كلية الرشيد الجامعة
قسم هندسة تقنيات الحاسوب
المرحلة / الرابع
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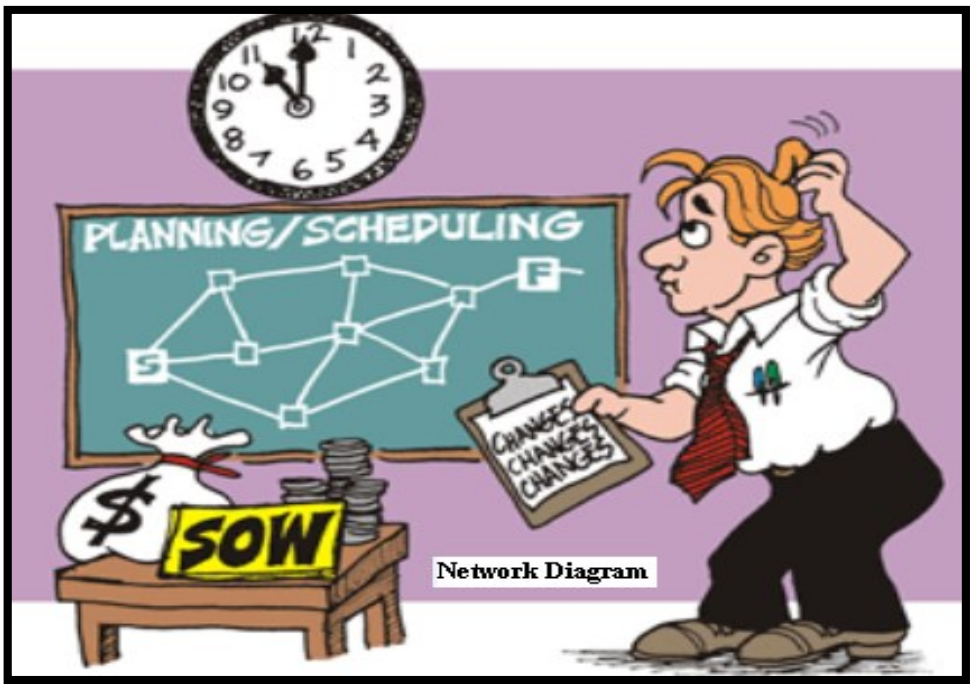
مدرس المادة / د. محمد علاء حسين

Project Planning Techniques
Network analysis
Critical Path Method (CPM)



Lecture By
Department Of Computer Technical Engineering
Dr. Mohammed Alaa Hussein

Lecture 8

1. Overview

a. **Target Population:** For students of stage of second and fourth stage in technical Colleges and institutes in foundation of technical education.

b. **Rationale:** The most common and widely used project management technique that can be classified under the title of Network Analysis is Critical Path Method (CPM). It was developed in the 1950's to help managers schedule, monitor and control large and complex projects. CPM was first used in 1957 to assist in the development and building of chemical plants within the DuPont corporation.

a. **Central Ideas:** The basic purpose of a network analysis is to help managers schedule, monitor and control large and complex projects.

b. **Objectives:** The student will be able after finishing lecture on:

- Define Critical Path Method (CPM).
- Study steps of CPM.

2. Pre-Test:

1. Define the term 'CPM.
2. CPM predicts the time required to complete the project— State True or False
3. The time between its earliest and latest start time, or between its earliest and latest finish time of an activity is

   a) delay time b) slack time c) critical path d) start time
4. The path through the project network in which none of the activities have slack is called
   a) start time b) slack time c) critical path d) delay time
5. Activity is an ---------- needed for the completion of a project.

Note: Check your answers in "Answer Keys" in end of mode unit. If you obtain 75% of solution, you cannot need to this mode unit. If your answer is poor, you will transfer to next page.

3. Theory:

Introduction

Critical Path Method (CPM) or (Calculate Schedule) is a modeling process that defines all the project's critical activities which must be completed on time. CPM models the activities and events of a project as a network.

Steps in CPM Project Planning

1. Specify the individual activities.
2. Determine the sequence of those activities.
3. Draw a network diagram.
4. Estimate the completion time for each activity.
5. Identify the critical path (longest path through the network)
6. Update the CPM diagram as the project progresses.

