Chapter 10

Project Management with PERT/CPM

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PERT: program evaluation and review technique

CPM: critical path method

Use a project network: (AON)

- nodes — activities, or tasks, to be performed
- arcs — show immediate predecessors to an activity
- times — duration times of activities are written next to the node

Reliable Construction Company Example

TABLE 10.1 Activity list for the Reliable Construction Co. project

Activity	Activity Description	Immediate Predecessors	Estimated Duration
A	Excavate	—	2 weeks
B	Lay the foundation	*A*	4 weeks
C	Put up the rough wall	*B*	10 weeks
D	Put up the roof	*C*	6 weeks
E	Install the exterior plumbing	*C*	4 weeks
F	Install the interior plumbing	*E*	5 weeks
G	Put up the exterior siding	*D*	7 weeks
H	Do the exterior painting	*E, G*	9 weeks
I	Do the electrical work	*C*	7 weeks
J	Put up the wallboard	*F, I*	8 weeks
K	Install the flooring	*J*	4 weeks
L	Do the interior painting	*J*	5 weeks
M	Install the exterior fixtures	*H*	2 weeks
N	Install the interior fixtures	*K, L*	6 weeks

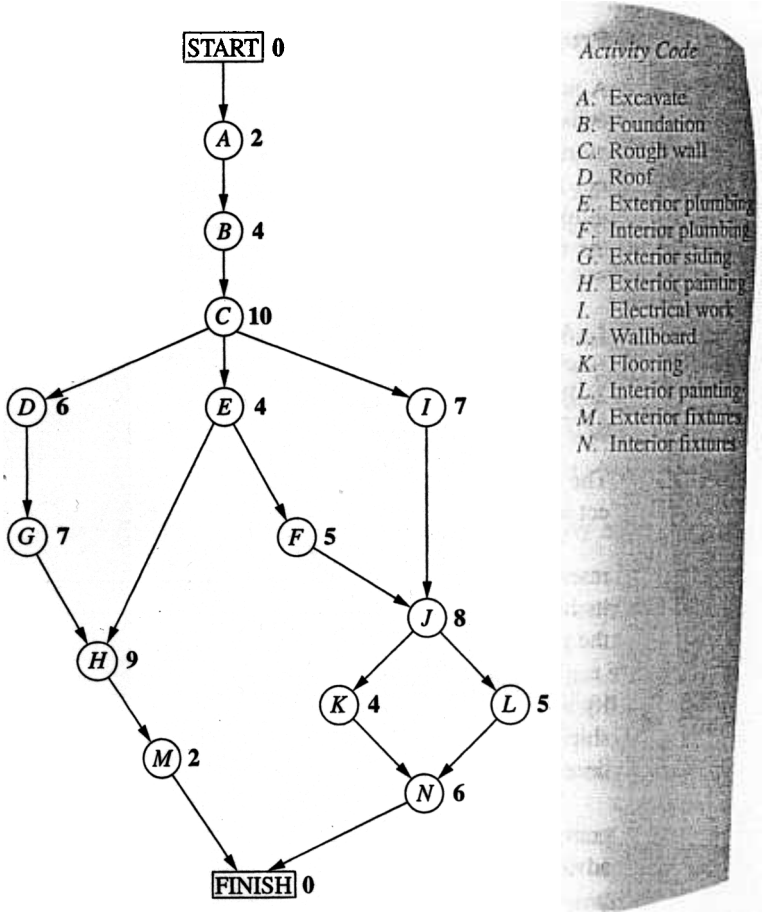
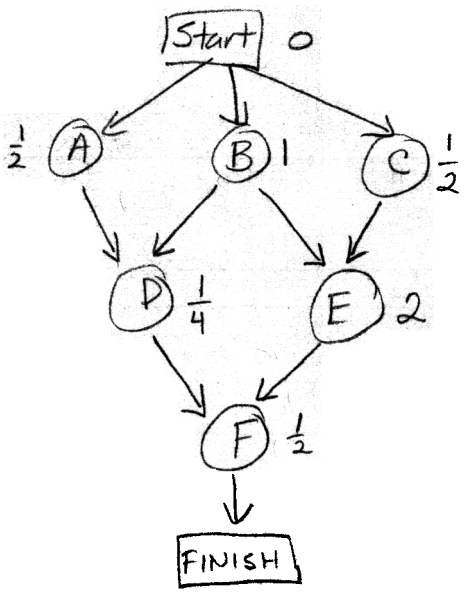


FIGURE 10.1
The project network for the Reliable Construction Co. project.

