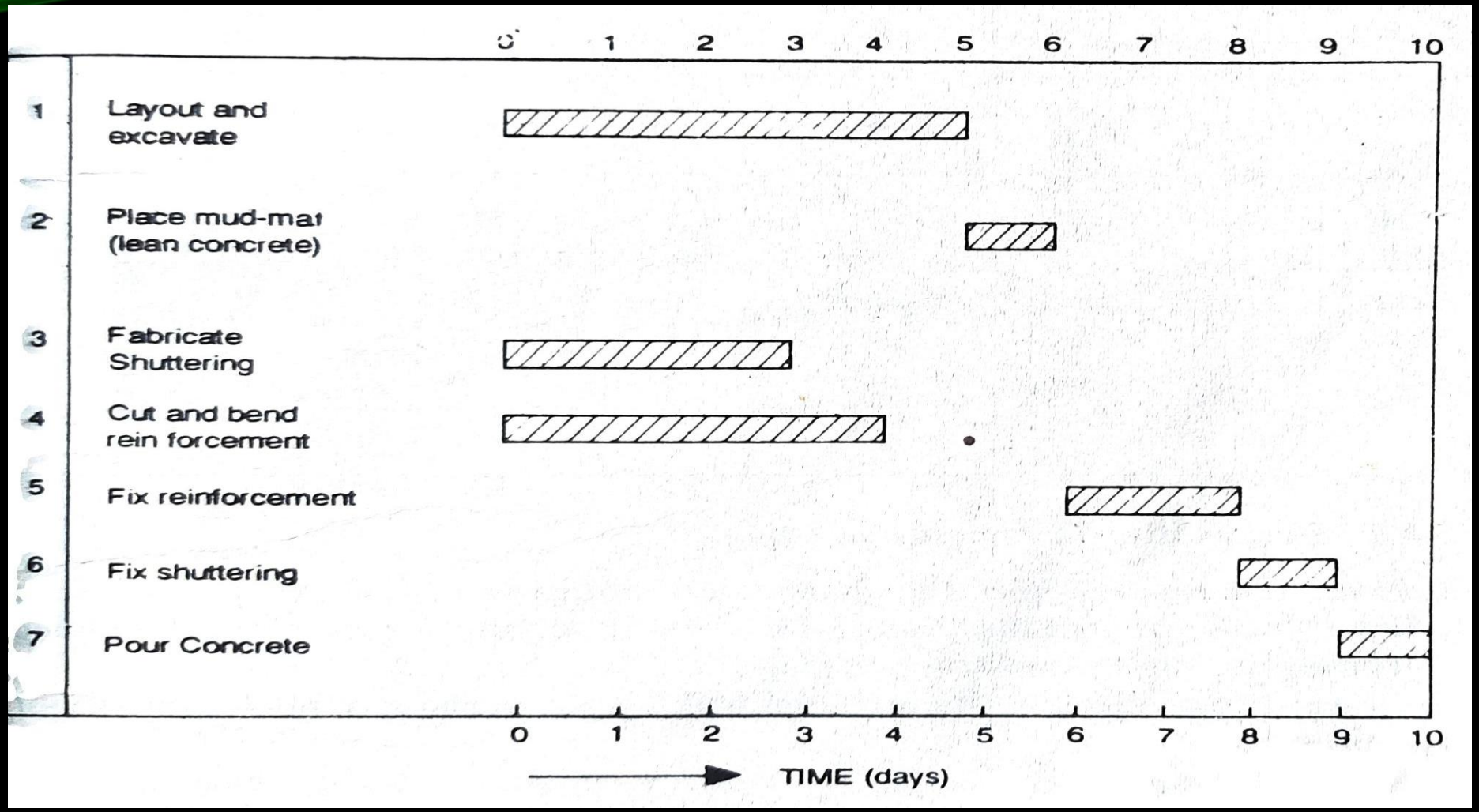
OBJECTIVE AND BENEFITS OF WBS

- **Objective:**
- To identify discrete activities or tasks that can be planned, estimated, scheduled, executed and controlled for completion
- **Benefits:**
- It helps more accurately and specifically to define and organize the scope of the total project.
- It helps with assigning responsibilities, resource allocation, monitoring the project, and controlling the project.
- Work can be done simultaneously by different team members, leading to better team productivity and easier project management.
- It allows you double check all the deliverables with the stakeholders and make sure there is nothing missing or overlapping.

BAR CHART (GANTT CHART)

- A bar chart consists of two coordinate axes, one showing the time (x-axis) and other showing jobs or activities (y-axis) to be performed.
- Also known as Gantt chart after Henry Gantt, who developed this technique around 1900.
- Each job is depicted in the form of a horizontal line and bar and length of the bar indicates the duration of the activities.
- Example of a bar chart involving the construction of a foundation with a set of activities is as shown in figure below.

BAR CHART (GANTT CHART)



Bar chart of construction of foundation

BAR CHART (GANTT CHART)

Advantages

- Easy graphical representation to prepare and understand.
- It can also be used for scheduling resource such as material, labor equipment and money required for a project

Limitations

- Conventional Bar-chart does not indicate the progress of activities but in modified bar chart it can be shown by coloring/hatching the bar.
- Does not show clearly the interdependencies among the various activities.
- Does not indicate the critical activities requiring attention of project team
- Does not show the quantity of the work.

NETWORK ANALYSIS

- Network analysis is the general name given to certain **specific techniques** which can be used for **planning, management and control of project.**
- Main objectives network analysis are:
  1. Complete the project within stipulated period.
  2. Complete the project within the estimated cost.
  3. Optimize resources utilization
  4. Provide better coordination in interdependent activities
  5. Trade-off between Time and Cost of Project
  6. Minimize Production Delay, Interruptions and Conflicts
- The two most frequently used forms of networks are:
  1. **Program Evaluation and Review Technique (PERT)**
  2. **Critical Path Method (CPM)**

PERT

- Developed by the US Navy for the planning and control of the Polaris missile program during 1957-58.
- The emphasis was on completing the program in the shortest possible time.
- It has been used for various research and development (R & D) projects which are non-repetitive in nature, where the duration of various activities cannot be predicted with certainty. Researchers are usually not sure as to how much time a particular research activity will take.
- PERT has the ability to cope with uncertain activity completion times (e.g. for a particular activity the most likely completion time is 4 weeks but it could be anywhere between 3 weeks and 5 weeks).
- Three time estimates are used to determine the expected time of each activity which forms the basis of PERT network.

CPM

- Developed by Dupont Corporation and Remington Rand in 1956 in the United States of America (USA) to solve project scheduling problems.
- The method was successfully tried for the construction of a chemical plant in Louisville, USA.
- The emphasis was on the trade-off between the cost of the project and its overall completion time.
- CPM is extensively used in production management and construction Industry due to their repetitive nature where activity time estimates can be predicted with considerable certainty due to the existence of past experience.

