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NETWORK ANALYSIS

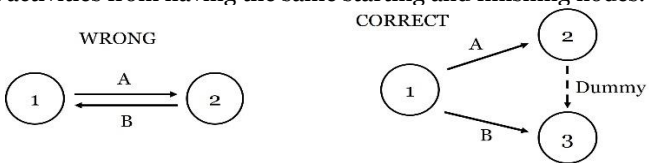
CONTENTS

Network analysis is used to analyze, control, and monitor complex business processes and project workflows. Its primary goal is to complete projects efficiently within the shortest possible timeframe. Network analysis involves creating a flow diagram to identify task sequences, concurrent tasks, and critical tasks essential to project success. This visual representation enables project managers to determine task dependencies and optimize resource allocation.
Network analysis has a rich history, dating back to 1958 when the US Naval Special Projects Office developed Project Evaluation and Review Technique (PERT). This innovation led to various network analysis variants, including Critical Path Method (CPM), Critical Path Analysis (CPA), Critical Path Scheduling (CPS), and Critical Path Planning (CPP). By applying network analysis, organizations can improve project planning and control, enhance task coordination and efficiency, reduce project duration and costs, and increase visibility into critical tasks and dependencies.

NETWORK TERMINOLOGY

The tasks are referred to as activities. An **activity** consumes time and resources and is represented by a single arrow that runs between two events.
An **event** is the start and/or end of an activity and is represented by a circle (called a node) and the **event** number is written within the **circle**.
NOTE: The main difference between activity and event is that activity represents the passage of time while event is a point in time.
In this figure, the activity is between event 1 and event 2

A **dummy activity** is an activity which consumes neither time nor resources and is only used to ensure adherence to the rules for drawing a network diagram. It is usually represented by a dotted line. The dummy activity prevents two different activities from having the same starting and finishing nodes.



A **path** is a sequence of activities from the start to the end of the network. The **critical path** is a sequence of activities which has the longest total duration and

gives the shortest time possible to complete the project. A c**ritical activity is** any activity on the critical path. If there is any delay in starting or finishing critical activities, the duration of the project will be prolonged.

NETWORK DIAGRAM

A network diagram is a graphic representation of the tasks and workflow for a project. It considers the chronological order of events, milestones and tasks, their durations and dependencies and visualizes them graphically or as a table.
Before starting to draw the network, the following measures should be taken:

- Identify all activities with their durations.
- Establish the logical sequence of the activities [i.e. which activities can be done one after the other (preceding activities) and which ones can be done simultaneously].
- Ensure that all activities contribute to the progression of the project. Otherwise, discard them.
- Ensure that the network diagram has a starting event and a finishing event.

CRITICAL PATH METHOD

Critical path method (CPM) is a step-by-step project management technique to identify activities on the critical path. The critical path determines the shortest time possible to complete the project. Delays in any of the critical path activities will directly impact the project completion time. Non-critical activities have slack time and do not impact the project duration if delayed within their slack limits.

☑ EXAMPLE 20.1

The *Time Traveler* software development project has the following activities:

Activity	Preceding Activity	Activity Description	Duration (Weeks)
A	-	Formalize specifications	3
B	A	Design software	7
C	A	Write tutorials	2
D	B,C	Format tutorials	2
E	B	Release prototype	6
F	E	Release software	5
G	D	Release tutorials	1

a) Draw the network diagram for the project.
b) Identify all the paths and compute the duration for each path.
c) Determine the critical path and the critical activities.

SOLUTION **tips**

a) Take it step by step. Using the hints for drawing network diagrams given above, start off with activity A which has no preceding activity(ies), then follow through with activities B, C, D, E, F and G as they follow A progressively. Note that the events are numbered from 0, the start event, through to 6, the finish event. A dummy is necessary between 2 and 3 because no time was expended on the activity. The activities and their durations are as shown in the diagram: