Unit 2.-Project Planning tools & Depreciation

What is a project ?

- A project is a **set of interdependent tasks** that have a common goal.
- A project is defined as **a sequence of tasks** that must be completed to attain a **certain outcome.**
- **The development of software for an improved business process, the construction of a building or bridge, the relief effort after a natural disaster, the expansion of sales into a new geographic market — all are projects.**
- According to the Project Management Institute (PMI), the term Project refers to **any temporary endeavour with a definite beginning and end".**
- Depending on its **complexity,** it can be managed by a single person or hundreds.

Essential Considerations in Project Managemet:

The **Three essential considerations in project management** ("three-legged stool" of successful project management) are:

- **Time** (project schedule),
- **Cost** (in terms of money and other resources)
- **Performance** (the extent to which objectives are achieved).
- Since, achieving maximum performance is often possible only at the expense of cost and schedule, difficult trade-off decisions involving compromises are often necessary.

Characteristics of a project

Project management, then, is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.

Projects have the following **characteristics**:

- A clear start and end date
- A project creates something new
- A project has boundaries
- A project is not business as usual

Project Life Cycle

- **1.Project Initiation.** The **creation** of the project, initial project funding, and authorization of the project manager.
- **2.Project Planning.** The creation and approval of the **project management plan.**
- **3.Project Execution.** The production of the **deliverables.**
- **4.Monitoring & Controlling.** Ensuring the project stays within the **boundaries** of the project management plan.
- **5.Project Closing.** **Releasing** project resources.
- They are in **chronological order** **except for #3 (Execution) and #4 (Monitoring & Controlling)** which are in parallel. .

Phases of Project management

- I) **Planning Phase**: Dividing the project into distinct activities. That is called **WBS(work Breakdown structure**. These activities are interrelated activities.
  - Estimating Time requirements for each task
  - Establishing Precedence Relationship
  - Estimating Resources needed
  - Construction of net work diagram.

- II) **Scheduling Phase**: Determining the Start & End Time of each task & relationship among the activities.

- III) **Controlling:** It is the follow up of Planning & scheduling phases, using Arrow Diagrams &Time Charts for continuous monitoring & progress reporting.

Project Planning tools

- Project planning tools are defined as a **series of systems and methodologies** designed to ensure teams are able to accomplish both short- and long-term projects.

- Project planning tools include **charts and graphs** designed **to track progress, repetition-based approaches to testing and adjusting everyday processes, and other actions that allow organizations to manage and improve important projects.**

The **Major planning tools** available are:

- The Statement of Work,
- The Milestone Schedule,
- The Work Breakdown structure,
- The Gantt (Bar) Charts,
- The Network Scheduling Systems (PERT, CPM , etc.)
- Resource Allocation Methods.

GANTT CHART

- Also called: **milestones chart, project bar chart, activity chart**
- **It was introduced by Henry Gantt.**
- **Gantt chart is a visual view of tasks scheduled over time** for planning projects .
- They are a useful way of **showing what work is scheduled to be done on a specific day.**
- **They also help you view the start and end dates of a project in one simple view.**
- As the project progresses, the chart's bars are **shaded** to show which tasks have been completed.
- People assigned to each task can also be represented on the **chart by name or by a color.**

HOW TO CREATE A GANTT CHART

Gantt charts are considered a **project planning tool.**

The basic procedure starts with identifying tasks to include in your Gantt chart.