PERT V/S CPM

Parameters	PERT	CPM
Basic Concept	A Probabilistic model with uncertainty in activity duration. Expected duration is calculated from to, tm, tp	A deterministic model with well known activity duration based upon past experience
Estimate	Three time estimates (optimistic time, most likely time and pessimistic time)	Single time estimates
Orientation	Network is constructed on the basis of Events (Event oriented)	Network is constructed on the basis of jobs or Activities (Activity oriented)
Nature of Job	Non- Repetitive Nature Ex: Research and development project, Defense project	Repetitive nature Ex: Civil construction, industrial setting, plant maintenance, Ship building
Focuses on	Time (meeting time target or estimating percent completion is more important. Resources are always made available as and when required)	Time-Cost trade off (Optimizing cost is more important. there is better utilization of resources)
Crashing	as there is no certainty of time activity duration cannot be reduced	Possible

APPLICATION OF NETWORK

These methods have been applied to a wide variety of problems in industries and have found acceptance even in government organizations. These include

- Construction of a dam or a canal system in a region
- Construction of a building or highway
- Maintenance or overhaul of airplanes or oil refinery
- Space flight
- Designing a prototype of a machine
- Development of supersonic planes

OBJECTIVES AND STEPS INVOLVED IN NETWORK ANALYSIS

Objectives

1. Minimization of Total Project Cost
2. Minimization of Total Project Duration
3. Trade-off between Time and Cost of Project
4. Minimization of Idle Resources
5. Minimize Production Delay, Interruptions and Conflicts

Steps involved are :

- Identify the specific activities.
- Determine proper sequence of the activities.
- Construct the network diagram.
- Estimate the time required for each activity.
- Determine the critical path , slack.
- Development of project schedule
- Calculate the variability of project duration and probability of completion in given time

ADVANTAGES 7 DISADVANTAGES OF PERT/CPM CHART

Advantages:

- A PERT/CPM chart clearly defines and makes visible dependencies between the activities.
- PERT/CPM facilitates identification of the critical path and makes this visible.
- PERT/CPM facilitates identification of early start, late start, and slack for each activity.
- PERT/CPM provides for potentially reduced project duration due to better understanding of dependencies leading to improved overlapping of activities and tasks where feasible.

Disadvantages:

- There can be potentially hundreds or thousands of activities and individual dependency relationships.
- The network charts tend to be large and unwieldy requiring several pages to print and requiring special size paper.
- The lack of a timeframe on most PERT/CPM charts makes it harder to show status although colors can help (e.g., specific color for completed nodes),
- When the PERT/CPM charts become unwieldy, they are no longer used to manage the project.

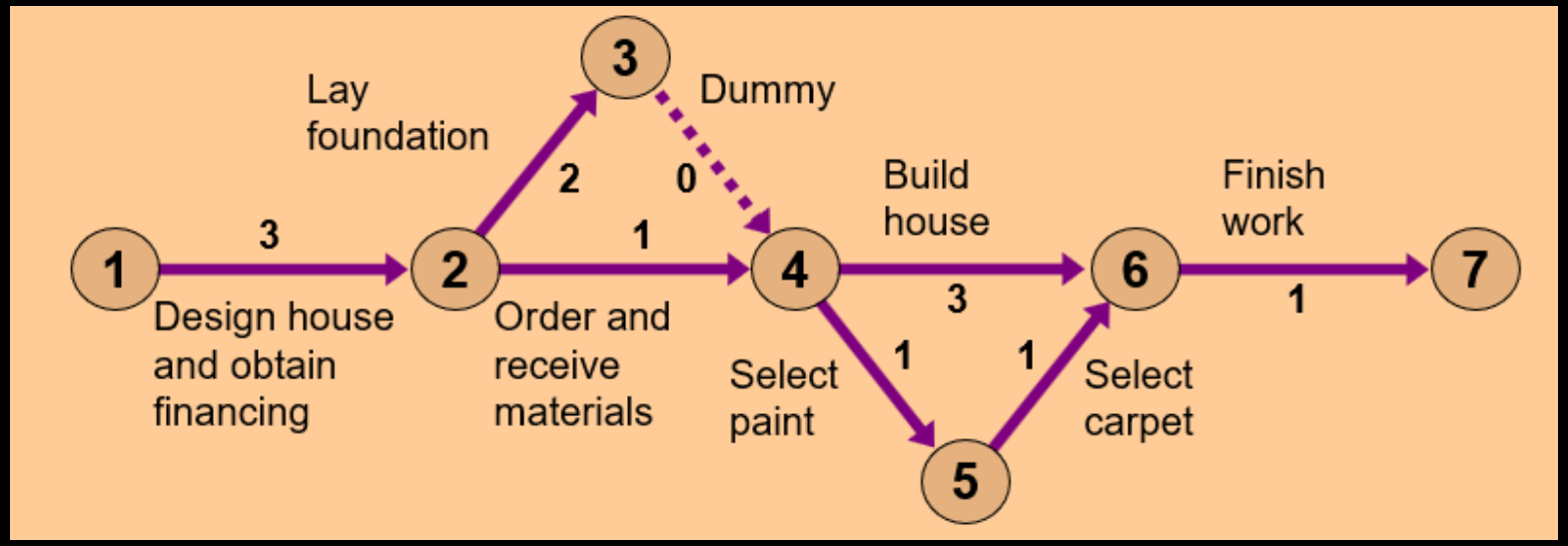
CONVENTION USED IN DRAWING NETWORK

Following two conventions are used in drawing network diagrams.

1. Activity on Arrow (A-O-A)
2. Activity on Node (A-O-N)

Activity on Arrow (A-O-A) :

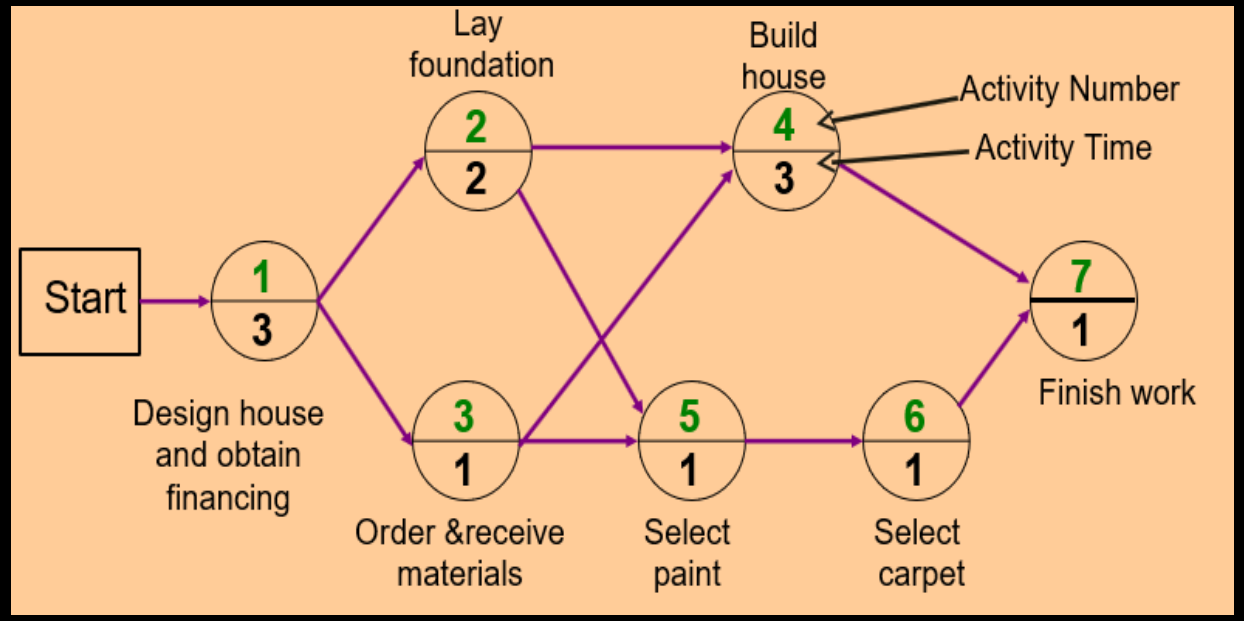
- An activity is denoted by Arrows ➔ drawn from left to right.
- The description of the activity is written above the arrow and the time taken to complete the activity is written below it.
- An events is denoted by a number enclosed in a circle.
- A-O-A is the most commonly used convention.

