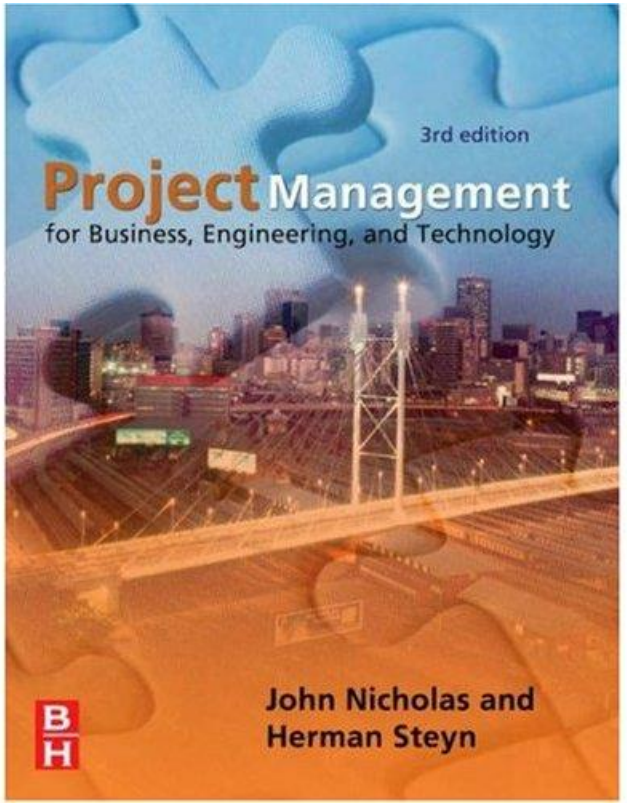
Chapter 7 (Cont'd)
Allocating Resources

Project Management for Business, Engineering, and Technology



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Allocating Resources

- Different tasks within a project typically rely on the shared resources (equipment and staff)
- Different projects within an organization (especially a matrix organization) also share resources
- Resources must not have unrealistic workloads
- Functional managers prefer more or less uniform workloads on their resources

Allocating Resources - Complexity

Say you have to do 10 tasks and you can start with any one. How many possible schedules exist?

10 x 9 x 8 x 7 x 6 x 5 x 4 x 3 x 2

> 3.6 million

And only one resource is involved in this example

Allocating Resources - Complexity

- Even with modern computers, attempts to develop optimal schedules for multiple projects require intolerably large amounts of computing time
- The practical way is to use *heuristic rules* to allocate resources (project scheduling software use such rules)

Heuristic Rules

- Schedule activities as early as possible
- Analyze the schedules for resource loading
- When a resource is needed at more than one place at the same time, (a resource is overloaded) use a heuristic rule to decide to which activity the resource should be allocated
- If one project has a high priority, it makes sense to give preference to that project when allocating resources

A Common Heuristic Rule: Least Slack

- If an activity is on the critical path, it should get preference when allocating resources
- Critical activities have the least slack
- Activities on near-critical paths should also have some priority
- Least slack rule: Activities with zero slack have priority, then ones with one day slack, and so on

A Common Heuristic Rule: Shortest Task Time

- Activities with shortest duration get priority
- It has motivational value (perception that work is getting done) – but that could be misleading!
- Succeeding activities can start early. This reduces the total waiting time:

A Common Heuristic Rule: Shortest Task Time

Total waiting time is reduced

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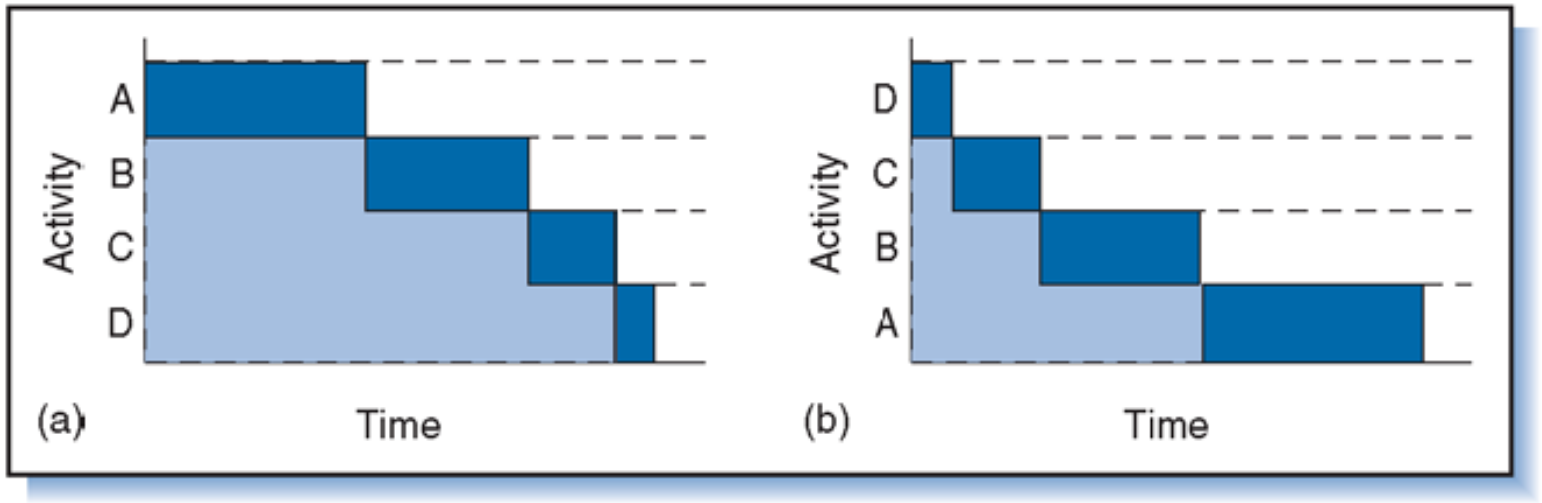


Figure 7-24
The shortest task time rule reduces waiting time. (a) Longest activity first. (b) Shortest activity first.