Bake a Cake Example

Tasks	Immediate Predecessors	Task Time
A: Buy frosting ingredients	—	$\frac{1}{2}$ hr.
Clean up kitchen	—	1 hr.
Buy cake ingredients	—	$\frac{1}{2}$ hr.
Prepare frosting	A, B	$\frac{1}{4}$ hr.
E: Prepare batter & bake	B, C	2 hr.
Frost cake	D, E	$\frac{1}{2}$ hr



Critical Path

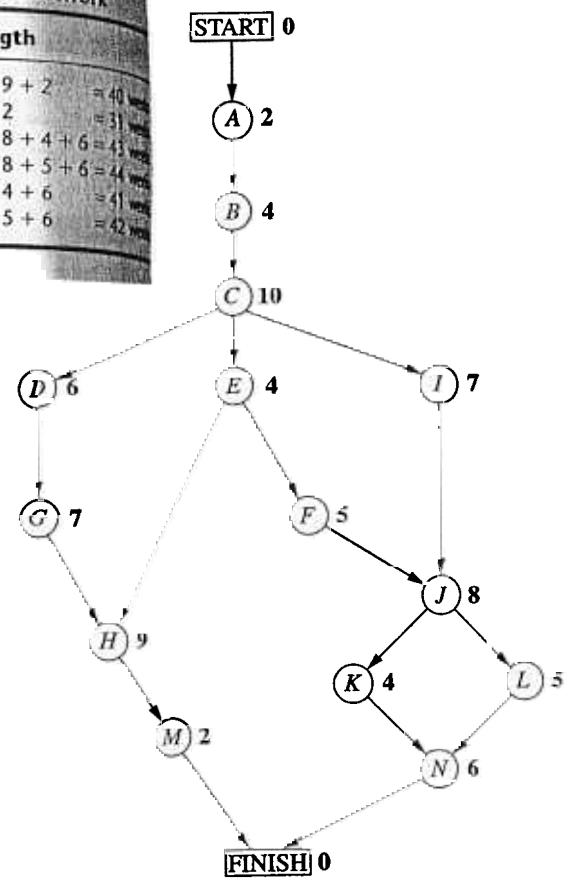
A path through a project network is a route from START to FINISH

length of a path is the sum of the task times (durations) of the nodes (activities) on the path

critical path is the longest path. The project duration is the length of the longest path.

TABLE 10.2 The paths and path lengths through Reliable's project network

Path	Length
START →A→B→C→D→G→H→M→ FINISH	2 + 4 + 10 + 6 + 7 + 9 + 2 = 40 weeks
START →A→B→C→E→H→M→ FINISH	2 + 4 + 10 + 4 + 9 + 2 = 31 weeks
START →A→B→C→E→F→J→K→N→ FINISH	2 + 4 + 10 + 4 + 5 + 8 + 4 + 6 = 43 weeks
START →A→B→C→E→F→J→L→N→ FINISH	2 + 4 + 10 + 4 + 5 + 8 + 5 + 6 = 44 weeks
START →A→B→C→I→J→K→N→ FINISH	2 + 4 + 10 + 7 + 8 + 4 + 6 = 41 weeks
START →A→B→C→I→J→L→N→ FINISH	2 + 4 + 10 + 7 + 8 + 5 + 6 = 42 weeks



Activity Code

A. Excavate
B. Foundation
C. Rough wall
D. Roof
E. Exterior plumbing
F. Interior plumbing
G. Exterior siding
H. Exterior painting
I. Electrical work
J. Wallboard
K. Flooring
L. Interior painting
M. Exterior fixtures
N. Interior fixtures

FIGURE 10.1
The project network for the Reliable Construction Co. project.