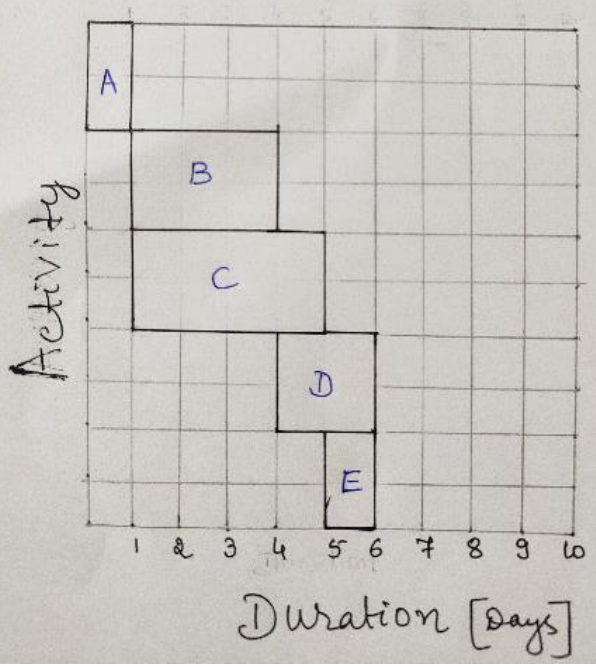
Determine the: **Tasks needed to complete the project & Time required for each task.**

- Time duration is shown on X axis & Activities are represented on Y axis.
- Activities are represented with he help of bar.
- **The length of the bar represents the time required for completing the activity.**

Draw a Gantt chart-

Activity:	A	B	C	D	E
Duration (Days)	1	3	4	2	1

Activity B & C can be performed simultaneously and can start only when Activity A is completed. Activity D can start only when activity B is completed. Activity E can't begin until Activity B & C are completed.



Advantages & Limitations of Gantt Chart

- 1.Easy to understand & simple to draw
- 2.Skilled persons are not required.
- 3.It can be used for determining resource requirements @ a particular stage of a project.
- 4.You can understand project progress from the chart.

Limitations:

- 1.Lack of degree of detail.
- 2.In case of major projects only major activities can be shown or else it becomes very crowded & clumsy.
- 3.Can not review the project Management – Incase of delay.

CPM (critical path method)

- CPM was introduced by **Morgan Walker** in 1950 to solve project scheduling problems.
- Critical Path Method (CPM) is an algorithm for planning, managing and analyzing the timing of a project.
- In CPM the time estimates for the different activities are **assumed to be deterministic (durations are certain &based on past experience).i**
- **t is used in repetitive type of work.**

  Eg:construction of bunglows,flyovers.
- In a project, the critical path is **the longest distance** between the start and the finish, including all the tasks and their duration.

- **While tasks with a critical value cannot be delayed during the implementation of the project and are limited in time.**
- If part of one task can be **slowed down or postponed for a term without leaving work on others,** then such a task is **not critical.**
- Once a critical path is determined, you'll have a clear picture of the project's actual schedule.
- In CPM each **Activity** is represented by **an Arrow .**
- The **Event** (starting & Finishing of an activity) is represented **by a Node, with a number.**
- Event doesn't consume any resources.

AOA System: Activity on the Arrow system
AON system: Activity on the Node system

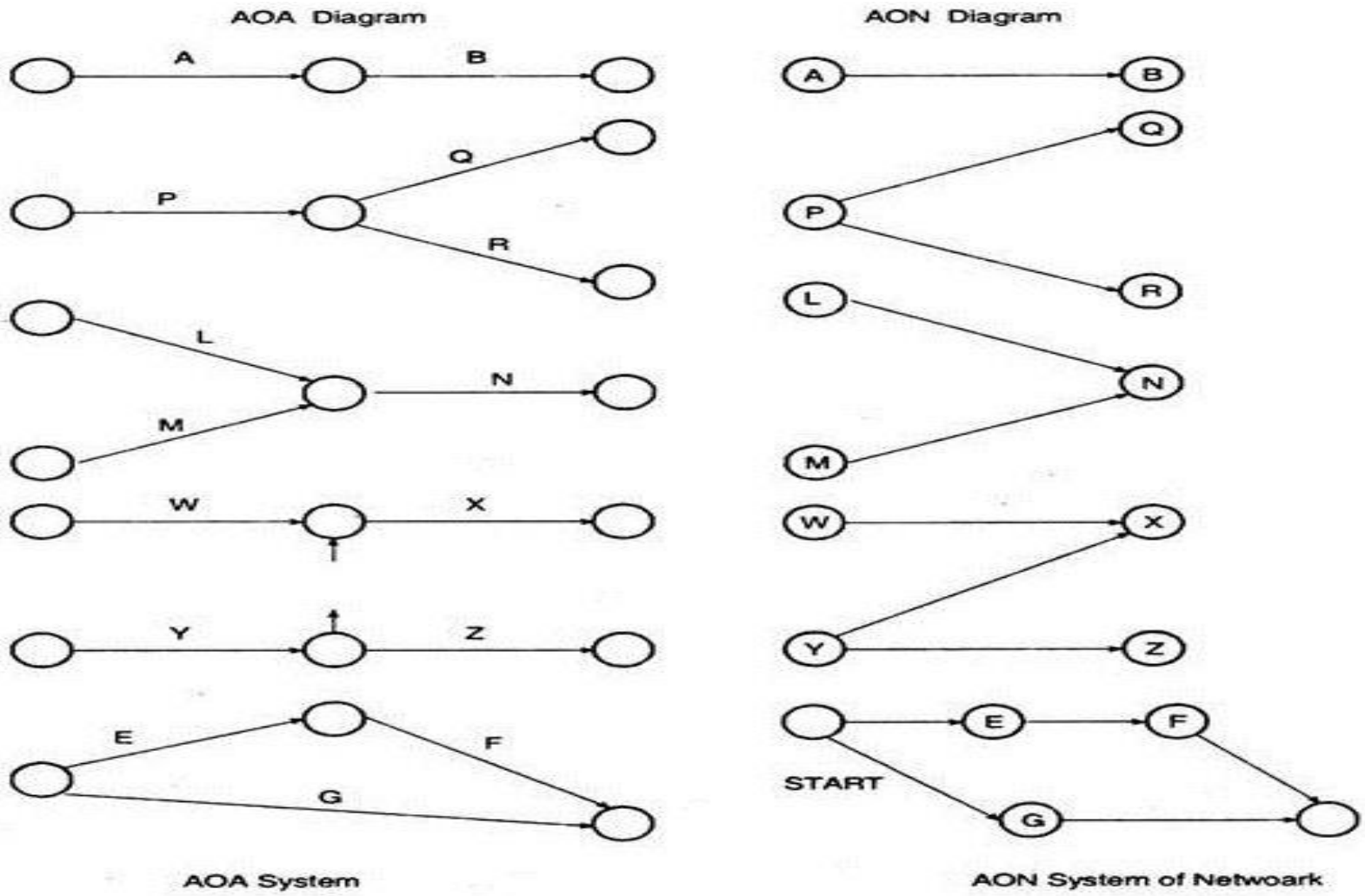


Fig. 28.17.