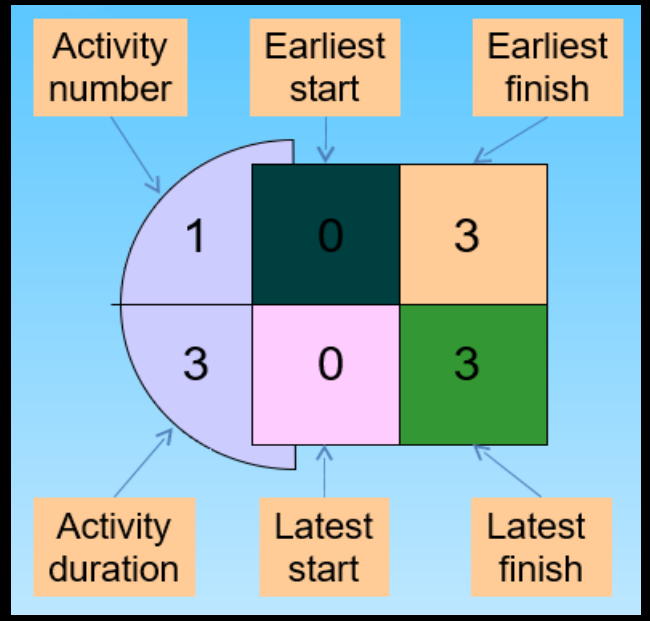


CONVENTION USED IN DRAWING NETWORK

Activity on Node(A-O-N) :

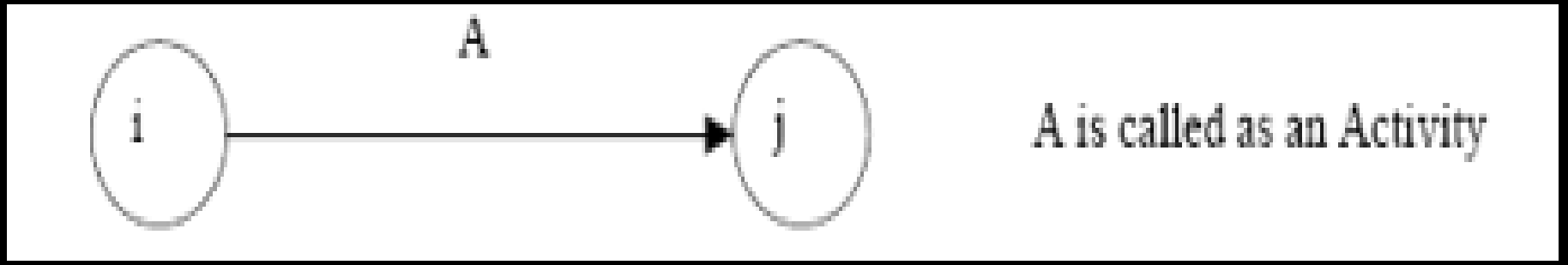
- Activities are denoted by circles(or nodes) and arrows are used to show the precedence relation ships among activities.
- Time required to complete the activity is also indicated in the node.





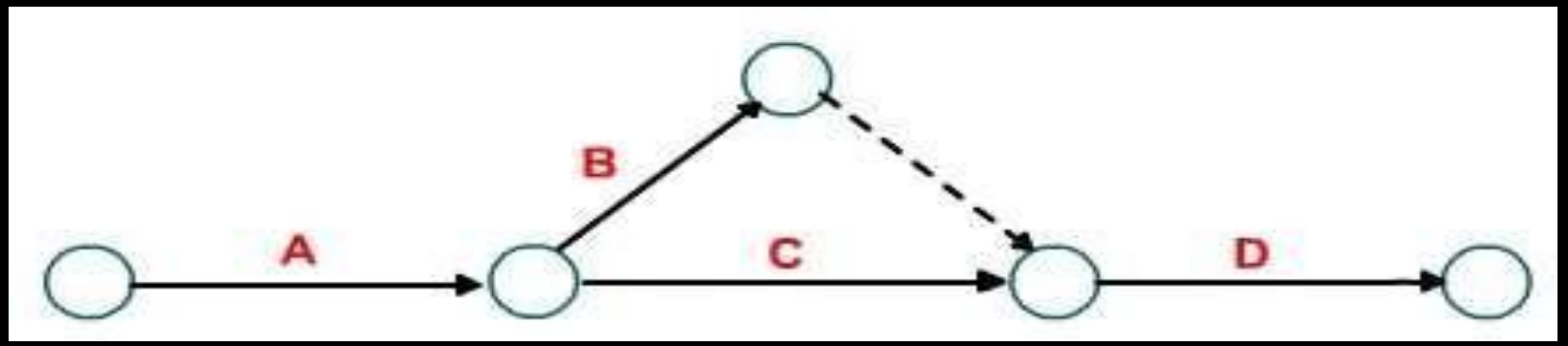
ACTIVITY

- Any individual operation which utilizes resources and has an end and a beginning is called **activity**.
- An arrow is commonly used to represent an activity with its head indicating the direction of progress in the project.
- The length of the arrow bears no relationship with the duration of the activity that it represents.
- These are classified into four categories:



TYPES OF ACTIVITY

1. **Predecessor activity** - Activities that must be completed immediately prior to the start of another activity are called predecessor activities. **Activity A** is predecessor activity of **activities B and C**
2. **Successor activity** - Activities that cannot be started until one or more of other activities are completed but immediately succeed them are called successor activities. **Activities B and C** are successor activities of **activity A**
3. **Concurrent activity** - Activities which can be accomplished concurrently are known as concurrent activities. It may be noted that an activity can be a predecessor or a successor to an event or it may be concurrent with one or more of other activities. **Activities B and C** are concurrent activity.

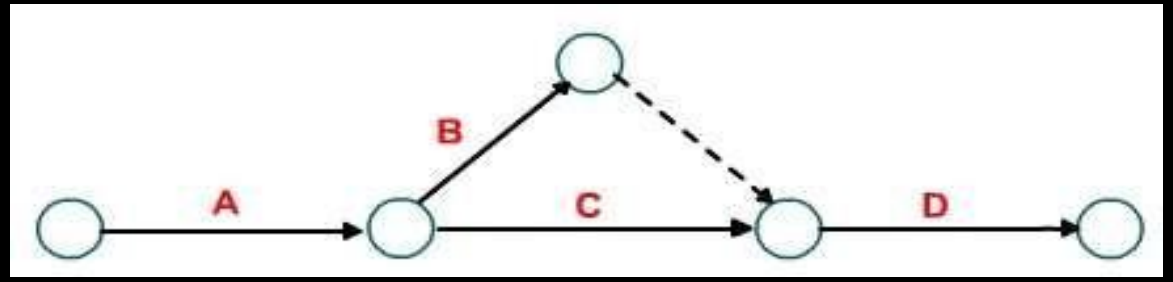


TYPES OF ACTIVITY CONT..

4. **Dummy activity** - An imaginary activity which does not consume any resource and time is called a dummy activity. Dummy activities are simply used to represent a connection between events in order to maintain a logic in the network. It is represented by a dotted line in a network

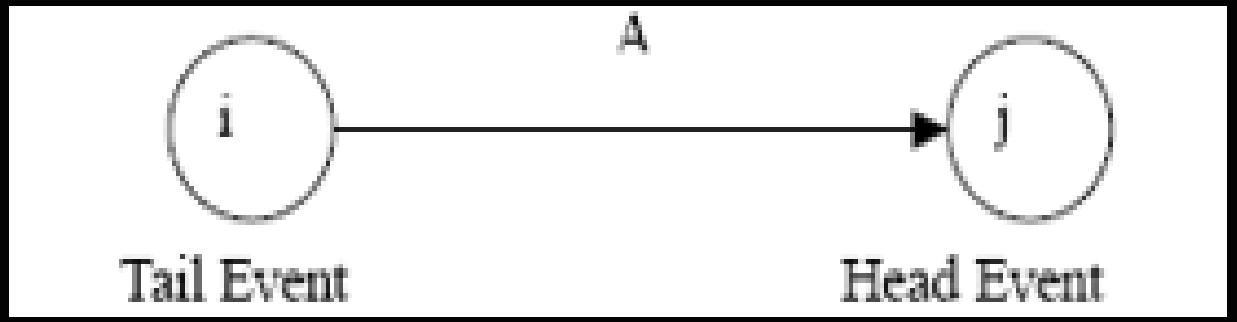
   The dummy activity is inserted in the network to clarify the activity pattern in the following two situations:

   - To make activities with common starting and finishing points distinguishable
   - To identify and maintain the proper precedence relationship between activities that is not connected by events.



