SCHEDULING

TIME-COST TRADE-OFF

When it comes to time-cost trade off in scheduling we are really talking about trying to expedient activities. There are generally two conditions, Normal and Crashed.

→ Normal Schedule : You have the normal schedule if everything is expected and you plan activities and the schedule with no constraints.

→Crash Schedule: Expediting activities, by applying additional resources

- -Specialized or additional equipment
- - More people (e.g. borrowed staff, temps)
- - More hours (e.g. overtime, weekends)

→ Crashing a schedule buys time, but nothing comes free

Potential cost areas

- - Additional equipment/material
- - Extra labor
- - Negative effects on other projects
- - Reduced morale, from excessive hours/shifts
- -Lower quality, from the pressure of time, inexperienced and tired staff "If you want it bad, you'll get it bad . . ."

When Trying to Crash a Project . . .

→ Two basic principles

1. Generally, focus on the critical path
   - Usually not helpful to shorten non-critical activities
   - Exception: When a scarce resource is needed elsewhere, e.g., in another project
2. When shortening project duration, choose least expensive way to do it

→ Compute cost/time slope for each expedited activity

$$\text{Slope} = \frac{\text{crash cost} - \text{normal cost}}{\text{crash time} - \text{normal time}}$$

An Example

Activity	Predecessor	Days (normal, crash)	Cost (normal, crash)
a	-	3, 2	$40, 80
b	a	2, 1	20, 80
c	a	2, 2	20, 20
d*	a	4, 1	30, 120
e**	b	3, 1	10, 80

* Partial crashing allowed

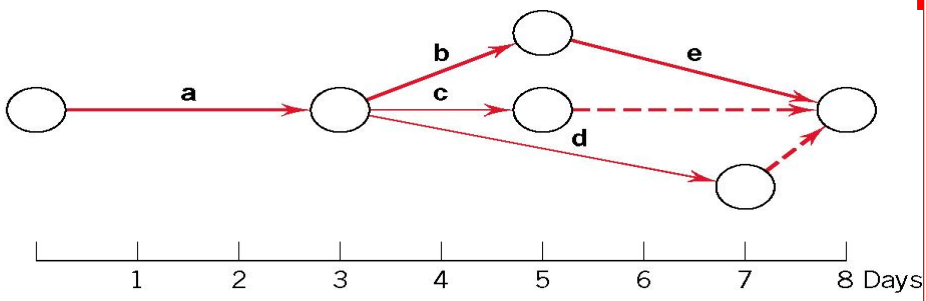
** Partial crashing not allowed

Cost per Day to Crash

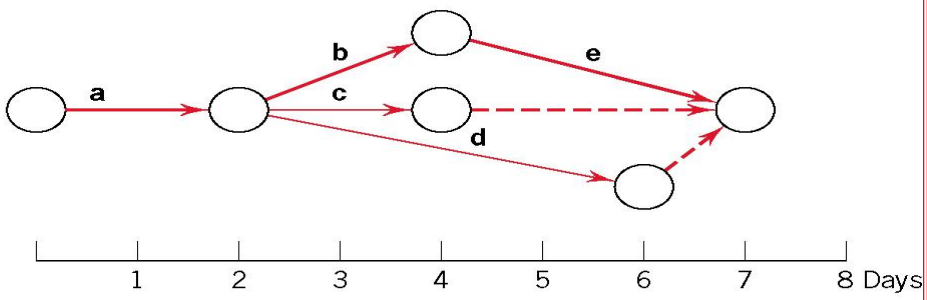
Activity	$ Saved/Day
a	40
b	60
c	-
d	30
e	70 (2 days)