Several Rules Exist

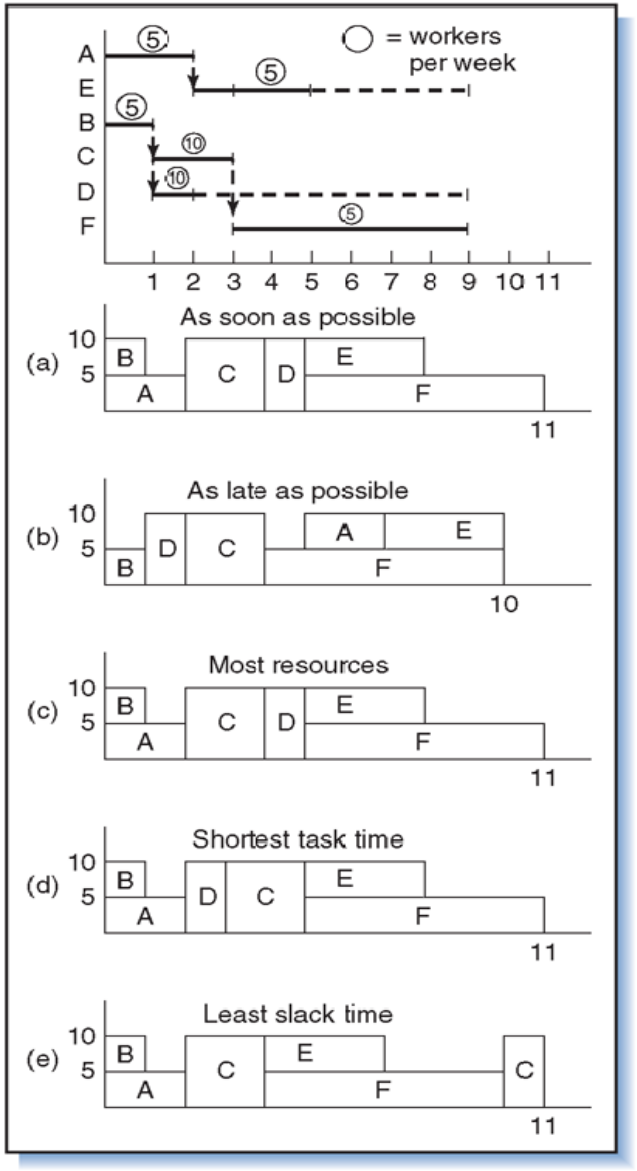
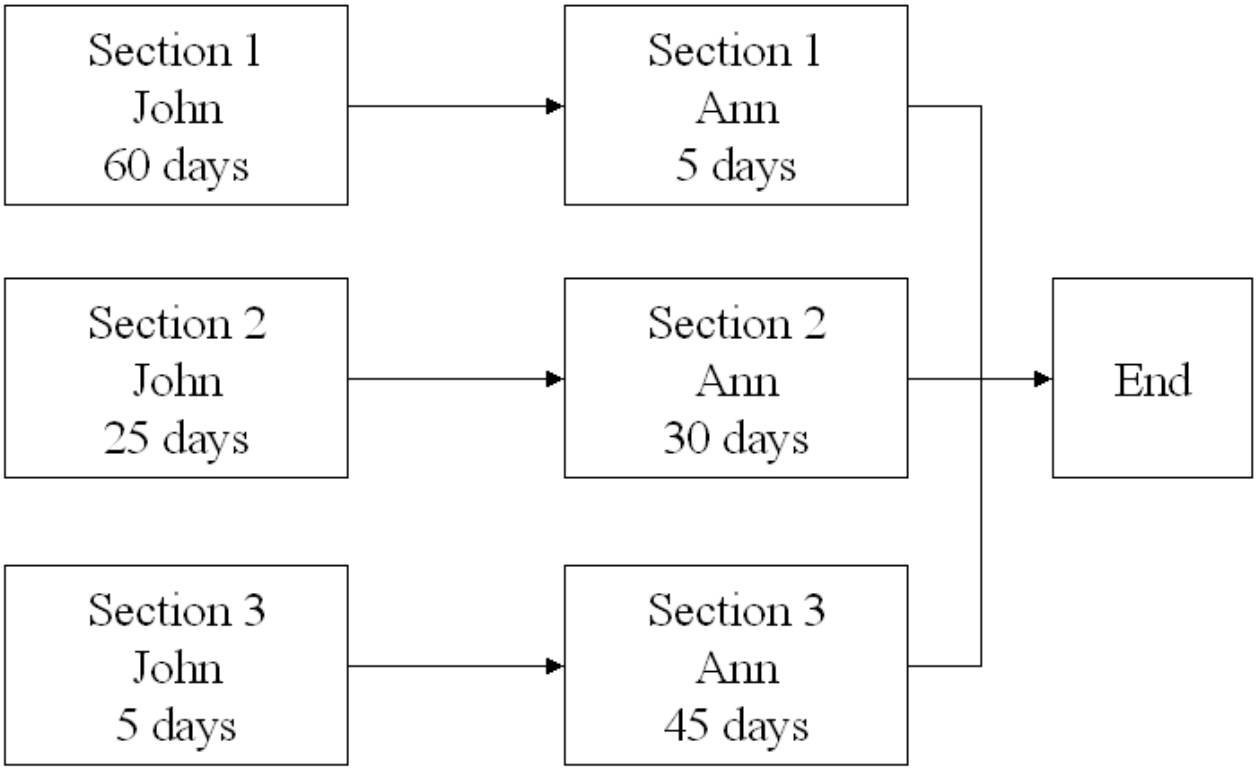


Figure 7-23
Results of several priority rules on project schedule and completion times.