EVENT

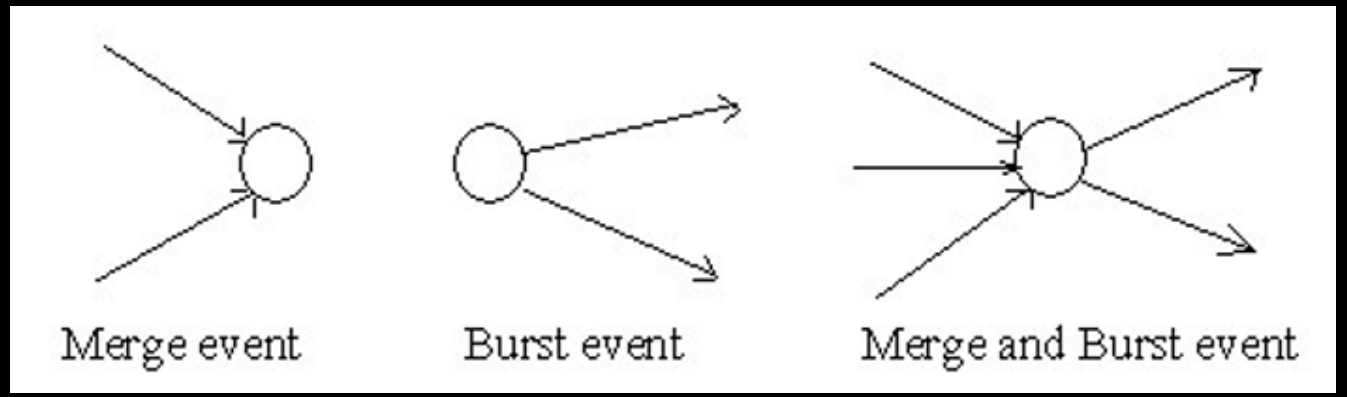
- An **event** represents a point in time signifying the completion of some activities (**Head event**) and the beginning of new ones (**Tail event**).
- The event consumes no time or resources and usually represented by a circle in a network which is also called a node or connector.



TYPES OF EVENT

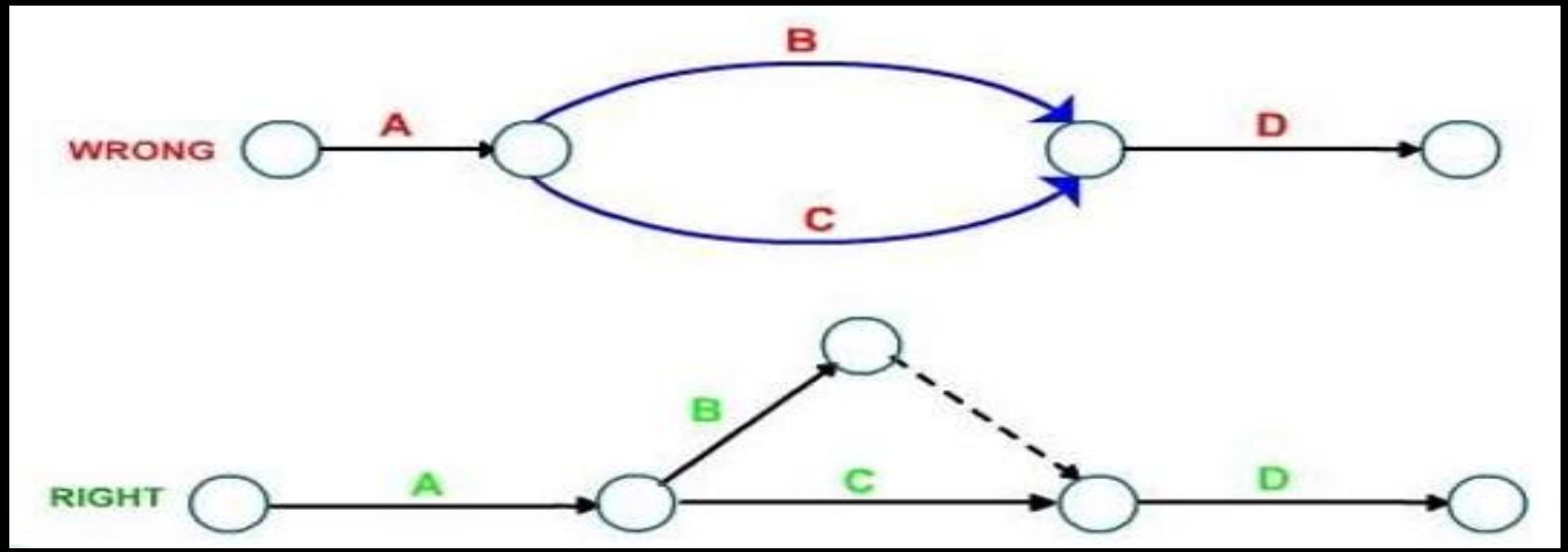
The events are classified in to three categories

1. **Merge event** – When more than one activity comes and joins an event such an event is known as merge event.
2. **Burst event** - When more than one activity leaves an event such an event is known as burst event.
3. **Merge and Burst event** - An activity may be merge and burst event at the same time as with respect to some activities it can be a merge event and with respect to some other activities it may be a burst event.



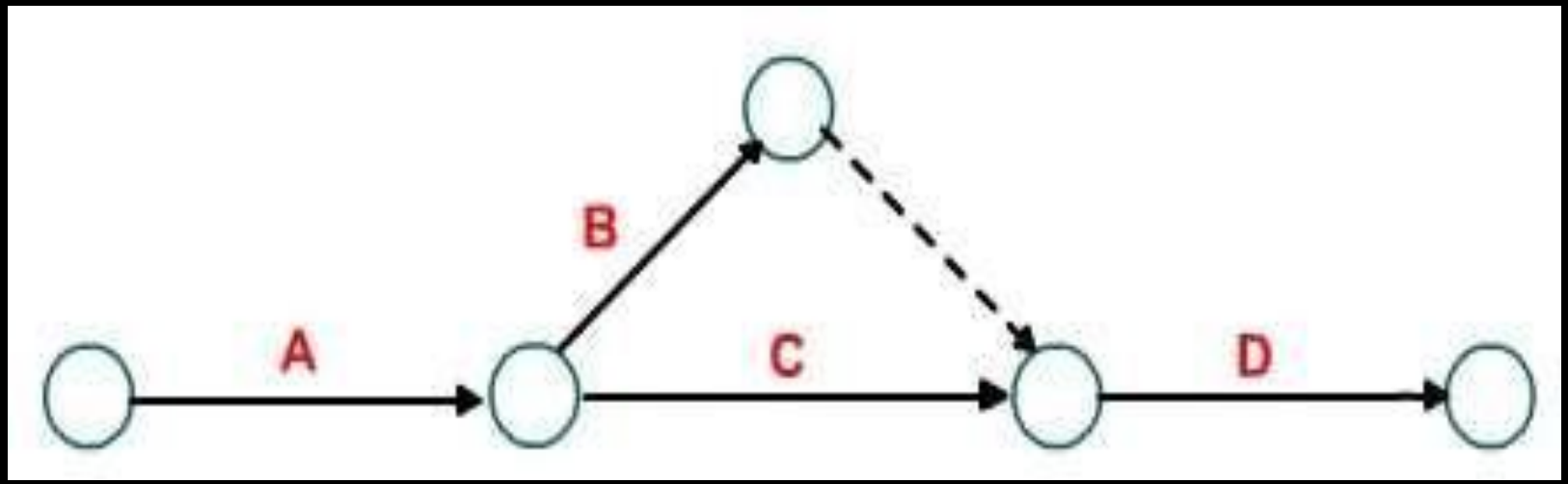
RULES TO DRAW THE NETWORK DIAGRAM

- Each activity is represented by one and only one arrow in the network. Length of arrow has no significance.
- No two activities can be identified by the same start and end events.
- The event numbered 1 is the start event and an event with highest number is the end event.



