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# OPERATIONS BOOTCAMP



**CONSTELLATION**  
HomeBuilder Systems

# Lessons from the Pipeline Workshop: Develop a Velocity Mindset to Drive Higher Productivity

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## Current Operating Environment

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### The Problem:

- Labor and staff resources are insufficient to support the growth potential of housing demand
- Margin pressure is increasing as land, labor and material costs increase at higher rates than house prices

### The Solution:

- Builders must develop a new mindset that values Velocity as much as it values Margin

## Today's Breakout Session

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- We will define and discuss the Pipeline Mindset, a balanced perspective on Velocity and Margin
- You will participate in two interactive exercises that help illustrate two concepts that can impact your 2016 business results
  - Epic Partnering®
  - Critical Chain Project Management
- We will wrap up with lessons learned and next steps

# Margin and Velocity

- ▶ Margin x Velocity determines Return on Assets (co-equal components, DuPont identity).
- ▶ Margin is a function of how much you make on every house; Velocity is a function of how many houses you can build with the available inventory and capacity.
- ▶ Margin is the easier, accepted track; Velocity is the more difficult, less intuitive track.

# A Tale of Two Operating Scenarios

- ▶ RB Builders gives you two building operations to analyze; same work-in-process (50 units, \$6 million); same capacity cost (\$3.6 million); same working capital:
  1. Company A: average sales price of \$240,000, 25% GM, turns WIP twice a year (i.e.,  $\text{Revenue} \div \text{Inventory} = 2$ ).
  2. Company B: average sales price of \$225,000, 20% GM, turns WIP three times a year.
- ▶ What do their operating statements look like?

# Operating Statement

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	Company A	%	Company B	%
Revenue				
Cost of Sales				
Gross Margin		25		20
Operating Expense	-3,600,000		-3,600,000	
Net Income				
Return on Sales				
Asset Turn				
ROIA				

# Higher margin or faster turn?

	Company A	%	Company B	%
Revenue	\$24,000,000	100	\$33,750,000	100
Cost of Sales	-18,000,000	-75	-27,000,000	-80
Gross Margin	6,000,000	25	6,750,000	20
Operating Expense	-3,600,000	-15	-3,600,000	-11
Net Income	\$2,400,000	10	\$3,150,000	9
Return on Sales		10%		9%
Asset Turn		4.0x		5.6x
ROIA		40%		50%

# The Image of Homebuilding Production

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- ▶ How do you define the SIZE, CAPACITY, LENGTH, and COST of a homebuilding production system?
- ▶ How do you measure its dimensions?
- ▶ How do you define its attributes?
- ▶ What controls its flow?



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# The Image of Homebuilding Production: Pipeline

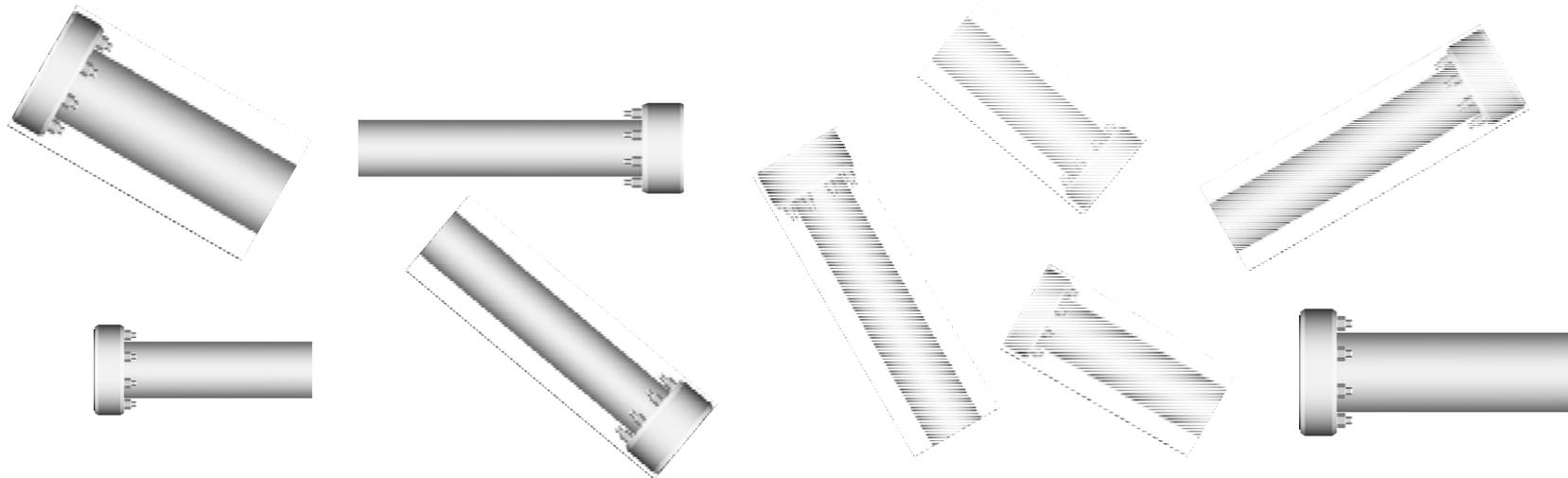
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- ▶ SIZE = houses under construction (work-in-process)
- ▶ CAPACITY = rate of closings (output) relative to the amount of work-in-process
- ▶ LENGTH = time (duration, cycle time)
- ▶ COST = all of the indirect, non-variable costs considered  
Operating Expense (overhead)
- ▶ CONTROLS = two valves: (1) activate by the rate of closings;  
(2) controls amount of work in front of the Constraint Capacity  
Resource