To find the critical path & slacks

ES = earliest start time for an activity
EF = " finish time

EF = ES + activity duration time

ES for activity i = largest EF of the immediate predecessors

LS = latest start time for an activity
LF = " finish " " " "

LS = LF − activity duration time

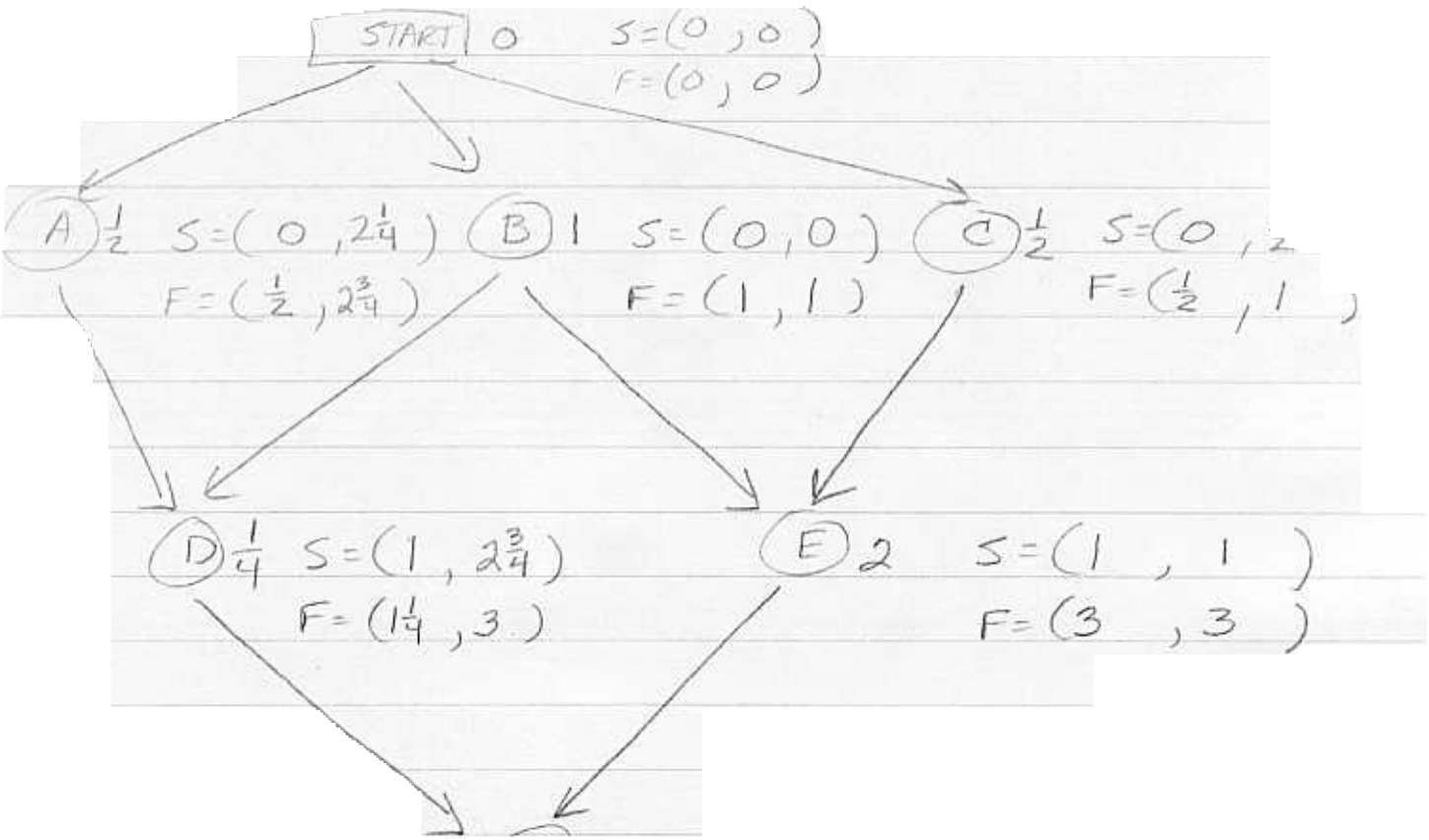
LF for activity i = smallest LS of the immediate successors

Slack = LF − EF = LS − ES

If slack is zero, the activity is on the critical path

S ES, LS

F EF LF



C. Critical Path is Start → B → E → F → Finish

Activity D has slack of 1 3/4 hrs (start of D could be delayed without affecting total project duration)