CPM Benefits

- Provides a graphical view of the project.
- Predicts the time required to complete the project.
- Shows which activities are critical to maintaining the schedule and which are not.

Critical path is the longest-duration path through the network. The significance of the critical path is that the activities that lie on it cannot be delayed without delaying the project. Because of its impact on the entire project, critical path analysis is an important aspect of project planning. The critical path can be identified by determining the following four parameters for each activity:

1. Earliest Start time (ES): the earliest time at which the activity can start given that its precedent activities must be completed first.
2. Earliest Finish time (EF), equal to the earliest start time for the activity plus the time required completing the activity.
3. Latest Finish time (LF): the latest time at which the activity can be completed without delaying the project.
4. Latest Start time (LS), equal to the latest finish time minus the time required to complete the activity.

4. Self-Test:

1. Define the term “critical path”.
2. List the benefits of CPM.

The **slack time** or **Total float** for an activity is the time between its earliest and latest start time, or between its earliest and latest finish time. Slack is the amount of time that an activity can be delayed past its earliest start or earliest finish without delaying the project.

The critical path is the path through the project network in which none of the activities have slack, that is, the path for which ES=LS and EF=LF for all activities in the path. A delay in the critical path delays the project. Similarly, to accelerate the project it is necessary to reduce the total time required for the activities in the critical path.

Activity is an individual task needed for the completion of a project.
Duration is the length of time (hours, days, weeks, months) needed to complete an activity.

Float is the amount of time that an activity can slip past its duration without delaying the rest of the project.

Free float is the excess time available before the start of the following activity.

3. The time between its earliest and latest start time, or between its earliest and latest finish time of an activity is
   a) delay time b) slack time c) critical path d) start time
4. ---------- is the longest-duration path through the network.

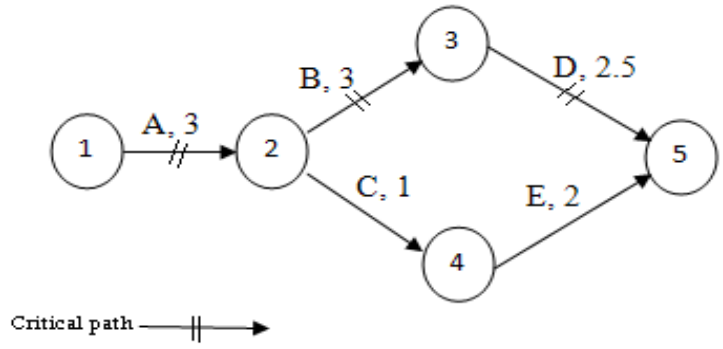
Activity on arrow (A.O.A)

Examples

Ex1: Determine the critical path by using CPM of the following Table (project),

Activities	Path	Duration (day)	Description
A	1 — 2	3	وصف مختصر لكل فعالية
B	2 — 3	3	
C	2 — 4	1	
D	3 — 5	2.5	
E	4 — 5	2	

Ans:

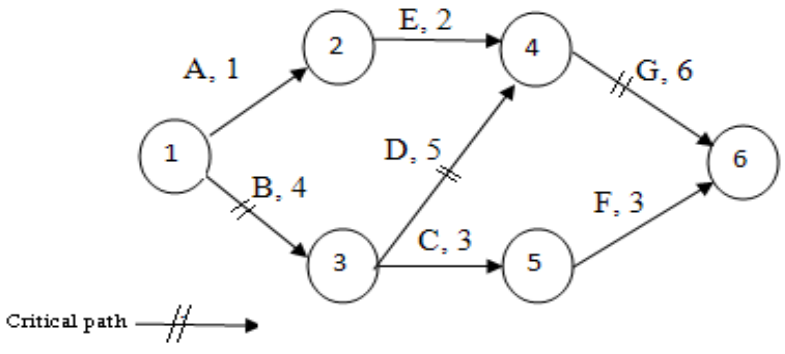


Critical path =3+ 3+ 2.5= 8.5 days

Ex2: Determine the critical path by using CPM of the following Table (project),

Activities	Path	Duration (week)	Description
A	1 — 2	1	وصف مختصر لكل فعالية
B	1 — 3	4	
C	3 — 5	3	
D	3 — 4	5	
E	2 — 4	2	
F	5 — 6	3	
G	4 — 6	6	

Ans:



Critical path= 4+ 5+ 6= 14 weeks