Network Diagram Representation

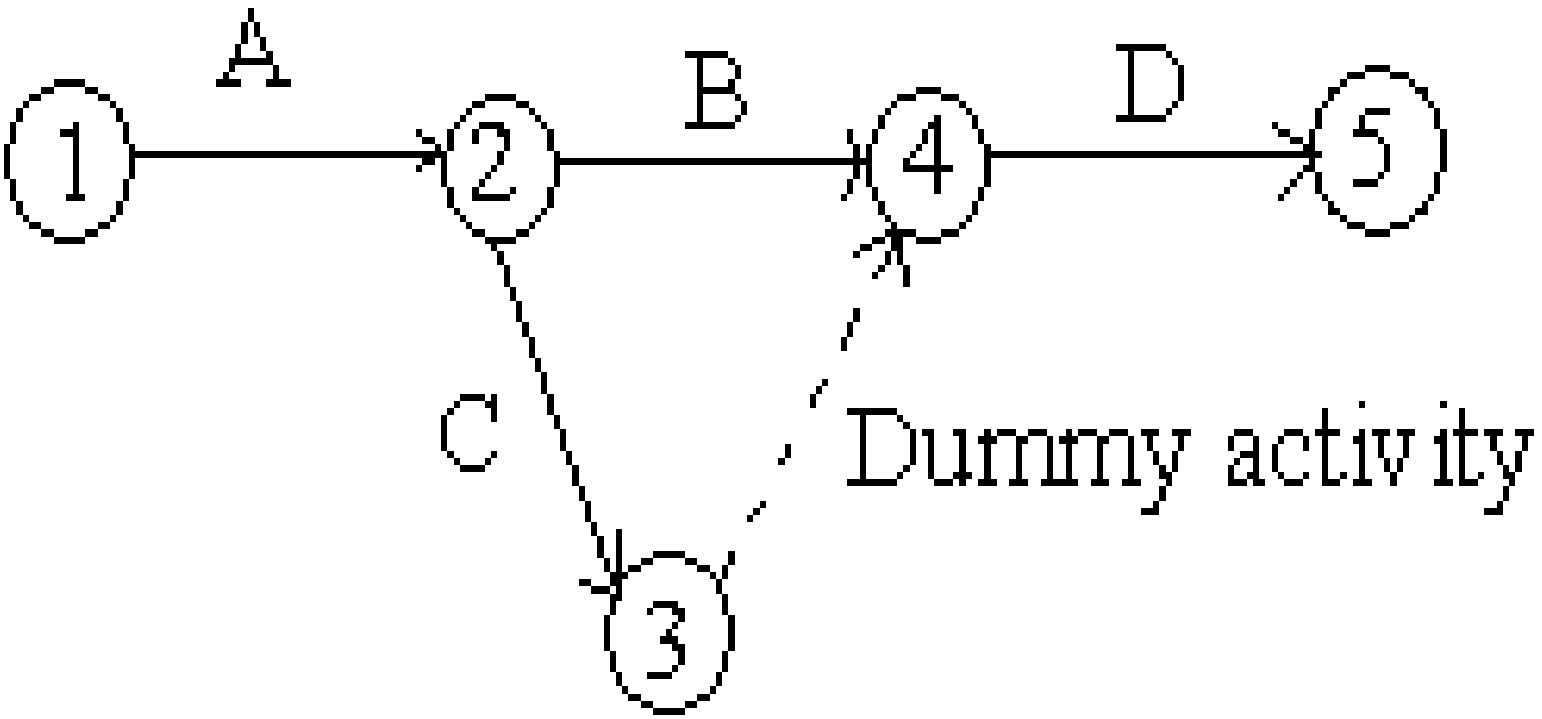
Types of Activity

1. **Predecessor activity** – Activities that must be completed immediately prior to the start of another activity are called predecessor activities.

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.

3. **Concurrent activity** – Activities which can be accomplished concurrently (simultaneously)are known as concurrent activities.

4. **Dummy activity** – An activity which does not consume any kind of resource & Time but merely depicts the technological (**Precedence Relationship**)dependence is called a dummy activity. To make activities with **common starting and finishing points distinguishable.**


A
B
D
1
2
4
5
C
3
Dummy activity

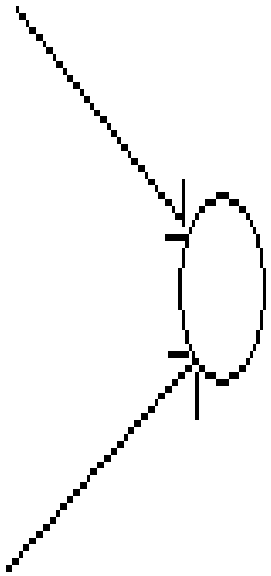
Event

- An **Event** represents a point in time **signifying the completion of some activities and the beginning of new ones.**

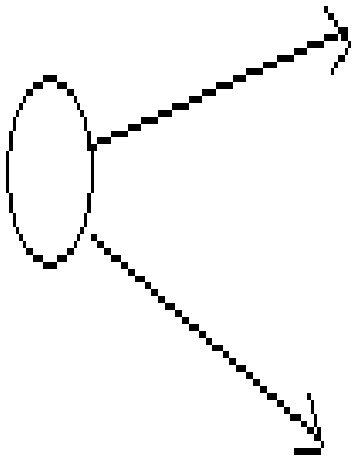
- This is usually represented by a **circle** **in a network which is also called a node.**

- The events are classified in to **three** categories:

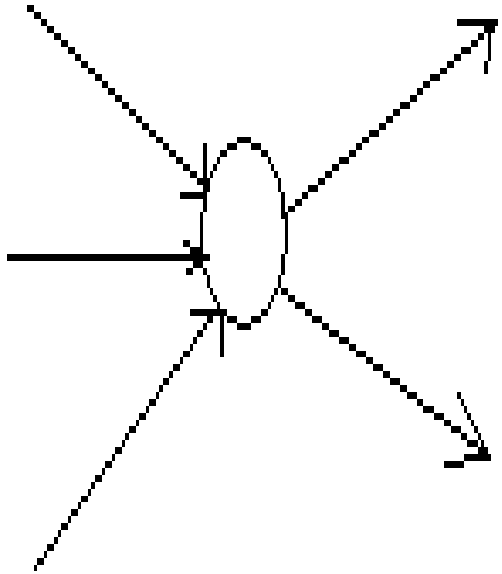
1. **Merge event** – When more than one activity comes and **joins** an event such an event is known as merge event.
2. **Burst event** – When more than one activity **leaves** an event such an event is known as burst event.
3. **Merge and Burst event** – An activity may be merge and burst event at the 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



Merge event



Burst event



Merge and Burst event

- **Duration**
- The **total number of work periods** (in calendar units) required to accomplish the work of the activity. The calendar units may be singular, eg: **weeks, days, minutes; or compound, eg: days and hours.** The duration may be further defined as the: current (planned) duration, actual duration (for completed work), or a defined baseline duration.

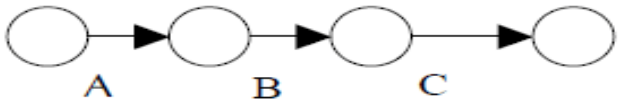
- **Sequencing**
- The first prerequisite in the development of network is to maintain the **precedence relationships.**
- In order to make a network, **the following points should be taken into considerations:**
  - What job or jobs precede it?
  - What job or jobs could run concurrently?
  - What job or jobs follow it?
  - What controls the start and finish of a job?

Rules for Drawing Network Diagram

- **No single activity can be represented more than once in a network.** The length of an arrow has no significance.
- The direction of arrows should **flow from left to right** avoiding mixing of direction. No looping
- **The event numbered 1 is the start event** and an event **with highest number is the end event**.
- Before an activity can be undertaken, all **activities preceding it must be completed.** That is, the activities must follow a **logical sequence (or – interrelationship)** between activities.
- In assigning numbers to events, **there should not be any duplication of event numbers** in a network.
- Dummy activities must be used only **if it is necessary** to reduce the complexity of a network.
- A network should **have only one start event and one end event.**

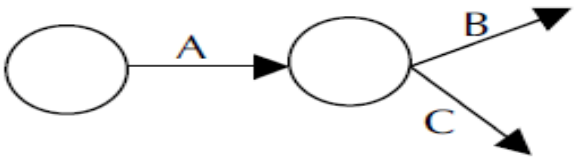
Some Conventions followed in making Network Diagrams

(a)



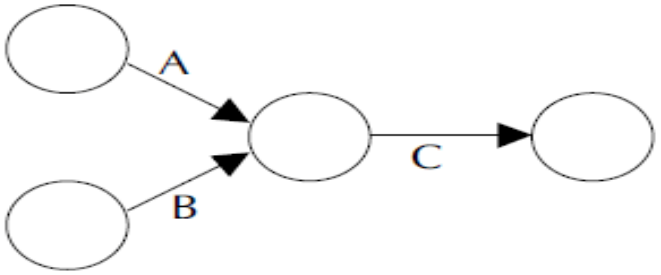
Activity B can be performed only after completing activity A, and activity C can be performed only after completing activity B.

