


Advanced topics in planning and scheduling

Chapter 11



Common reasons new projects miss delivery dates

Based on Kickstarter projects, the most common reasons that new projects do not meet their delivery dates include:

1. Manufacturing obstacles
 2. Shipping
 3. Volume
 4. Apple's "curve ball"
 5. Changing scope
 6. Certifications
 7. Kickstarter's infrastructure
 8. Overseas logistics
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Critical chain project management (CCPM)

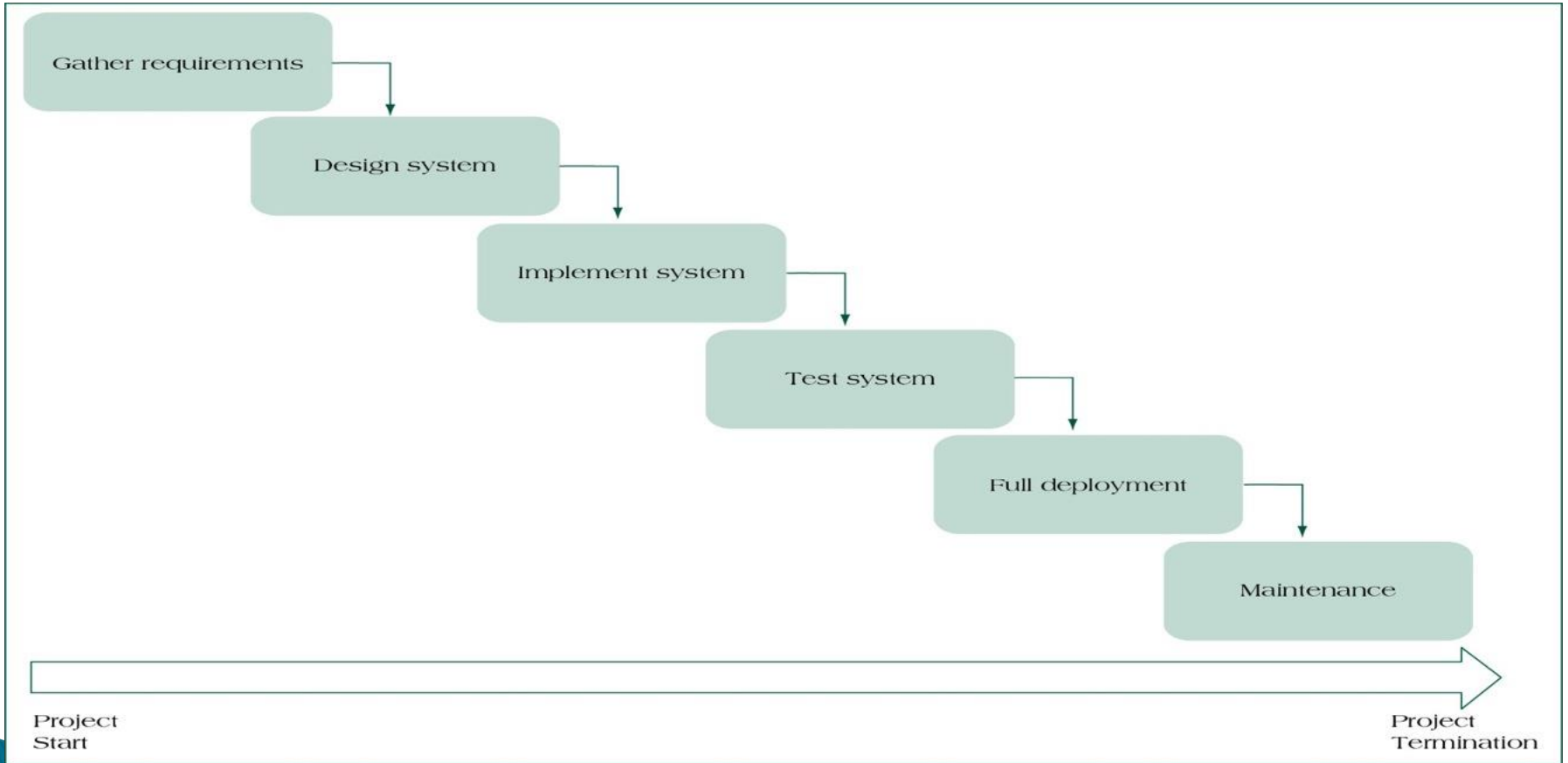
- ▶ Developed by Dr. Eli Goldratt in mid-1990s
- ▶ Alternative scheduling mechanism to speed up project delivery
- ▶ Make better use of project resources
- ▶ More efficiently allocate and discipline the process of implementing projects
- ▶ Based on *theory of constraints* (TOC)
- ▶ Represents both cultural shift and change in scheduling processes
- ▶ Applies technical and behavioral elements of project management

Agile project management

Agile Project Management (Agile PM) reflects a new era in project planning that places a premium on flexibility and evolving customer requirements throughout the development process.

- ▶ Planning the work and then working the plan
- ▶ Customer needs may evolve and change over course of project
- ▶ Importance of evolving customer needs leads to incremental, iterative planning process

