

Critical Chain Project Scheduling

Chapter 11

Theory of Constraints & Critical Chain Project Scheduling

A constraint limits system output.

The Goal – Goldratt

TOC Methodology

1. Identify the constraint
2. Exploit the constraint
3. Subordinate the system
4. Elevate the constraint
5. Repeat the process

Variation

Common Cause

Inherent in the system

Special Cause

Due to a special circumstance

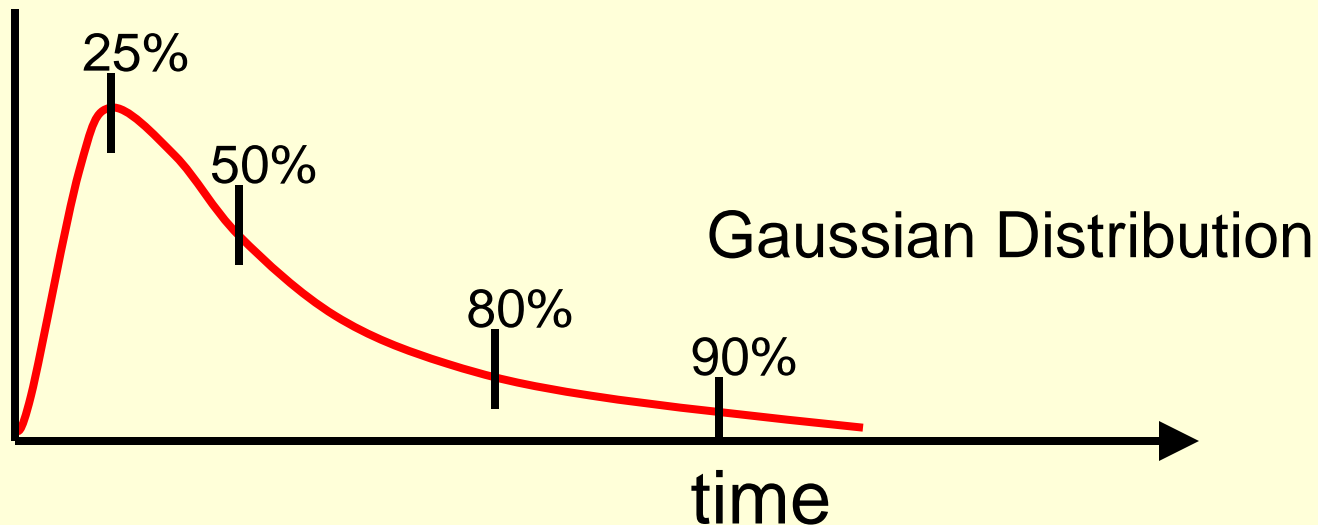
Managers should

- Understand the difference between the two
- Not adjust the process if variation is common cause
- Not include special cause variation in risk simulation
- Not aggregate discrete project risks

CCPM and the Causes of Project Delay

How safety is added to project activities

1. Individual activities **overestimated**
2. Project manager **safety margin**
3. Anticipating **expected cuts** from management