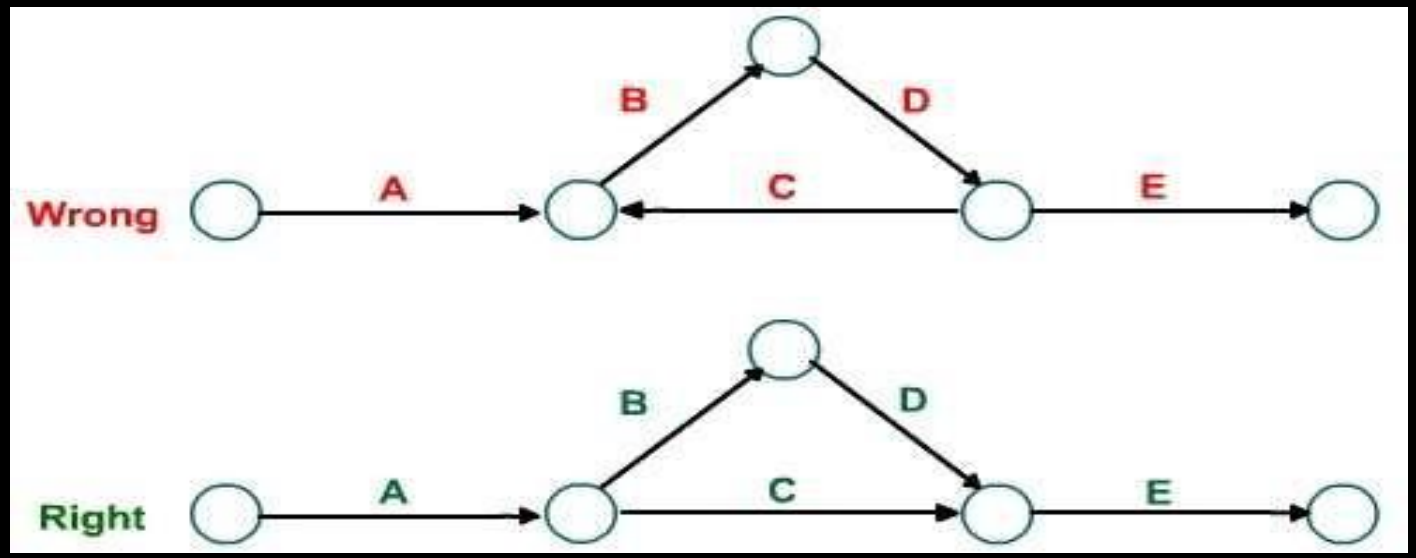
RULES TO DRAW THE NETWORK DIAGRAM

- Before an activity can begin, its preceding activity must be completed.
- Each event should have distinct number in way that head of arrow is greater than the tail. There should not be any duplication of event numbers in a network.
- Dummy activities can be used to maintain precedence relationships only when actually required. Their use should be minimized in the network diagram.



RULES TO DRAW THE NETWORK DIAGRAM

- Looping among the activities must be avoided.



- Arrow should not intersect.
- A network should have only one start event and one end event.

Thank You

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Project Management

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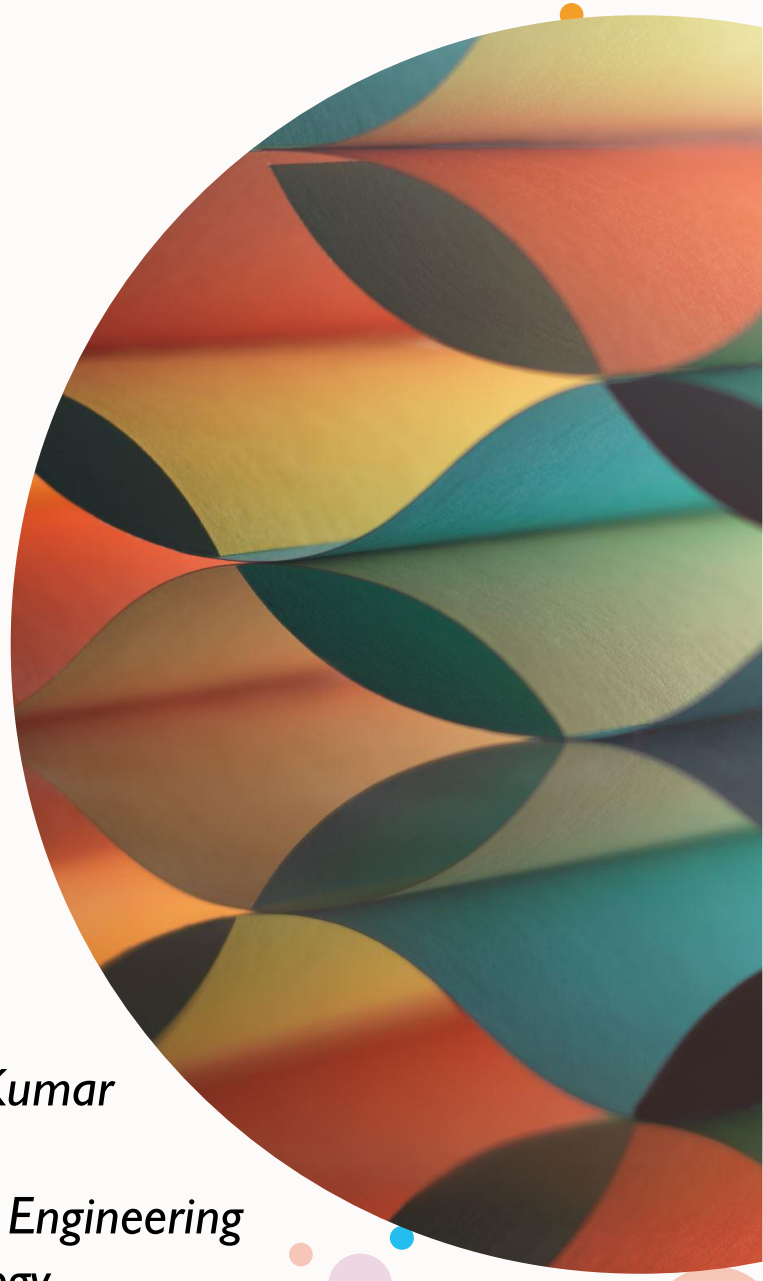

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Negotiation in projects

- A potentially beneficial process of interaction by which two or more parties seek to improve their options through joint actions and decisions.
- It is communication back and forth for the purpose of making a joint decision.
- A way of finding a mutually acceptable solution to a shared problem.
- Outcome: a wise decision, efficiently, and amicably agreed upon.