A CPM Example

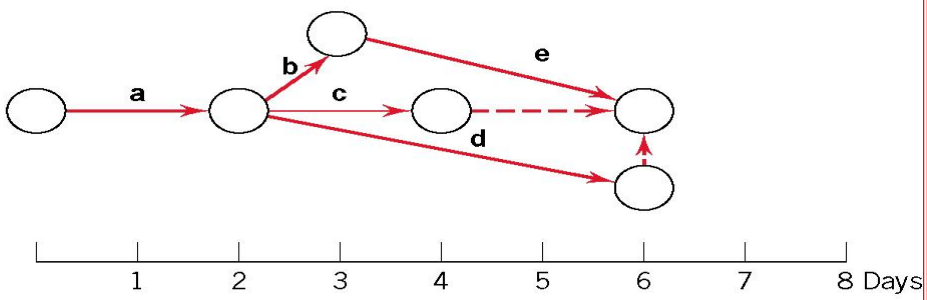
a. Normal Schedule
8 Days, $120



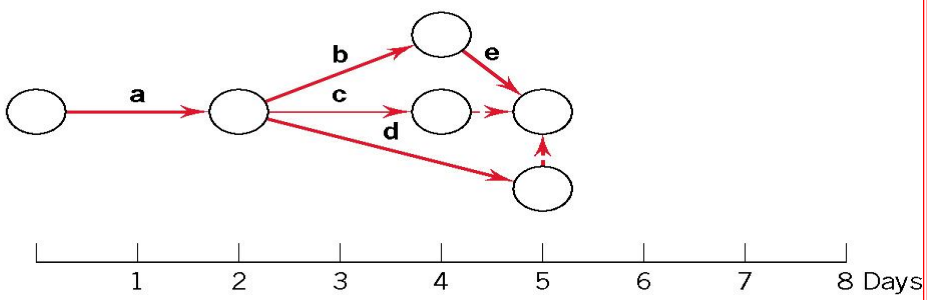
b. 7-Day Schedule,
$160



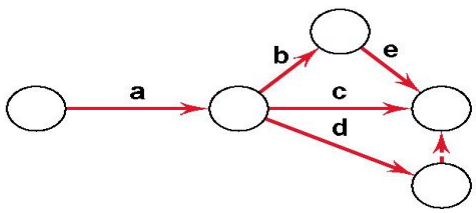
c. 6-Day Schedule,
$220



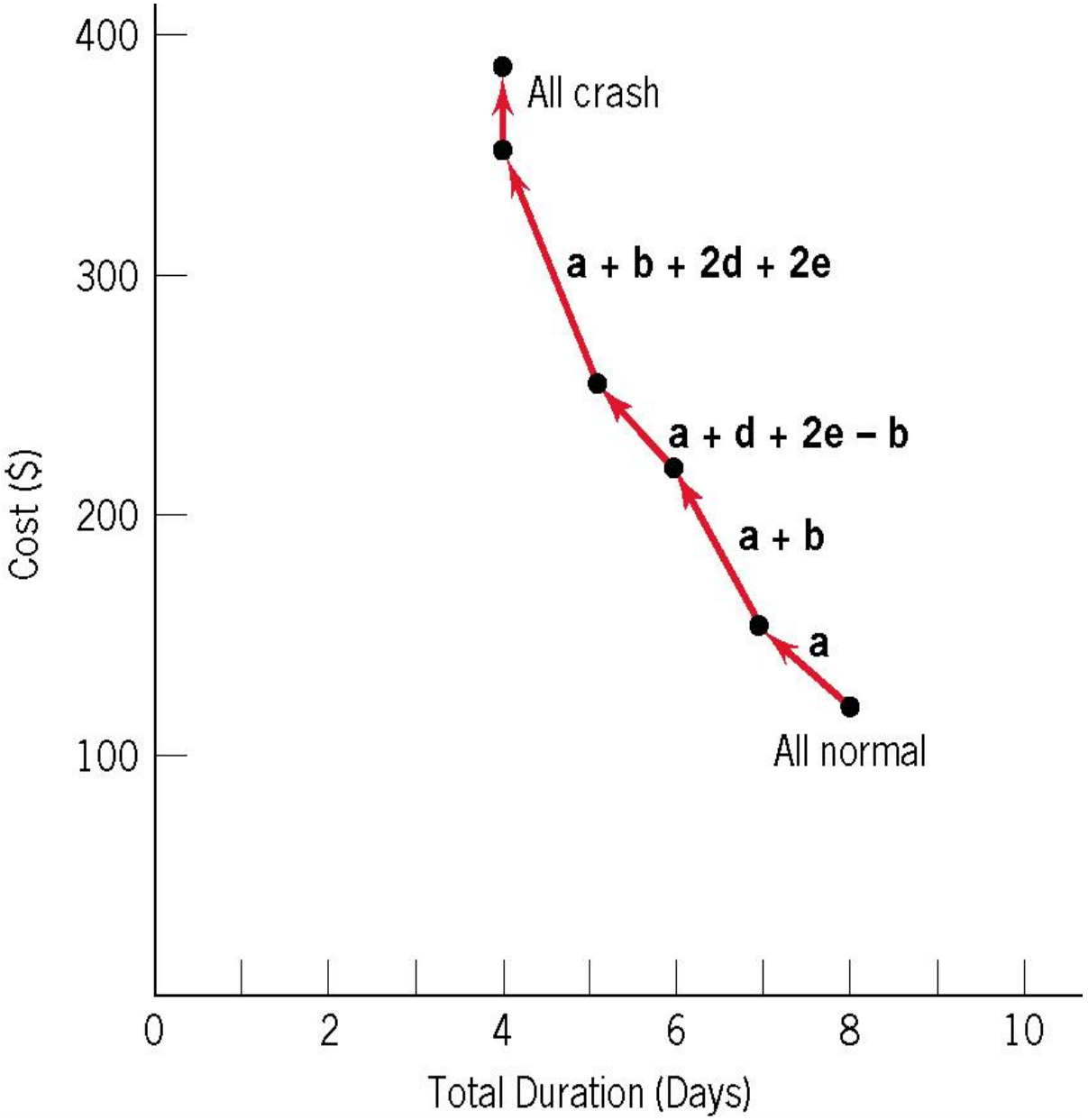
d. 5-Day Schedule,
$260



e. 4-Day Schedule,
$350



CPM Cost-Duration



Another Approach to Expediting: Fast-tracking/Concurrency

- Different terms for similar concept
  - "Fast-tracking" (construction), "Concurrent engineering" (manufacturing)
  - Both refer to overlapping project phases
    - E.g., design/build, or build/test

→ Pros:

- Can shorten project duration
- Can reduce product development cycles
- Can help meet clients' demands

→ Cons:

- Can increase cost through redesigns, excessive changes, rework, out-of-sequence installation, and more

As the saying goes "Cost, Schedule, or Performance: Pick Any Two . . ."