Waterfall model for project development



Waterfall model

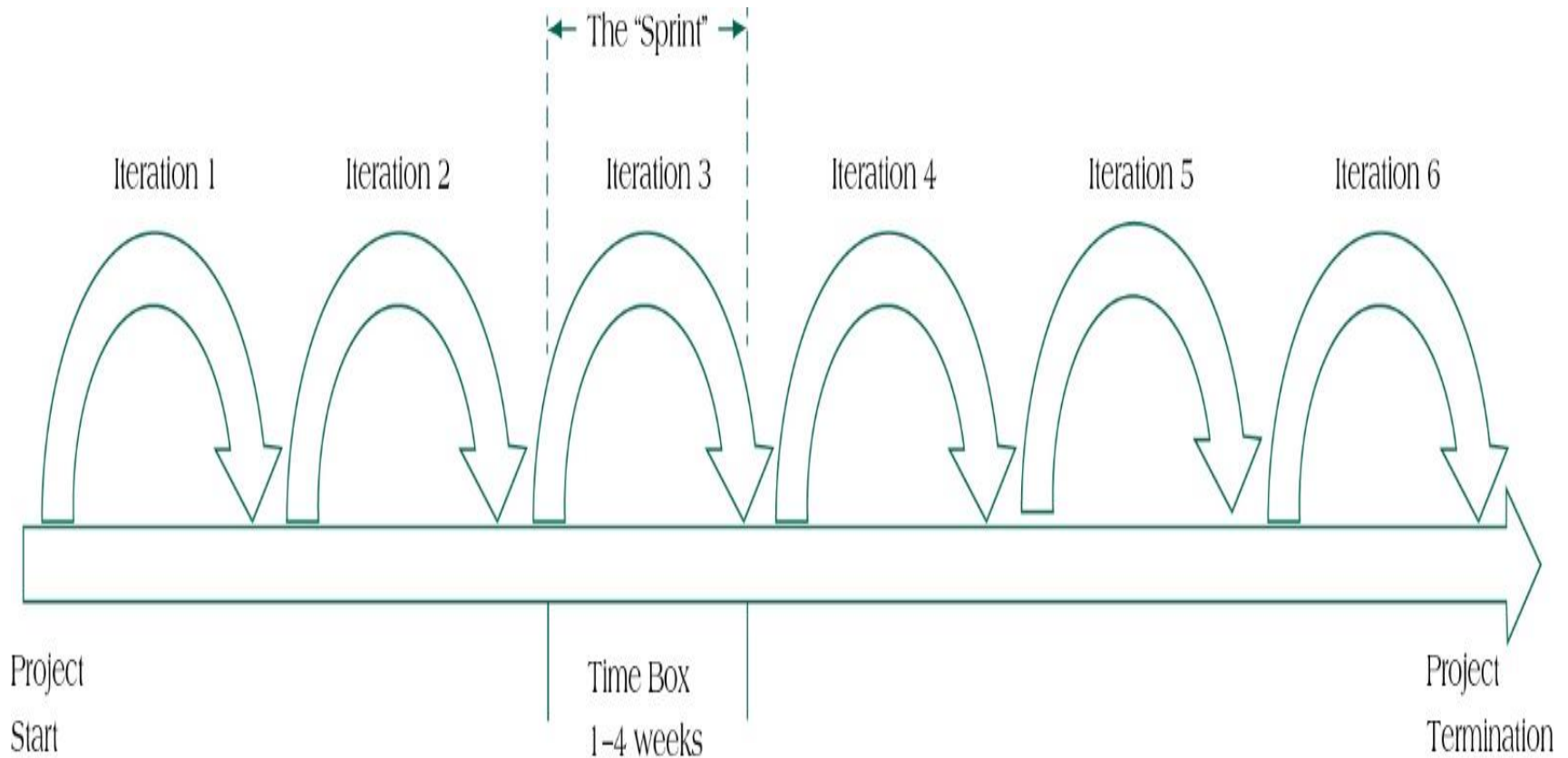
Waterfall project development process works well when:

- ▶ Requirements are very well understood and fixed at the outset of the project.
- ▶ Product definition is stable and not subject to changes.
- ▶ Technology is understood.
- ▶ Ample resources with required expertise are available freely.
- ▶ The project is of short duration.

Unique feature of agile pm

- ▶ Agile PM, referred to as *Scrum*, recognizes mistakes of assuming once initial project conceptualization and planning are completed, project will be executed to original specifications.
 - Example, software projects are prone to constant changes.
- ▶ Flexible, iterative system designed for the challenge of managing projects in midst of change and uncertainty
- ▶ “Rolling wave” process of continuous plan–execute–evaluate cycle
- ▶ Emphasis on adaptation, flexibility, and coordinated efforts of multiple disciplines

Scrum process for product development



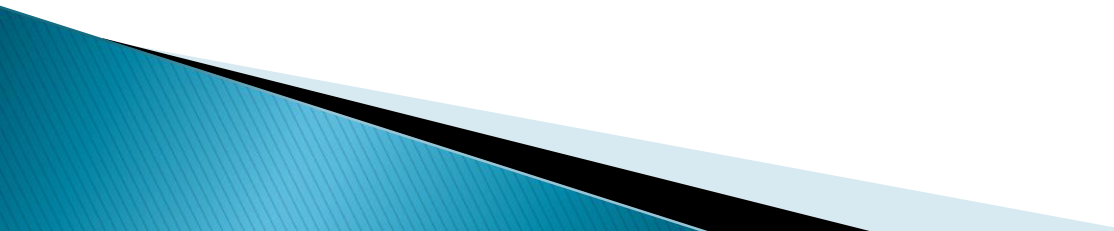
Key terms in agile pm

- ▶ *Sprint* – one iteration of the Agile planning and executing cycle.
- ▶ *Scrum* – the development strategy agreed to by all key members of the project.
- ▶ *Time-box* – the length of any particular sprint, fixed in advance, during the Scrum meeting.
- ▶ *User stories* – short explanation of the end user that captures what they do or what they need from the project under development
- ▶ *Scrum Master* – person on the project team responsible for moving the project forward between iterations, removing impediments, or resolving differences of opinions between major stakeholders.