Preparation

- Background knowledge
- Personalities involved
- Establish BATNA (Best Alternative to Negotiated Agreement)
- Set goals
  - Know what you want!
  - Know the deal- breakers?
- Formulate specific questions
- Trouble shoot disagreements: bargain & seek alternative solutions, introduce trade offs

Working together

- Establish how to work together
- Acknowledge shared ground
- Put both parties on same side of the problem
- Use ‘we’
- Identify mutual gain
- Create value for both ‘sides’

Things that don’t work

- Sweeping generalisations
- Emotive language
- Speaking on behalf of others with no authority
- Seeing situation as a win-lose
- Fearing rejection
- Distractions/ interruptions
- Lack of clarity
- Aggressiveness

It was a mistake for Eric to wear a t-shirt to his job interview, and it was a bigger mistake to wear that particular t-shirt.

Project Approval

- The approval of a new project by a superior body.
- Organizations have a ***Project Board*** that approves projects resulting in a project portfolio.
- Board chooses projects that support organization's mission, values, goals, and strategies.

Process in Project Approval

- Create a Project Board
- Define Selection Criteria
- Engage Project Teams
- Project teams submit a Project Charter
- Give Initial Approvals Contingent on Subsequent Reviews

➢Create a Project Board

For approval of projects.

Project teams submit their projects to the board.

Make brief presentations to the board and respond to questions.

➢Define Selection Criteria

Defining and communicating the criteria saves time

Criteria might include: 1) strategic importance, 2) regulatory compliance, 3) financial viability, and 4) business and technical flexibility to accommodate future changes

➢Engage Project teams

Senior individual in organizations should ensure the project teams are actively engaged

Project teams do engage appropriate stakeholders early in the project initiation process to obtain their input

➢Project Teams Submit a Project Charter

Brief document defining the business case, project problem definition, goals, deliverables, constraints, assumptions, stakeholders, team members, and top risks

➢Give Initial Approvals Contingent on Subsequent Reviews

Project Board approves a project contingent on subsequent reviews after the product and project scope have been vividly defined.

Project Feasibility

- Examines a project’s pertinent aspects, including economic, technical, legal, and scheduling issues to determine the possibility of the project's successful completion.
- Prior to commencing the project and investing funds, time, and efforts into it, managers conduct a feasibility study of the project.
- Different Types of Project Feasibility Studies

a) Technical
b) Economic
c) Legal
d) Operational
e) Scheduling

Technical Feasibility

- Assists businesses in determining whether technical resources are capable of executing planned concepts.
- To assess the technical viability factors like the system's hardware, software, and other possible technical needs are taken into account.

Economic Feasibility

- Determines the project's viability, cost, and benefits before investing financial resources.
- An unbiased project evaluation, enhancing project credibility by supporting decision-makers in identifying the proposed project's favorable economic benefits.

Legal Feasibility

- This evaluation determines if any planned project elements violate any laws, including zoning rules and data protection requirements.

Operational Feasibility

- Entails researching to evaluate whether and to what extent the project can meet the organization's needs.

Scheduling Feasibility

- Forecasts the amount of time for project execution.

Helps in identifying potential project constraints, such as:

a) Internal project constraints: technological, financial, and resource constraints.

b) Internal corporate constraints: Import/export, financial, and marketing.

c) External constraints: Logistics, environment, laws and regulations.

Project cost estimation

- Basis for determining and controlling the project budget.
- Estimated for the first time at the start/before a project start.
- It is repeated on an ongoing basis to account for more detailed information or changes in the project timeline.

Types of Cost Estimates

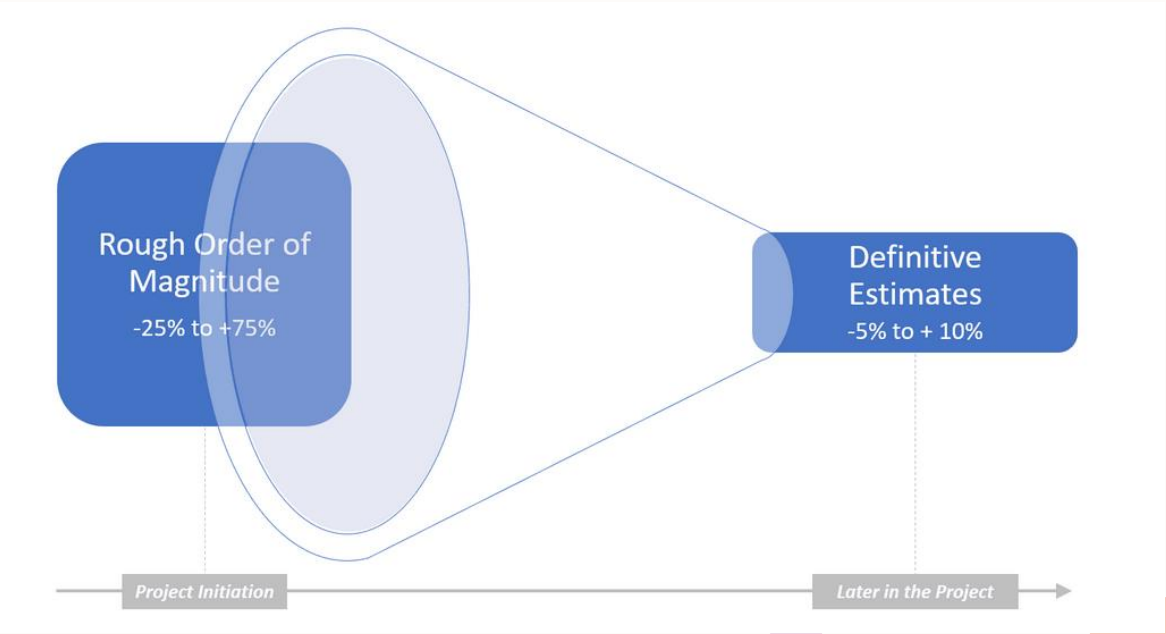
➢ ***Rough Order of Magnitude***

Rather inaccurate with a broad range of possible outcomes.

Typically used in project initiation phases

➢ ***Definitive Estimate***

Determined in the course of the project when more information and resources for accurate estimates are available.



Tools and Techniques for Estimating Project Cost

- Expert judgment
- Analogous estimating
- Parametric estimating
- Bottom-up estimating
- Three-point estimating

Expert judgment

- Requires a certain level of familiarity with the subject of a project and its environment.
- Accuracy depends greatly on the number and experience of the experts involved, the clarity of the planned activities and steps as well as the type of the project.

Analogous estimating

- The use of observed cost figures and related values in previous projects
- Type and nature of these reference activities must be comparable with the current project.
- Categorized as a gross value estimating approach.
- This technique uses historical data in the form of values and parameters to determine the expected resource requirements of a current project.
- Adopted historic values can be adjusted for differences in scope or complexity.
- Also called top-down estimating.

Parametric estimating

- A statistical approach to determine the expected resource requirements.
- Input data can be obtained from previous projects or external data sources such as industry benchmarks or publicly available statistics.
- More accurate than analogous estimating.

Bottom-up estimating

- Involves estimating the cost at a granular level of work units.
- Estimates for all components of a project are then aggregated in order to determine the overall project cost estimate.
- This approach often comes with significantly higher accuracy.

Three-point estimating

- Usually leverages on bottom-up estimate and expert estimates.
- The concept requires three different points of estimates: the optimistic (best case), pessimistic (worst case) and the most likely cost estimate.
- Based on these 3 points, a weighted average cost estimate is determined that overweighs the most likely point.