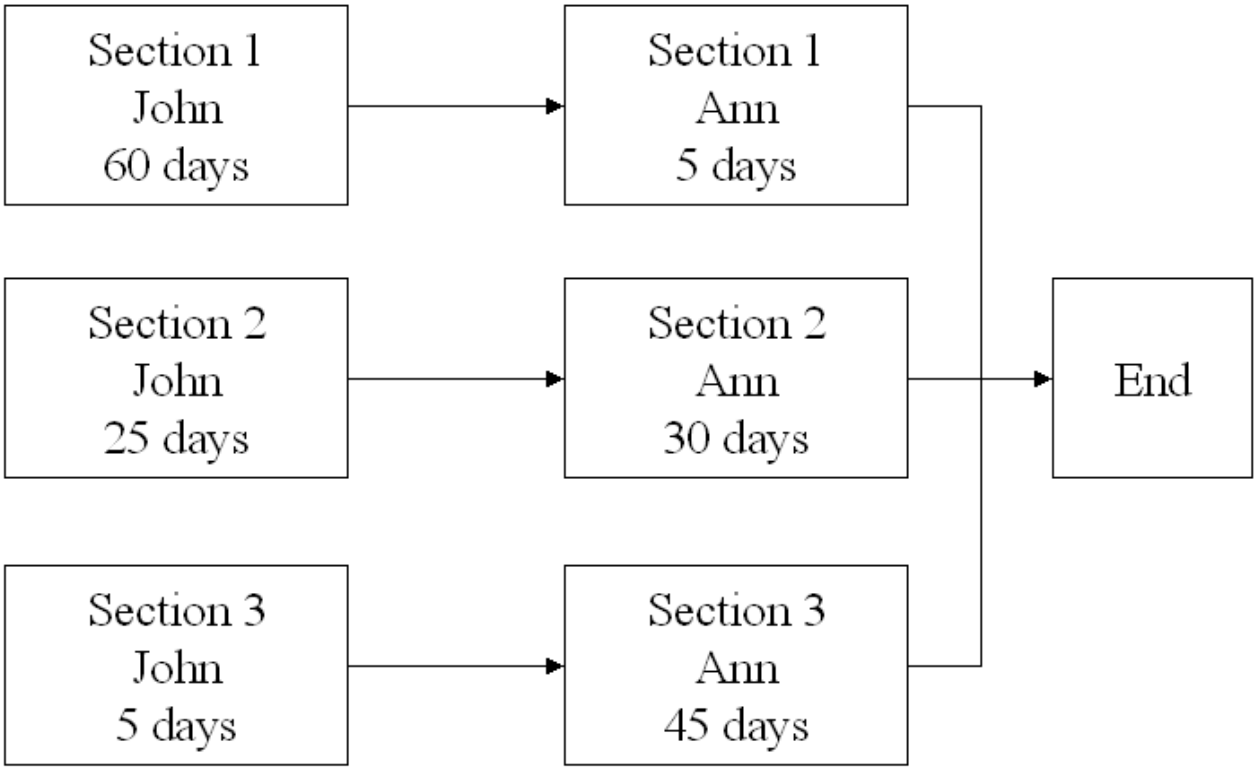
Class Exercise

Use the Shortest Task Time rule to schedule the following small project:



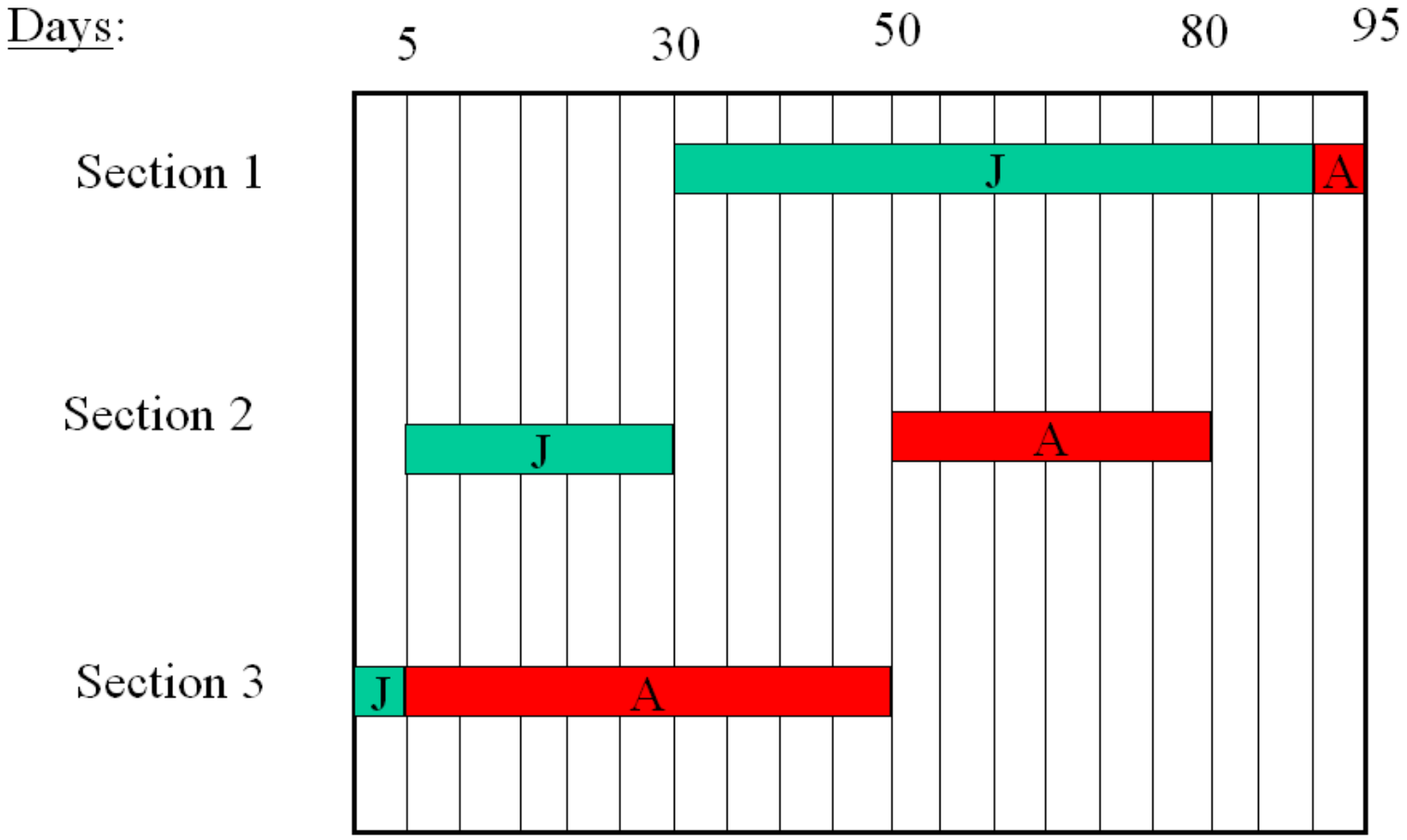
Class Exercise (Cont'd)

Then use the Least Slack rule to schedule the same project:



Class Exercise -Solution

Shortest Task Time Rule



Class Exercise -Solution

Least Slack Rule:

- All activities to be performed by John (as well as the work Ann has to do on Section 1) have zero slack
- This rule does not indicate with which one John should start
- This is called a “tie” between the activities
- A secondary rule is needed to break a tie

The TOC Method for Multiple Projects

5-step process – see page 259 for analogy of a chain

- Step 1: Identify the constraint / bottleneck
- Step 2: Decide how to exploit (utilize) the constraint
- Step 3: Subordinate all non-constraints to the decision made in Step 2
- Step 4: Elevate the constraint
- Step 5: Return to Step 1 to identify new constraint

The TOC Method for Multiple Projects

- Constraint for individual project: duration
- Goal of organization handling multiple projects: maximize flow of projects through the system

Step 1: Identify the constraint

- Constraint may be a specific resource that limits the number of projects that can be handled

The TOC Method for Multiple Projects

Step 1 (Cont'd):

- Constraint for planning and execution sometimes not the same
- For planning a set of projects a rule may be used as proxy for the constraint
- Example of rule: *three projects in execution phase*

The TOC Method for Multiple Projects

Example of rule for planning:

Three projects in execution phase

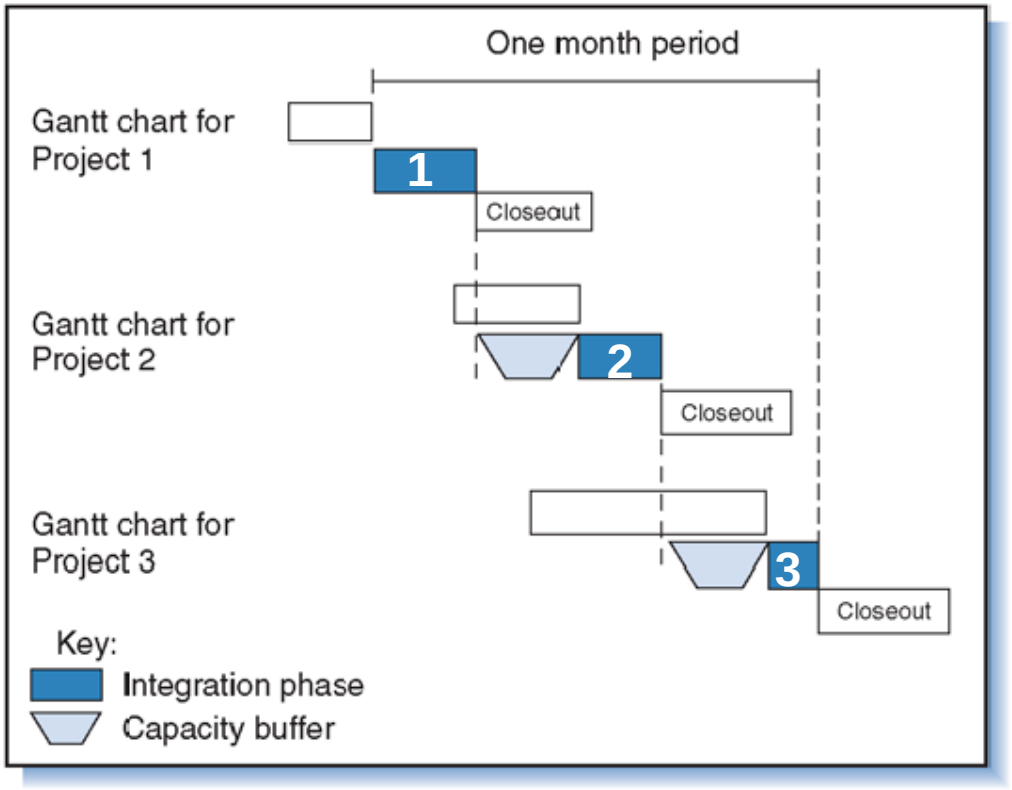


Figure 7-25
Capacity buffer used to stagger projects.

The TOC Method for Multiple Projects

Step 1 (Cont'd):

- Constraint for executing work may be the time that managers have available to spend on monitoring projects

Step 2: Decide how to exploit the constraint

- For rule: *Three projects in execution phase,* insert Capacity Buffers to stagger projects
- If management time is constraint during execution, they should not spend time on activities such as attempting to keep all resources busy all the time

The TOC Method for Multiple Projects

Step 4: Elevate constraint

- This could imply adding additional capacity
- For the constraint *Three projects in execution phase* it could imply additional capacity to increase the number of projects in execution from 3 to 4
- As this is costly, it is done only after Step s 2 and 3
- Elevate management time: simplify management systems

The TOC Method for Multiple Projects

Step 5: Return to Step 1

- Adding additional capacity might remove the constraint and a new constraint may emerge
- Sometimes taking a new constraint into account could be disruptive and the decision may be made *not* to take another constraint into account

The TOC Method for Multiple Projects

Three rules used by consultancy that implement the TOC method for multiple projects:

1. During planning, stagger the release of projects
2. Plan aggressive durations, using project buffers 1/3 of critical chain length
3. During execution:
   a) Priorities determined by buffer status (Chapter 11)
   b) Minimize buffer consumption by performing all work as soon as possible

Source: Training material of Realization Technologies Inc. www.realization.com