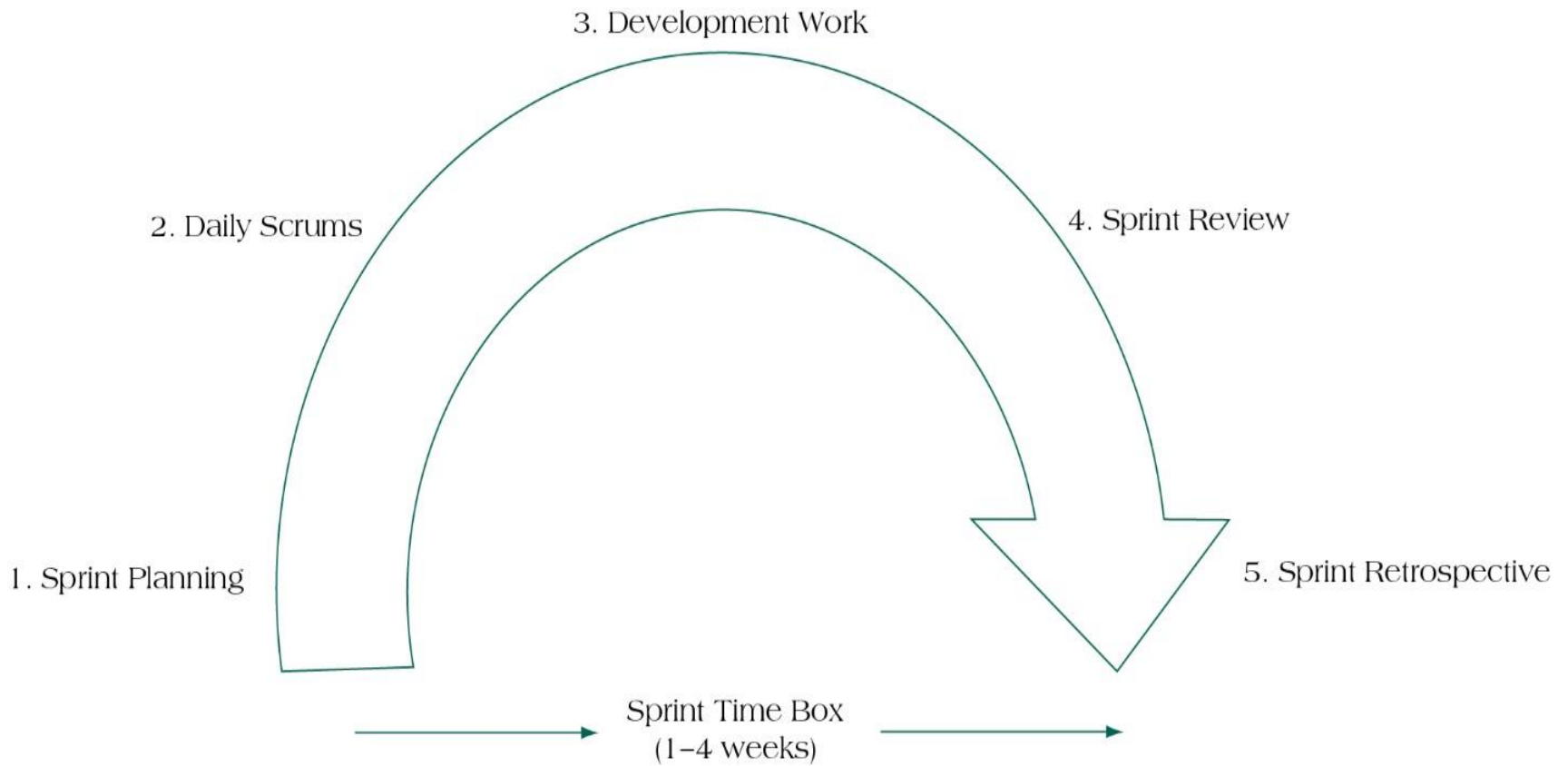
Key terms in agile pm

- ▶ ***Sprint backlog*** – the set of product backlog items selected for the Sprint, plus a plan for delivering the Sprint Goal.
- ▶ ***Burndown chart*** – remaining work in the Sprint backlog.
- ▶ ***Product owner*** – person representing the stakeholders and serving as the “voice of the customer.”
- ▶ ***Development team*** – organizational unit responsible for delivering the product at the end of the iteration (Sprint).
- ▶ ***Product backlog*** – a prioritized list of everything that might be needed in completed product and source of requirements for any changes.
- ▶ ***Work backlog*** – evolving, prioritized queue of business and technical functionality that needs to be developed into a system.

Steps in agile

1. Sprint Planning
 2. Daily Scrums
 3. Development Work
 4. Sprint Review
 5. Sprint Retrospective
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Stages in a sprint



Problems with agile

1. Active user involvement and close collaboration of the Scrum team are critical throughout the development cycle.
2. Evolving requirements can lead to potential for scope creep.
3. It is harder to predict at beginning of project what the end product will actually resemble.
4. Agile requirements are kept to minimum, which can lead to confusion about the final outcomes.
5. Testing is integrated throughout lifecycle, which can add cost to project.
6. Frequent delivery of project features puts a burden on product owners.
7. If it is misapplied to traditional projects, it can be an expensive approach without delivering benefits.

Extreme programming (XP)

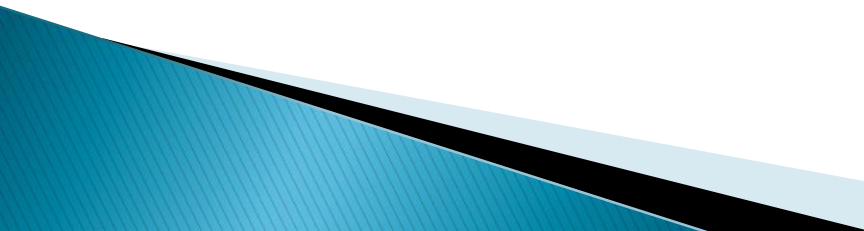
- ▶ A more aggressive form of Scrum; a software development methodology intended to improve software quality and responsiveness to changing customer requirements.
- ▶ Two guiding features of XP:
 - Refactoring
 - Pair programming
- ▶ Advantage of XP is whole process is visible and accountable.
- ▶ Agile PM and XP have grown out of need to combine the discipline of project management methodology with the needs of modern enterprise to respond quickly.

Theory of Constraints & Critical Chain Project Scheduling

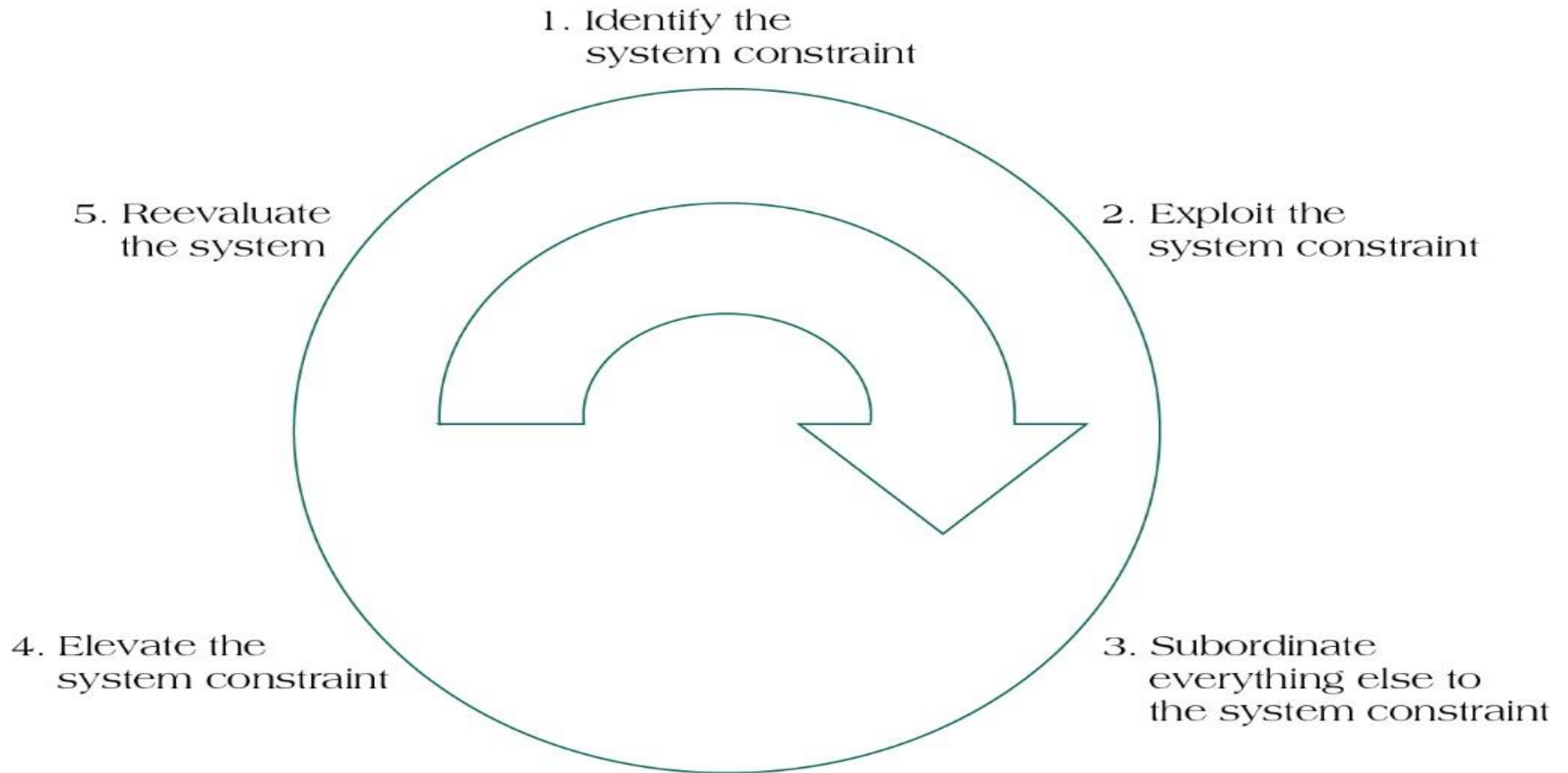
A constraint limits any system's output.

The Goal – Goldratt

TOC Methodology

1. Identify the constraint.
 2. Exploit the constraint.
 3. Subordinate the system constraint.
 4. Elevate the constraint.
 5. Repeat the process.
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Five key steps in theory of constraints methodology



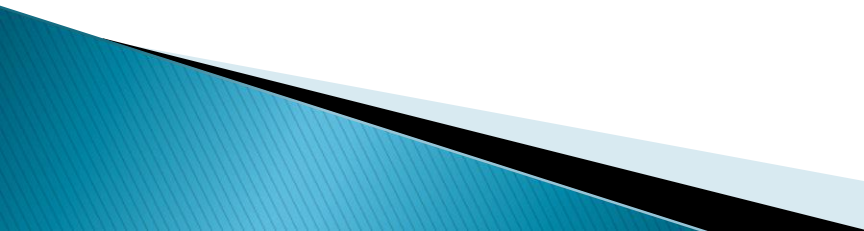
Critical Chain Solutions

- Central Limit Theorem
- Activity durations *estimated at 50%* level
- *Buffer* reapplied at *project level*
 - Goldratt rule of thumb (50%)
 - Newbold formula
- *Feeder buffers* for non-critical paths