(b)



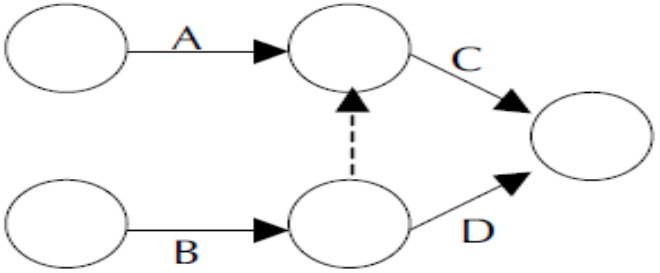
Activities B and C can start simultaneously only after completing A.

(c)



Activities A and B must be completed before start of activity C.

(d)

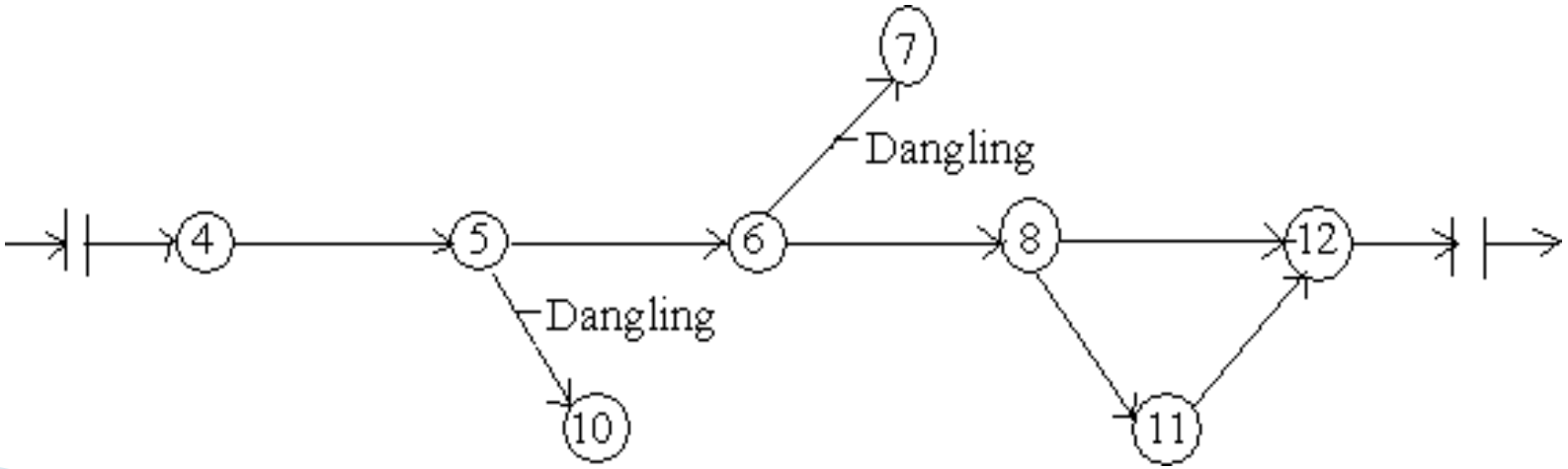


Activity C must start only after completing activities A and B. But activity D can start after completion of activity B.