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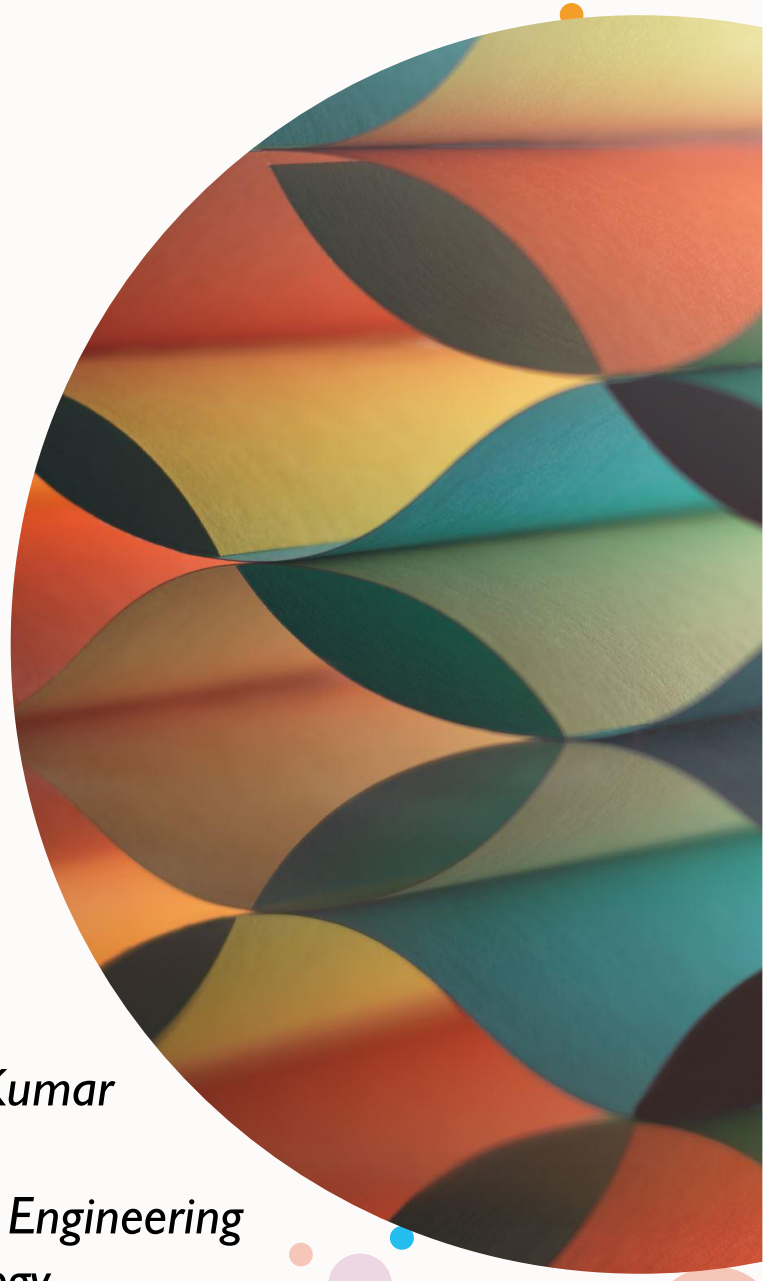

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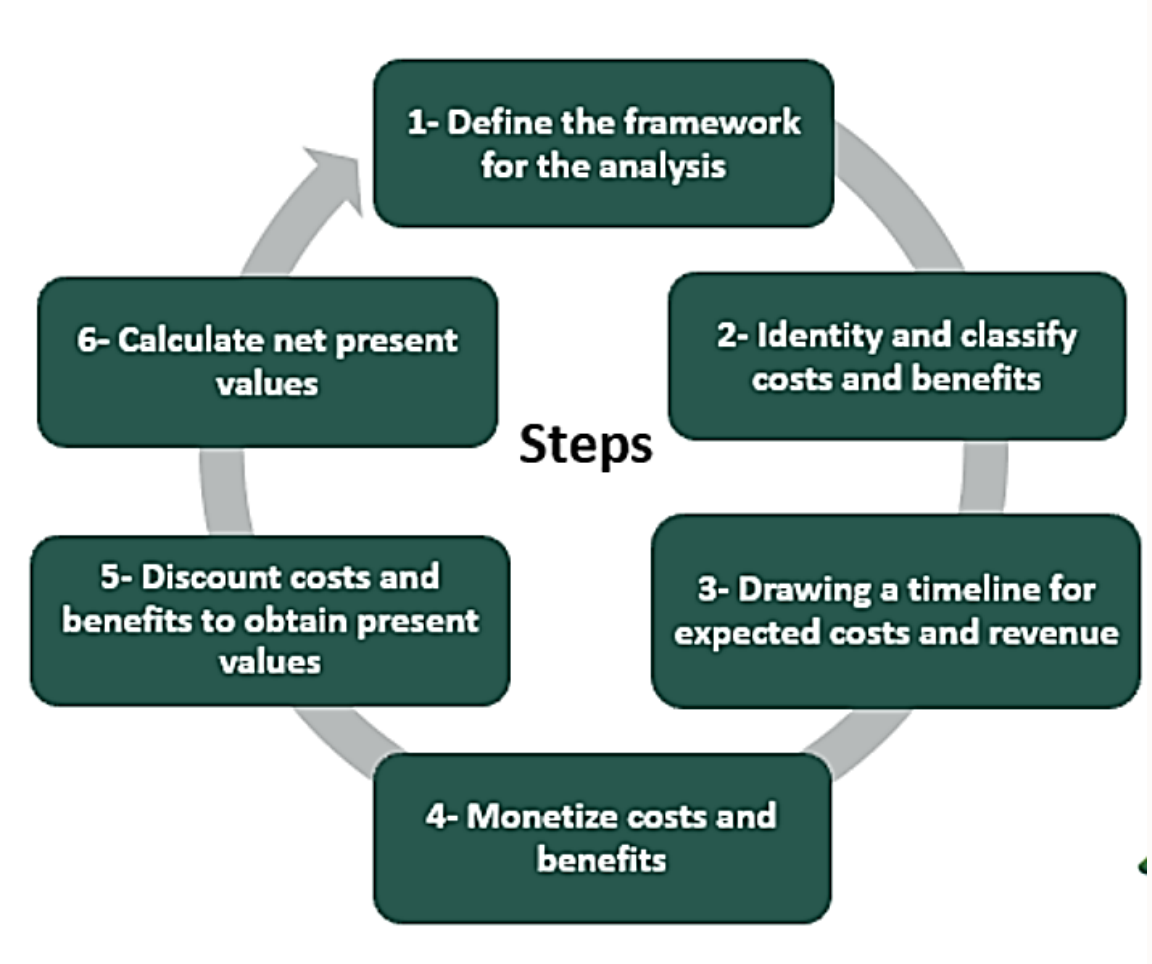
Cost Benefit Analysis

- Cost-Benefit Analysis (CBA) measures a project's societal value by quantifying the project's societal effects and making costs and benefits comparable in monetary terms.
- CBA is most widely applied tool for the appraisal of projects.
- Principal analytical framework used to evaluate public expenditure decisions.
- General purpose of CBA is to help government & society better allocate their scarce productive resources.
- Societal goal behind CBA is to achieve maximum economic efficiency.
- Economic efficiency: it requires Benefits > Costs

Steps in a CBA



Define the framework for the analysis

- ➢Identify the state of affairs before and after the policy change or investment on a particular project.

➢Measure the profit of taking up the investment option.

Identity and classify costs and benefits

Costs and benefits are classified in the following manner to ensure that you understand the effects of each cost and benefit.