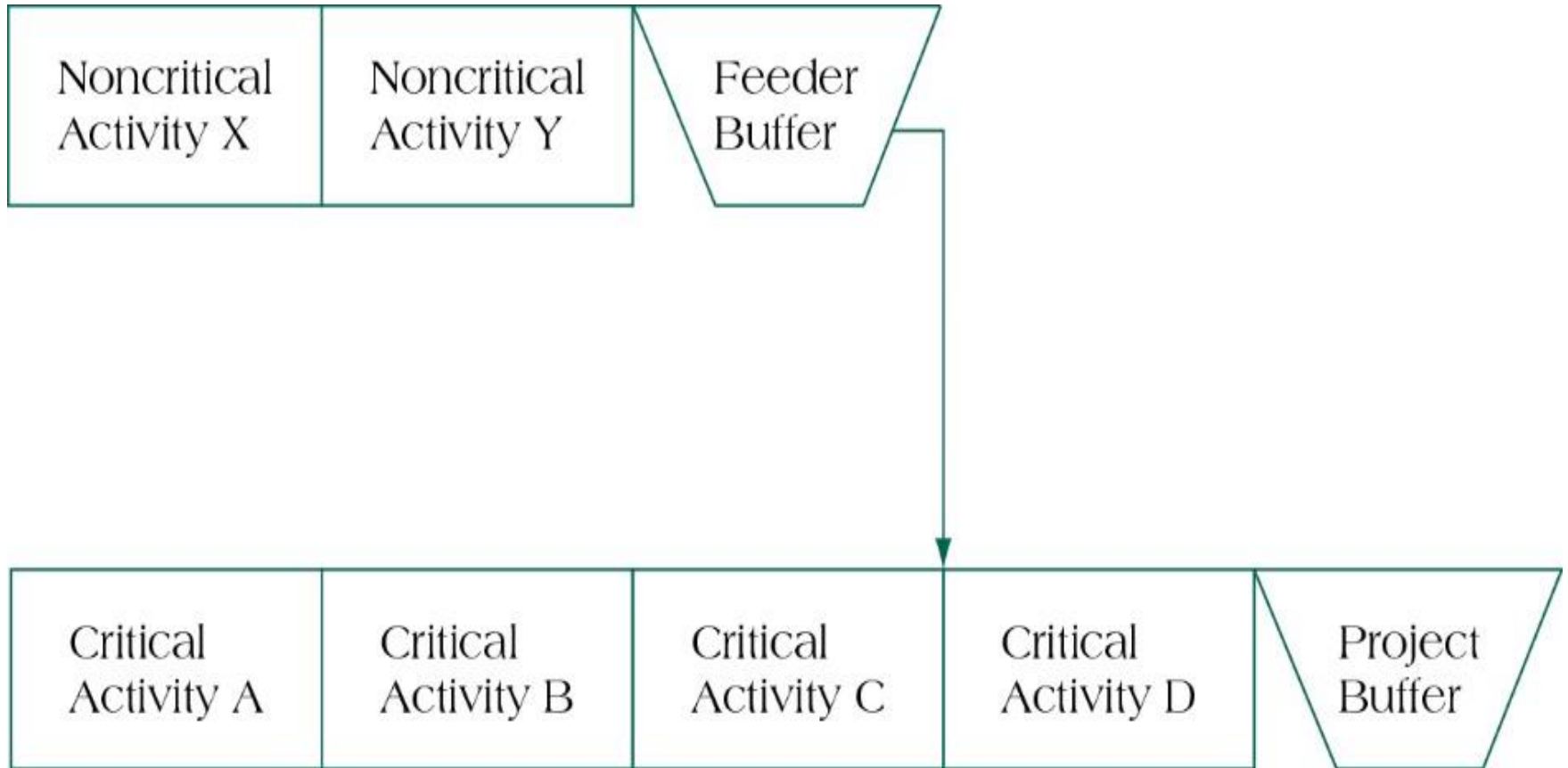
Reduction in project duration after aggregation



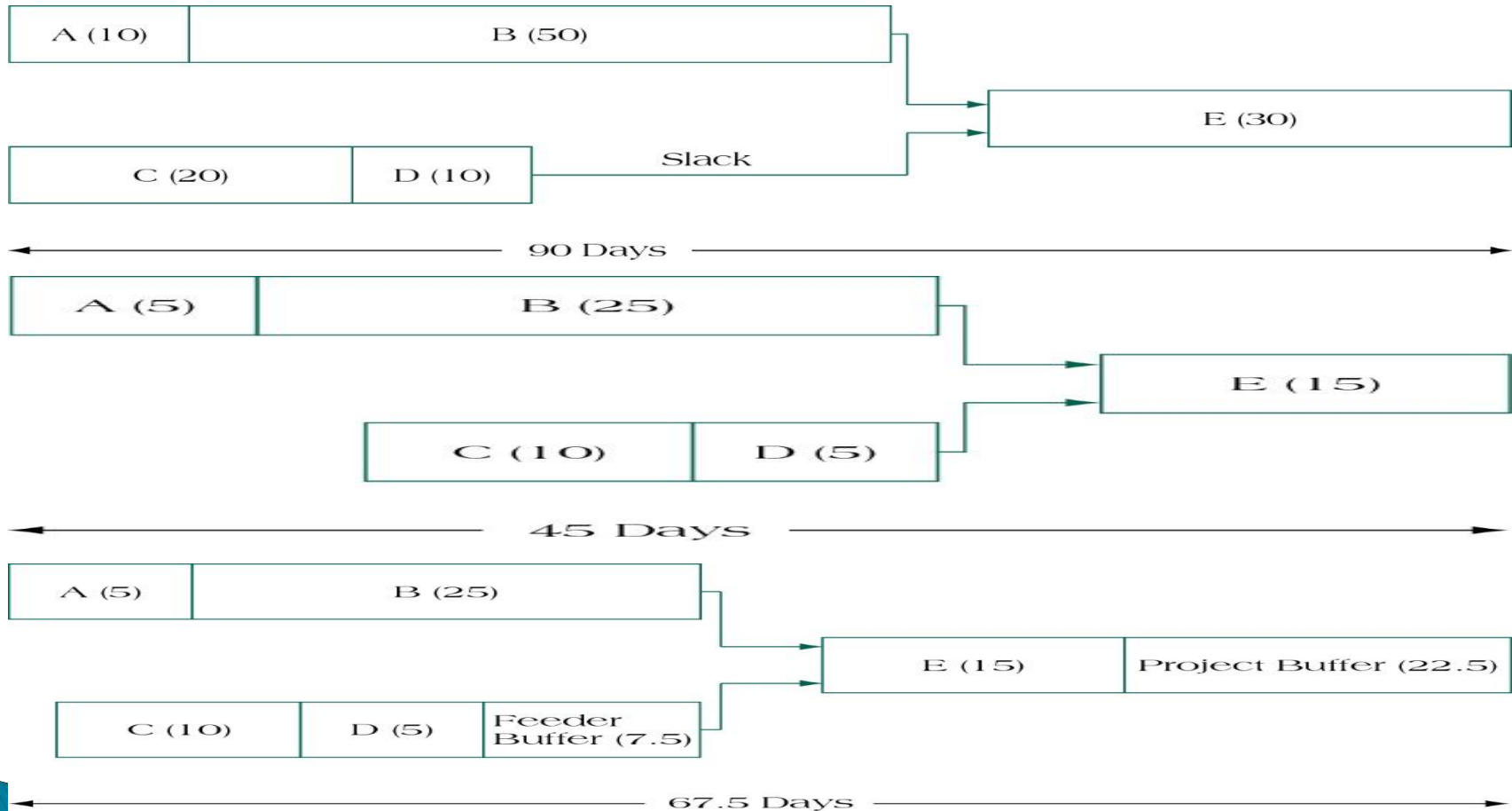
Developing critical chain activity network

- ▶ Resource leveling is not required because resources are leveled within the project in the process of identifying the critical chain.
 - ▶ CCPM advocates putting off all noncritical activities as late as possible, while providing each noncritical path in the network with its own buffer.
 - ▶ Noncritical buffers are referred to as *feeder buffers*.
 - ▶ Feeding buffer duration is calculated similarly to the process used to create the overall project buffer.
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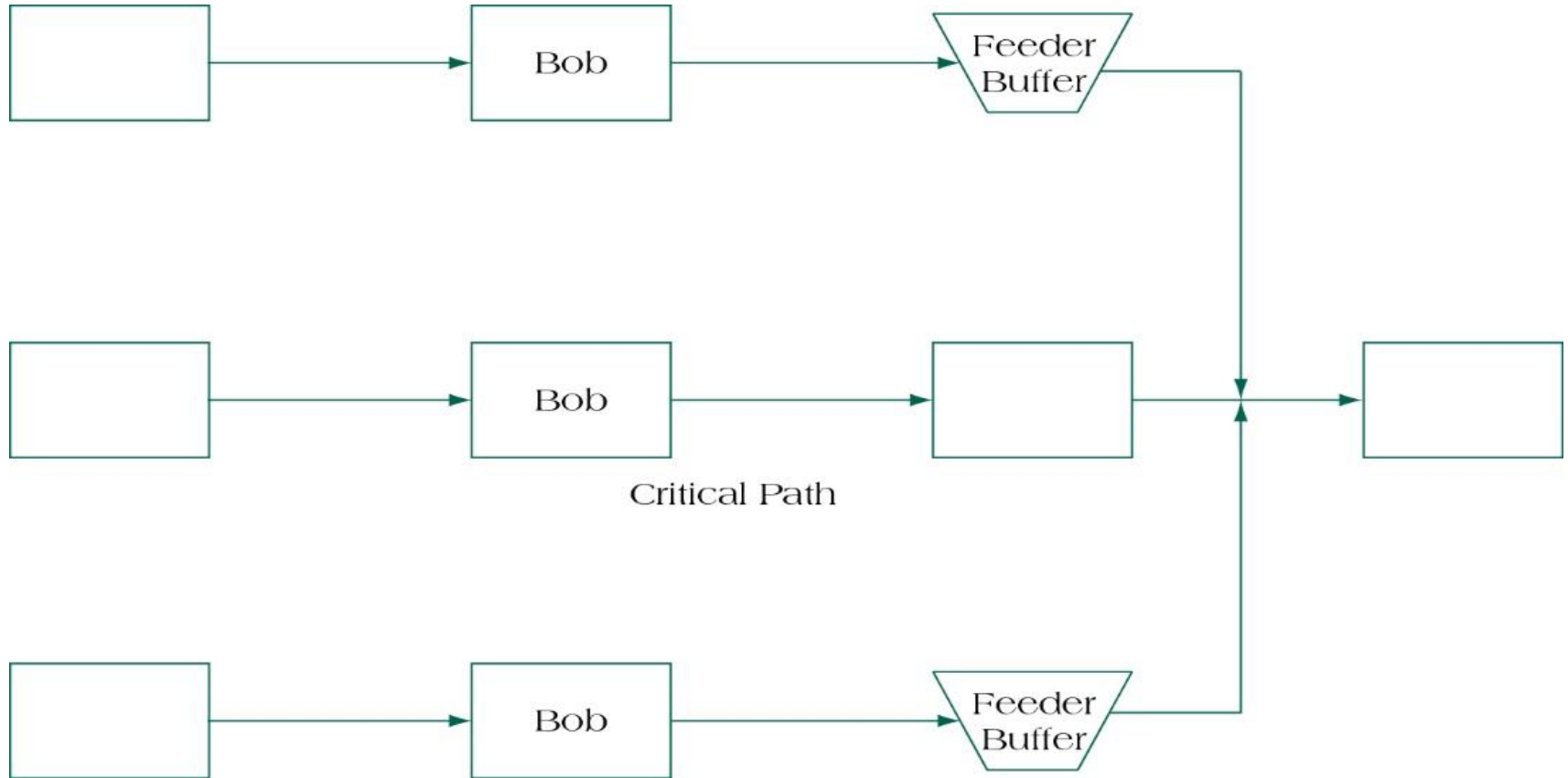
Ccpm employing feeder buffer