Common Errors in Drawing Networks

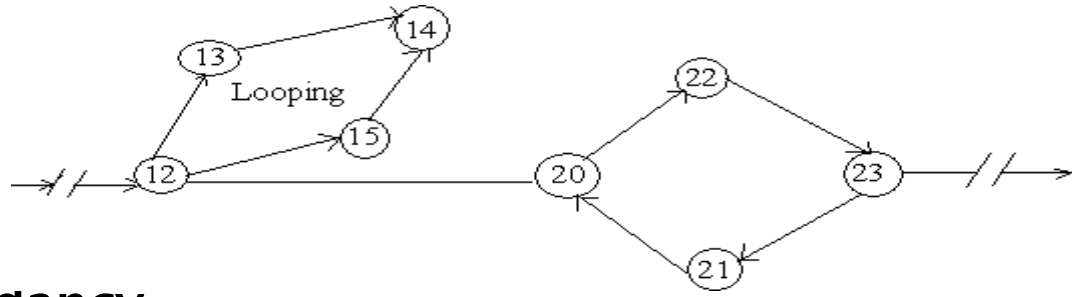
- **Dangling**

- To disconnect an activity **before the completion of all activities** in a network diagram is known as dangling.
- As shown in the figure **activities (5 – 10) and (6 – 7) are not the last activities in the network. So the diagram is wrong and indicates the error of dangling.**

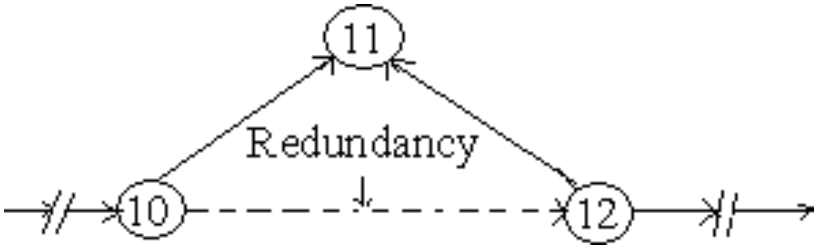


- **Looping or Cycling**

  Looping error is also known as **cycling error** in a network diagram. Drawing an endless loop in a network is known as error of looping as shown in the following figure.



- **Redundancy**
- **Unnecessarily** inserting the dummy activity in network logic is known as the error of redundancy as shown in the following diagram.



Key stages of Critical Path Method

- Identify activities /tasks
- Identify the sequences
- Create a network of your activities.
- Determine the time intervals for completing each activity.
- Find a critical path.

Step-by-Step Process for Using Critical Path Method

- **WBS is the first ingredient** in using the Critical Path Method.
- **Identify all dependencies**
- Tasks that depend on other tasks for their completion, i.e. **dependent tasks**
- Tasks that are independent of others and can be done in parallel to others, i.e. **concurrent tasks**

- **For example**, if you're making a **sandwich**, you can buy bread, vegetables, cheese, and chicken for it simultaneously.
- You can also chop vegetables while the chicken is cooking. Thus, **these would be concurrent tasks.**
- However, ***buying bread*** **and** ***toasting bread*** **are dependent tasks.** You can't toast bread if you don't buy it, after all.

- The next step in the CPM process is
- to establish which of the tasks are dependent and which are concurrent.

- Create a network diagram
- Estimate duration of each activity

- **critical path method describes** the longest sequence of activities necessary to deliver the project successfully**.**
- At its heart, the Critical Path Method is essentially an **algorithm for decision making.**

- This algorithm takes a **task's start time, its duration, and finish time to figure out which activities deserve the most attention (i.e. are "critical" for the project).**

- **Early Start** – the time when **all previous** tasks are completed.
- **Early Finish** – the **nearest start time and the time required** to complete the task.
- **Late Finish** – **all activities are completed** without postponing the deadlines.
- **Late Start** – **the last end time minus** the time it takes to complete the task.

Forward Pass

- **Start from the first event** for computation of EST.
- Consider the EST (Early start time) of the first activity as **zero**
- **Add the activity duration** to the EST of **preceding** event to get the EST of **succeeding** event.
- Whenever an event is **competing** with **two or more activities (Merge Event)**, the **largest value** must be considered to arrive at the EST of the succeeding event**. EST is the result of forward pass.**

$$ESj = \max(ES\,i + Di\,j)$$

i : starting activity j: ending activity Di j : duration of the activity

Backward Pass

- Consider the **LCT (latest completion time) value of the last event as equal to its EST value.**
- In **contrast to the forward pass, start from the last event** and **subtract** the activity duration from the LCT of succeeding event to arrive at the LCT of **the preceding** event.