Wasting Extra Safety Margin

1. **The Student Syndrome**

- a. Immediate deadlines
- b. Padded estimates
- c. High demand

2. **Failure to pass along positive variation**

- a. Other tasks
- b. Overestimation penalty
- c. Perfectionism

3. **Multitasking**

4. **Path Merging**

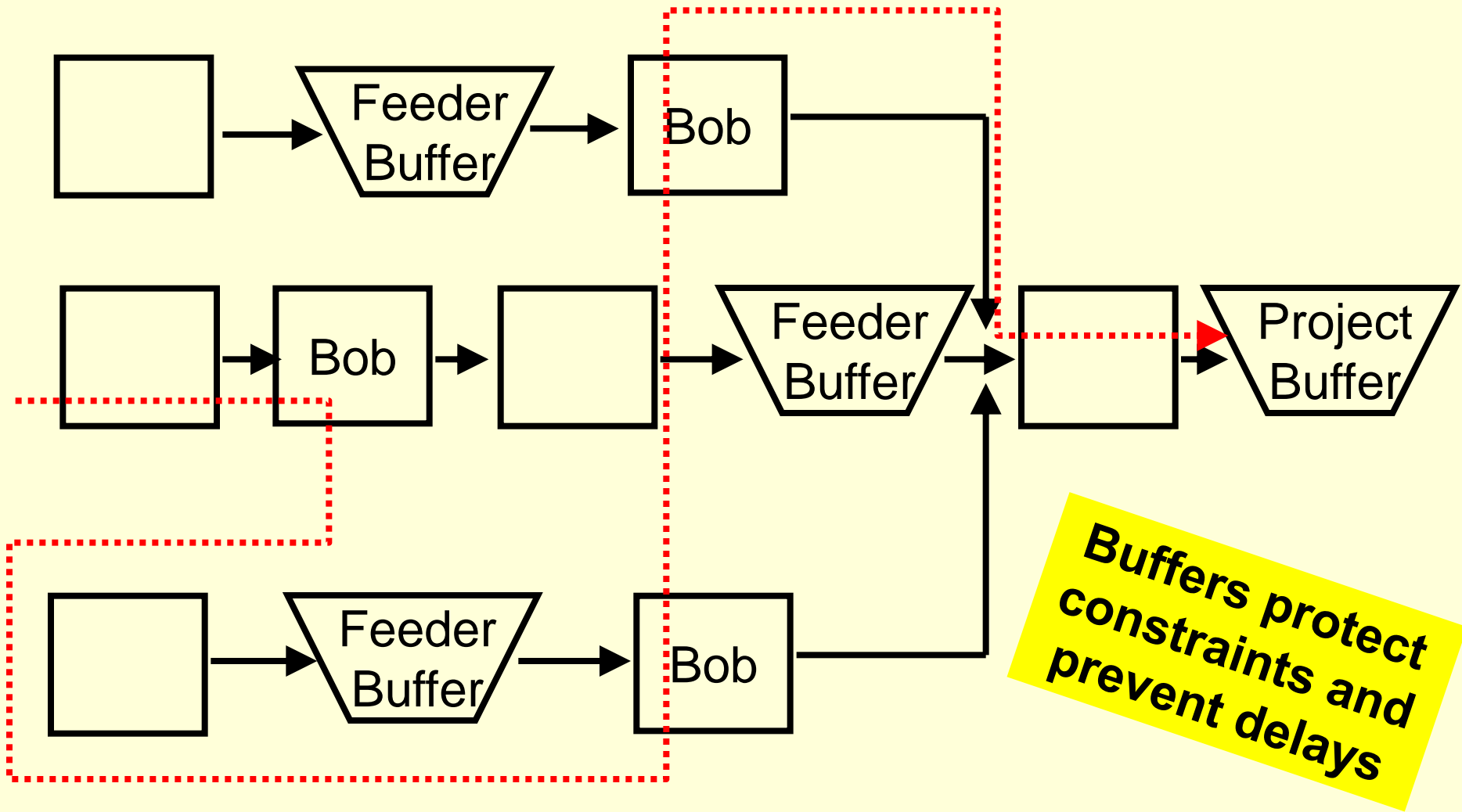
Critical Chain Solutions

- Central Limit Theorem $\sigma_{\Sigma} < n\sigma$
- Activity durations estimated at 50% level
- Buffer reapplied at project level
 - Goldratt rule of thumb
 - Newbold formula
- Feeder buffers for non-critical paths

CCPM Changes

- ❖ Due dates & milestones ***eliminated***
- ❖ ***Realistic estimates*** – 50% level not 90%
- ❖ ***“No blame”*** culture
- ❖ Subcontractor deliveries & work ***scheduled ES***
- ❖ ***Non critical*** activities scheduled ***LS***
- ❖ Factor the effects of ***resource contention***
- ❖ ***Critical chain usually not the critical path***
- ❖ Solve resource conflicts with ***minimal disruption***

Critical Chain Solutions



Critical Chain Project Portfolios

Drum – system-wide constraint that sets the beat for the firm's throughput

- Drum – person, department, policy, resource
- Capacity constraint buffer – safety margin between projects
- Drum buffer – extra safety before the constraint

Applying CCPM to Project Portfolios

1. Identify the drum
2. Exploit the drum
 - a. Prepare a schedule for each project
 - b. Determine priority for the drum
 - c. Create the drum schedule
3. Subordinate the project schedules (next slide)
4. Elevate the capacity of the drum
5. Go back to step 2

Subordinating Project Schedules

- Schedule projects **based on drum**
- Designate **critical chain**
- Insert **capacity constraint buffers**
- **Resolve any conflicts**
- **Insert drum buffers** so the constraint is not starved

CCPM Critiques

- ***No milestones*** used
- ***Not significantly different*** from PERT
- ***Unproven*** at the portfolio level
- ***Anecdotal support*** only
- ***Incomplete*** solution
- Overestimation of activity ***duration padding***
- ***Cultural changes*** unattainable