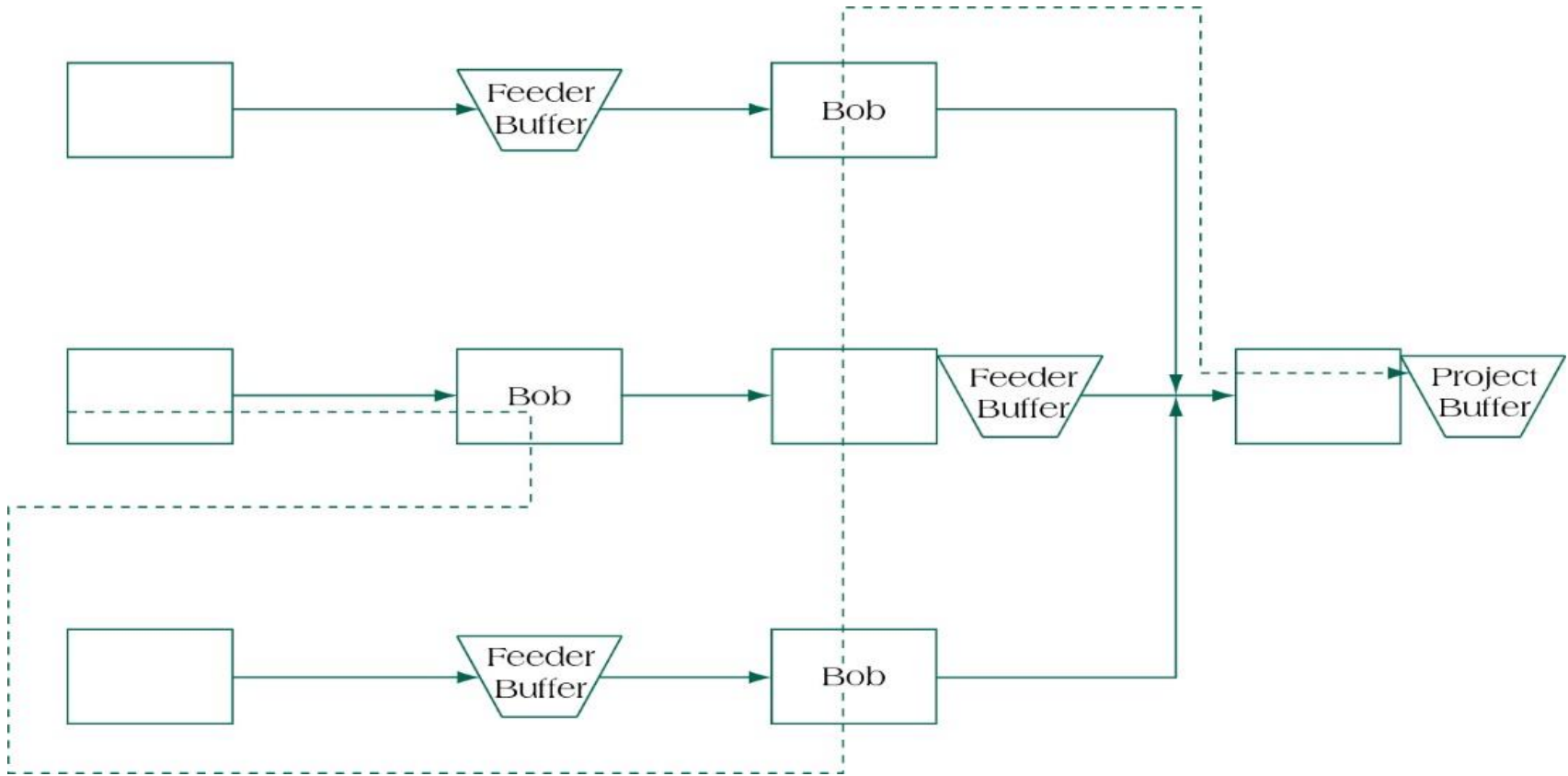
Changes in critical change example



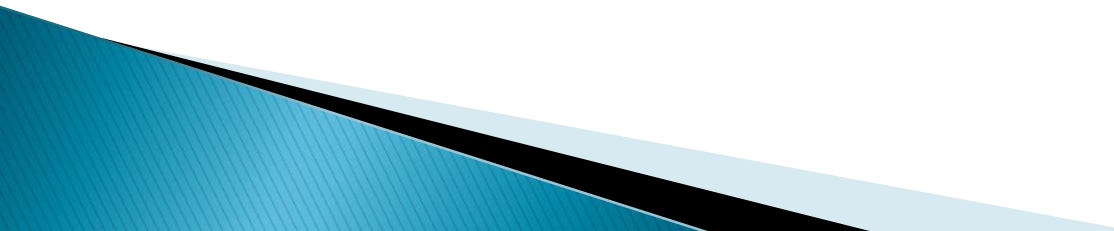
Critical path network with resource constraints




Critical chain solution



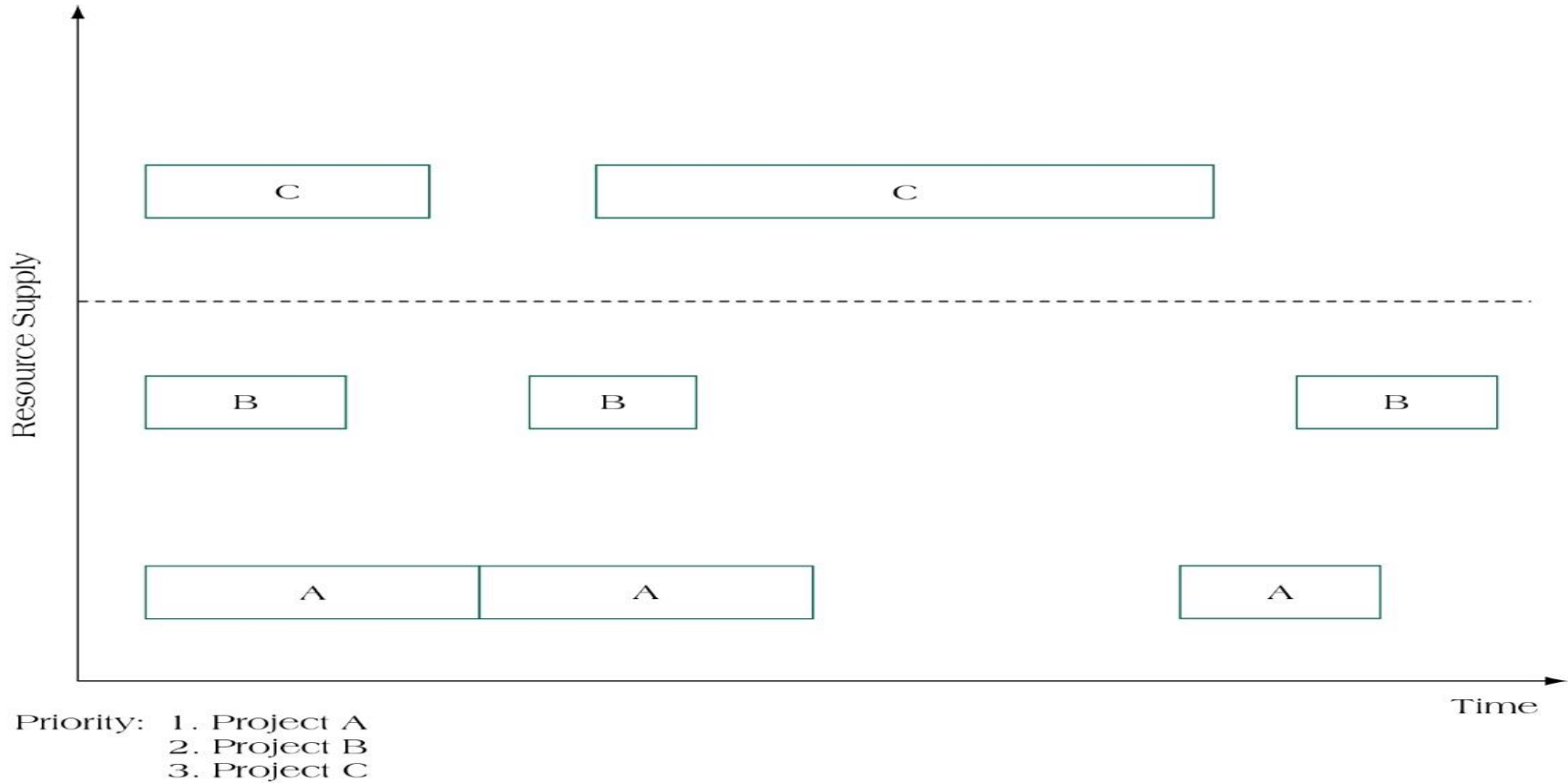
Critical chain project portfolio management