# Introducing Mental Models

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*"We cannot solve our problems with the same thinking we used when we created them"*



# Mental Model:

## Margin and Velocity

### CONVENTIONAL

- ▶ Focus on margin, because margin is what we know and it is what comes most naturally to us.

### PIPELINE

- ▶ Focus as much on velocity as we do on margin, because – as the co-equal determinants of economic return – that is what creates sustainable competitive separation.

# Mental Model:

Size

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## CONVENTIONAL

- ▶ Size is measured in terms of number of houses sold and amount of revenue generated.
- ▶ Income Statement view and perspective of size.

## PIPELINE

- ▶ Size is expressed in terms of the level of work-in-process, and the internal capacity reflected by Operating Expense.
- ▶ Balance Sheet view and perspective that supports the concept of a limited-size business model.

# Mental Model:

Growth

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## CONVENTIONAL

- ▶ If size is defined by Revenue, a building company will be willing to increase work-in-process and Operating Expense as the tradeoff for higher Revenue.
- ▶ “More-with-more”

## PIPELINE

- ▶ If size is defined by the level of work-in-process or the capacity afforded by its Operating Expense, a building company will not emphasize growth; it will emphasize higher productivity.
- ▶ “More-with-less”

# Mental Model:

## Cycle Time

### CONVENTIONAL

- ▶ Cycle Time is measured as the mean (average) duration of a selected range of individual jobs.
- ▶ “Measured”

### PIPELINE

- ▶ Cycle time is calculated as the relationship between the number of houses under construction (Inventory or WIP) and the number of completions during a specified period.
- ▶ “Calculated”

# Mental Model:

## Production Balance

### CONVENTIONAL

“Balanced capacity”

- ▶ In order to achieve balanced production (even rate of sales, starts, closings), a production system has to have balanced capacity.
- ▶ As the trade-off, the system accepts the effect of variation and uncertainty that appears anywhere and everywhere.

### PIPELINE

“Unbalanced capacity”

- ▶ In order to achieve balanced production, a production system creates unbalanced capacity, and focuses on managing the resource that limits the output of the system.
- ▶ As the trade-off, accepts a level of protective capacity on its other resources.

# Mental Model:

## Production Capacity

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### CONVENTIONAL

"Increase capacity"

- ▶ In order to increase the rate of closings and Revenue generation, we have to increase the number of resources and the amount of work-in-process.

### PIPELINE

"Increase productivity"

- ▶ In order to increase the rate of closings, we have to reduce cycle time – we have to increase the rate of closings with a planned, finite, controlled level of work-in-process and production capacity.

# Mental Model:

## Production Flow

### CONVENTIONAL

Push: "Even-flow is a mechanism."

- ▶ Intent: even rate of starts, "pushed" into the system will produce an even rate of closings.
- ▶ Order and rate of starts is prescribed by a start matrix, protected by a sales backlog.
- ▶ Does not address capacity or control WIP.

### PIPELINE

Pull: "Even-flow is an outcome."

- ▶ Result: even rate of starts, "pulled" into the system at the rate of closings.
- ▶ Order of starts is prescribed by start matrix, rate of starts by the load/capacity of the constraint resource.
- ▶ Capacity is finite; WIP is controlled.

# Mental Model:

## Cost of Variation

### CONVENTIONAL

- ▶ The cost of variation in a production system is the amount of additional, unnecessary costs or expenses incurred or left unused.
- ▶ Cost World

### PIPELINE

- ▶ The true cost of variation in a production system is the lost opportunity of the Gross Income that would have been produced on the houses not built.
- ▶ Presuming it was achieving breakeven, this is lost Gross Income that is lost Net Income.
- ▶ Throughput World

# Velocity Accelerators

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- ▶ How do we increase the rate of closings – and the Revenue they generate – with a finite supply of (1) external capacity, (2) overhead, (3) work-in-process, and (4) capital?
- ▶ How do we reduce cycle time?
- ▶ How do we achieve more with what we have?
- ▶ How do we achieve more with less?