– Direct Costs (Intended Costs/Benefits)

– Indirect Costs (Unintended Costs/Benefits)

– Tangible (Easy To Measure And Quantify)

– Intangible (Hard To Identify And Measure)

Drawing a timeline for expected costs and revenue

- Mapping needs to be done when the costs and benefits will occur and how much they will pan out over a phase.
- A defined timeline enables businesses to align with the expectations of all interested parties.
- Understanding the timeline allows to plan for the impact that the cost and revenue will have on the operations.

Monetize costs and benefits

- Convert an asset into cash by selling or using it as the security for loan
- Ensure to place all costs and all benefits in the same monetary unit.

Discount costs and benefits to obtain present values

- It implies converting future costs and benefits into present value.
- Also known as discounting the cash flows or benefits by a suitable discount rate.
- Every business tends to have a different discount rate.

Calculate net present values

- It is done by subtracting costs from benefits.
- Investment proposition is considered efficient.

Importance of Cost-Benefit analysis

- **Determining the feasibility of an opportunity:** Massive sum of money is invested in a project, it should at least break even or recover the cost. To determine whether the project is in the positive zone, the costs and benefits are identified and discounted to present value to ascertain the viability.

To provide a basis for comparing projects: It is one of the tools to pick through the available options. When one out of the many options seems more beneficial, the choice is simple. This model helps businesses to rank the projects according to their order of merit and select the most viable one.

Evaluating Opportunity Cost: It is imperative to be aware of the Opportunity Cost or the cost of the next best alternative foregone. It helps businesses to identify the benefits that could have arisen if the other option was chosen.

Performing Sensitivity Analysis for the various real-life scenarios: Sensitivity analysis can be instrumental in improving the credibility of a Cost-benefit analysis and is mainly used where there is ambiguity over the discount rate. The investigator may change the discount rate and the horizon value to test the sensitivity of the model.

Cost-benefit analysis has two main methods of arriving at the overall results.

- **Net Present Value (NPV) and the Benefit-Cost Ratio (BCR)**

Net Present Value Model

NPV of a project refers to the difference between the present value of the benefits and the present value of the costs. If NPV > 0, then it follows that the project has economic justification for going ahead.

Represented by the following equation:

$$NPV = \sum \text{Present Value of Total Future Benefits} - \sum \text{Present Value of Total Future Costs}$$

Benefit-Cost Ratio

Benefit-Cost provides value by calculating the ratio of the sum of the present value of the benefits associated with a project against the sum of the present value of the costs associated with a project.

BCR = ∑ Present Value of Total Future Benefits / ∑ Present Value of Total Future Costs

Greater the value above 1, the greater are the benefits associated with the alternative considered.

Sources of Finance

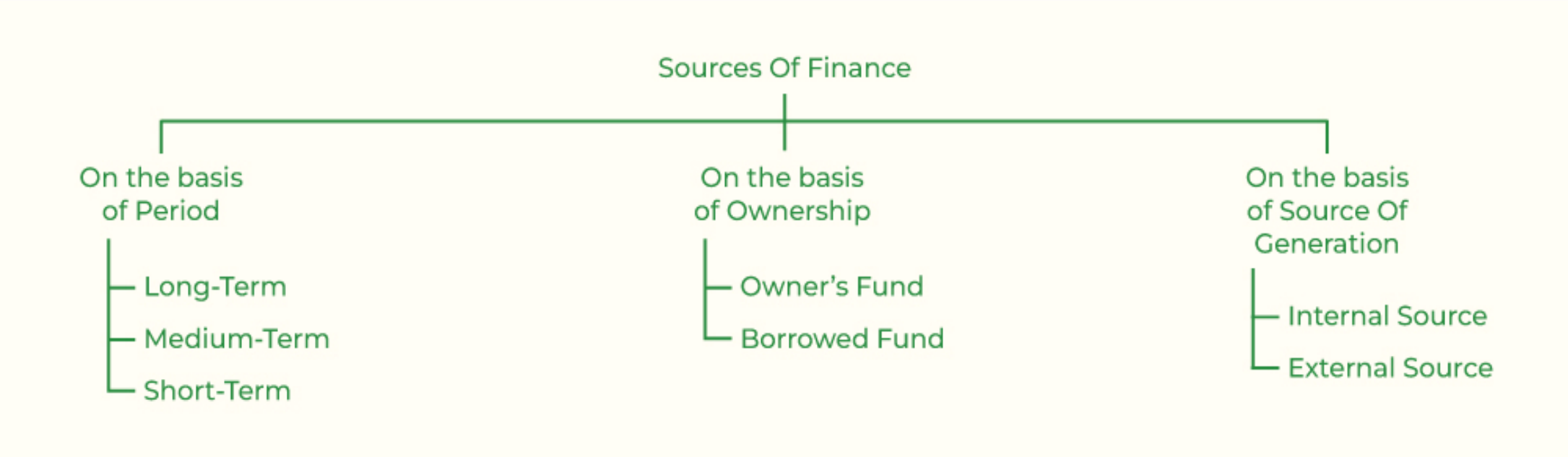
- ➢Money required to run business functions known as business funds
- ➢Funds are required continuously in business
- ➢Every source of funds needs to be analyzed carefully.

Two types of financial needs of a business:

Fixed Capital Requirement: Refers to the money which is required to purchase fixed assets of a business such as Plants and Machinery, Land and Buildings, etc. These assets are kept in the business for more than one year. Nature of the business plays a very important role in deciding the type of capital requirements. If the business concern is based on retailing, then it requires very less fixed assets as compared to the manufacturing industry.

- Working Capital Requirement: Working capital is a vital aspect of any business organization, whether it is trading, manufacturing, or retailing. No matter how large or small the enterprise is, working capital is required. The amount required for working capital may vary according to the size of the enterprise. The day-to-day operations, such as payments to creditors and suppliers and payment of salaries, rent, and wages fall under the category of working capital.

- Firms raise funds through different sources
- Sources are classified based on Time, Ownership and control, Sources of generation.



Based on period

Long-term Sources: Fulfill the needs of any business for a period exceeding 5 years. Generally used for purchasing fixed assets. Examples of long-term sources of funds are shares, debentures, bonds, long-term loans from banks.

Medium-term Sources: Funds required for more than one year but less than five years. These include public deposits, borrowing from banks, lease financing, etc.

Short-term Sources: Funds required for less than one year is termed short-term sources of fund. These kinds of funds are easily available and are easy to repay also. For Example, short-term loans from commercial banks, trade credit etc.

Based on ownership

Owner's Funds: Owner's funds are those which are provided to the firm by its owners. The owner can be a sole trader, a shareholder of the company, or a partner. The owners not only invest capital but also reinvest profits in the organization. The investment made by the owners decides their control over the management. Issue of equity shares and retained earnings are the two most important sources of the owner's fund.

Borrowed Funds: A fund which is borrowed from different financial institutions or raised through the issue of bonds debentures. These sources provide a firm with different sources of funds for a fixed period with a fixed amount of interest, which a company has to pay whether it is making a profit or not. Usually, the borrowed funds are provided to the firms by keeping some fixed assets as security. So this source of funds is a bit riskier as compared to the owner's fund. For Example, public deposits, loans from a bank etc.

Based on the Source of Generation

- ***Internal Sources*** – Every business organization has some funds which are kept aside for future uncertainties and needs. When the funds are generated internally, then they are said to be internal sources of funds. The biggest advantage is that these are a permanent source of funds that could be easily availed, and does not involve any explicit cost. However, internal funds lead to various risks to the firm and can accomplish only the limited needs of the firm.

External Sources – When a large amount of funds is required by a business enterprise, then it opts for external financing. Therefore, external sources of finance are the sources that are obtained from outside the business. The cost of raising funds from external sources is more than the cost from internal sources. For example, lease financing, Commercial papers, etc.