- ▶ *Capacity constraint buffer* (CCP) refers to a safety margin separating different projects scheduled to use the same resource.
 - ▶ *Drum buffers* are extra safety applied to a project immediately before the use of the constrained resource to ensure that the resource will not be starved for work.
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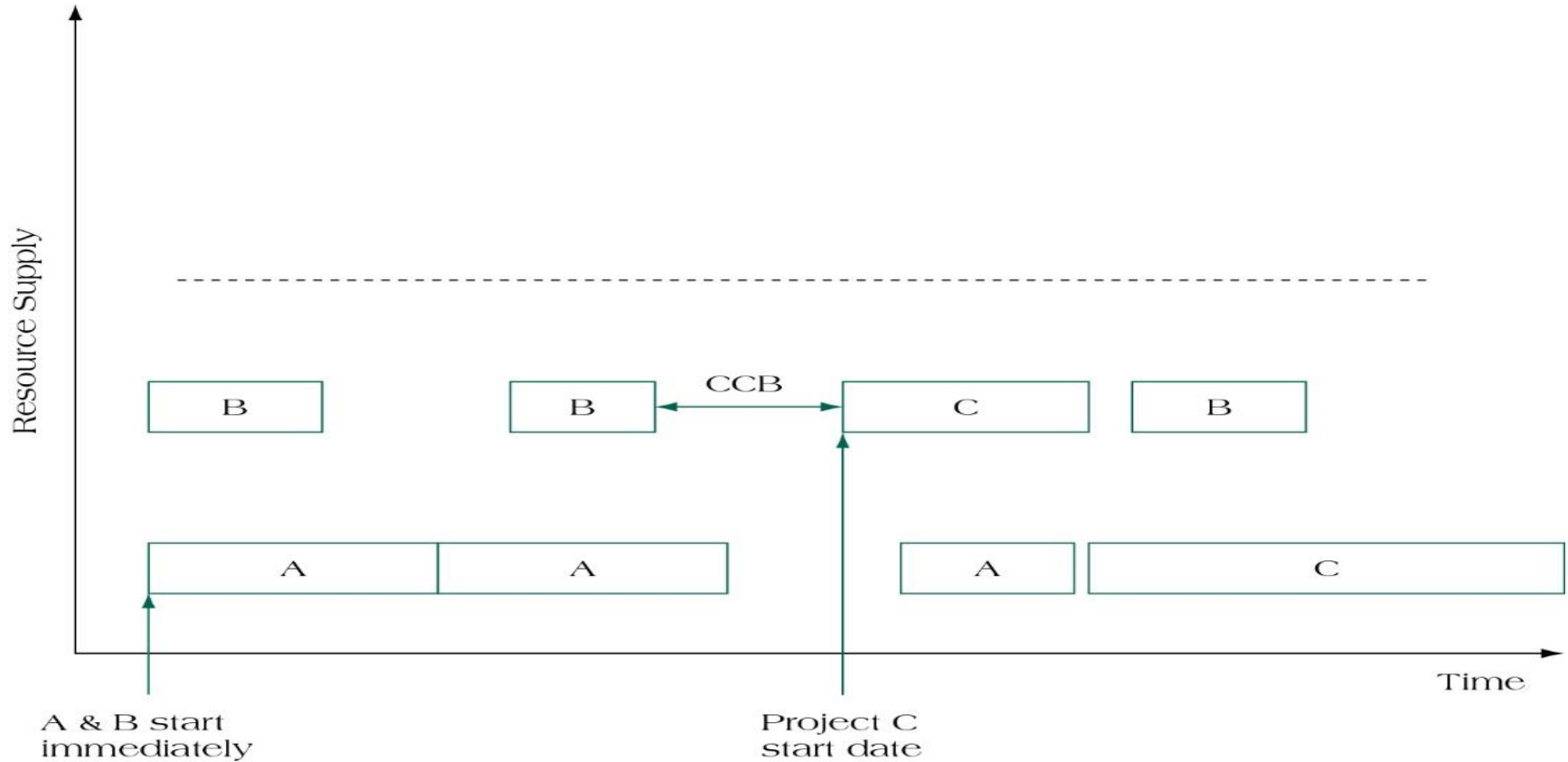
Steps to apply ccpm to multiple project portfolio

1. Identify company resource constraints or drum.
 2. Exploit resource constraints.
 3. Subordinate individual project schedules.
 4. Elevate the capacity of the constraint resource.
 5. Go back to step 2 and reiterate the sequence.
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Three projects stacked for access to a drum resource



Applying ccb to drum schedules



CCPM Critiques

1. *No milestones* used
 2. *Not significantly different* from PERT
 3. *Unproven* at the portfolio level
 4. *Anecdotal support* only
 5. *Incomplete* solution
 6. Overestimation of activity *duration padding*
 7. *Cultural changes* unattainable
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