- When **two or more activities are backing** to an even (**Burst Event**), the **smallest** of these must be taken into account for the LCT of **preceding** event.

LCT is the result of backward pass.

- **LC i= Min (LC j- Di j)**

Conditions for critical path

- 1. Esi = Lci
- 2.Esj = Lcj
- 3.Esj – Esi =Lcj – Lci = Dij

- Esi: Earliest start time of starting activity
- Lci: Latest completion time of starting activity
- Es j : Earliest start time of ending activity
- Lcj: Latest completion time of ending activity

i : starting activity j: ending activity

Di j: duration of an activity

PERT(PROJECT Evaluation & Review Technique

- PERT charts were created in the 1950s to help manage the creation of weapons and defence projects for the US Navy working on the polar's missile programme.

- PERT is similar to critical path in that they are both used to visualize the timeline and the work that must be done for a project. **However with PERT, you create three different time estimates for the project.**
- **You estimate**
- The Shortest possible time(**to**: **optimistic**)each task will take,
- The Most Probable Time (**tm**: **Most Likely**) and
- The Longest Time (**tp**: **Pessimistic**) the tasks might take if things don't go as planned.
- Hence you need to calculate the **Estimated Time**(**te**):

$$te = to + 4tm + tp / 6$$

Project Crashing

- Project crashing is the method for **shortening** the project duration by **reducing the time of one or more critical activities** to less than their normal time.

- Crashing **accelerates delivery and increases spending**; however, it will have no effect on the scope of the project.

- **The objective of crashing is: To reduce Project duration while minimising cost of crashing**

Crashing Procedure

1. **Critical path:** Find the normal critical path and identify the critical activity.

2. **Cost slope:** Calculate the cost slope for the different activities by using the formula:

Cost slope =Crash cost-Normal cost/Normal time-Crash Time

The cost slope indicates the **extra cost required** to expedite an activity per unit time.

- **3.Ranking**: Rank the activities in the ascending order of cost slope . The activity having the minimum cost slope have to be crashed first, crash the selected activity to its minimum duration.

- **4.Crashing**: Crash the activities in the critical path as per the ranking i.e., activity having lower cost slope would be crashed first to the maximum extent possible Calculate the new direct cost by cumulative adding the cost of crashing to the normal cost.

5.Parallel crashing : As the critical path duration is reduced by the crashing in step 3, **other paths also become critical**, i.e., we get parallel critical path. This means that project duration can be reduced duly by simultaneous crashing activity on the parallel critical path.

6.Determine Total cost :

Crashing as per steps 3 and 4, one reaches a point when further crashing is either not possible or does not result in the reduction of project duration.

For the different project durations **total cost is got by adding corresponding fixed cost to the direct cost, and the direct cost is got by adding the expediting crashing cost commutative to the normal cost.**

Depreciation

- Definition: The monetary value of an asset decreases over time due to use, wear and tear or obsolescence. This decrease is measured as depreciation.

  Depreciation, i.e. a decrease in an asset's value, may be caused by a number of other factors as well such as unfavourable market conditions, etc. Machinery, equipment, currency are some examples of assets that are likely to depreciate over a specific period of time. Opposite of depreciation is appreciation which is increase in the value of an asset over a period of time.

Three main inputs are required to calculate depreciation:

- Useful life – this is the time period over which the organisation considers the fixed asset to be productive. Beyond its useful life, the fixed asset is no longer cost-effective to continue the operation of the asset.

- Salvage value – Post the useful life of the fixed asset, the company may consider selling it at a reduced amount. This is known as the salvage value of the asset.

- The cost of the asset – this includes taxes, shipping, and preparation/setup expenses.

Types

- **Straight-line depreciation method**

  Annual Depreciation expense = (Asset cost – Residual Value) / Useful life of the asset

- Example – Suppose a manufacturing company purchases a machinery for Rs. 100,000 and the useful life of the machinery are 10 years and the residual value of the machinery is Rs. 20,000

  Annual Depreciation expense = (100,000-20,000) / 10 = Rs. 8,000