# Start with these two key areas:

- ▶ Trade Partner Relationships: Epic Partnering®



- ▶ Critical Chain Project Management



# Velocity Accelerators: Epic Partnering<sup>®</sup>

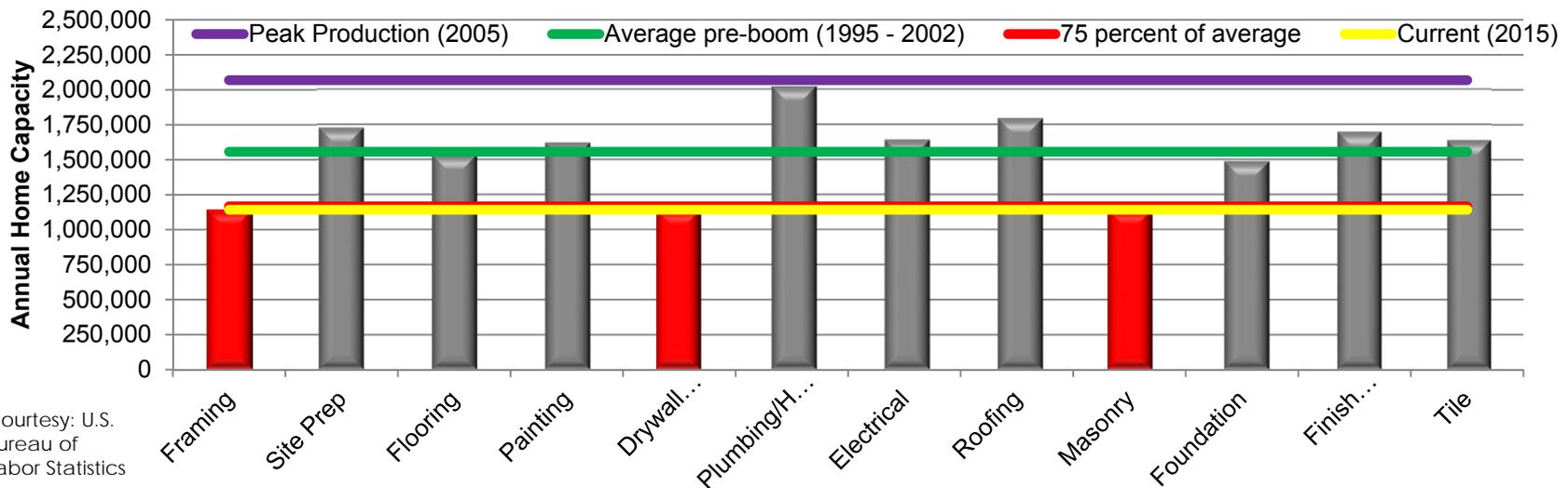
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- ▶ How do we increase our velocity with fewer, less experienced trades?



Wilfred Wong Photography

# Trade Capacity remains a significant challenge for the industry



Courtesy: U.S. Bureau of Labor Statistics

- ▶ Typical capacity per framer (defined as '01-'04) is 16 homes per employee - As of September 2015, current homes per framer is at 20: zero excess capacity

# Workshop Exercise

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- ▶ What do your trade partners do well that makes you money?
- ▶ What do your trade partners do poorly that costs you money?
- ▶ What does your company do well that makes your trade partners money?
- ▶ What does your company do poorly that costs your trade partners money?

# Value of Trade Council

- ▶ GOAL: Convert INDUSTRY STANDARD resources to HIGH PRODUCTIVITY resources!
- ▶ Identify top 5-10 trade partners to engage in a strategic discussion (see previous questions).
- ▶ Set schedule (monthly/quarterly meetings off-site).
- ▶ Include detailed Agenda with Objectives.
- ▶ Include Builder representation from Production and Purchasing.
- ▶ Develop Action Plan updated after each meeting.

# Epic Partnering<sup>®</sup>: Key Takeaways

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- ▶ Treat your trade partners as an extension of your business.....as true **business** partners!
- ▶ Work with your trades to get their feedback on ways to improve velocity.
  - Eliminate sources of variation.
  - Enhance communication.
  - Align interests of the builder and the trades.



# Velocity Accelerators: Critical Chain Project Management

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- ▶ How do we dependably reduce cycle time and make job schedules more manageable?



# Critical Path and Critical Chain

## CRITICAL PATH (CPM)

- ▶ CPM addresses task dependency; does not resolve resource contention.
- ▶ CPM allows safety in task durations; protects the completion date of every task; allows float.
- ▶ Managing the schedule under CPM requires constant updates.

## CRITICAL CHAIN (CCPM)

- ▶ CCPM addresses task dependency and resource contention.
- ▶ CCPM removes safety in task durations and places a portion in a buffer that protects the project completion date.
- ▶ CCPM is better for PPOs.
- ▶ CCPM eliminates constant schedule updates.

# Law of Variability

(how a system responds to variation)

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- ▶ Law of Variability: increasing levels of variation progressively degrade the performance of a system!
- ▶ Law of Variability Buffering: a production system will protect itself from variation, through some combination of:
  - Inventory (higher work-in-process)
  - Capacity (excess/unused capacity)
  - Duration (longer cycle time)

# Variation and Uncertainty

How does this situation happen?

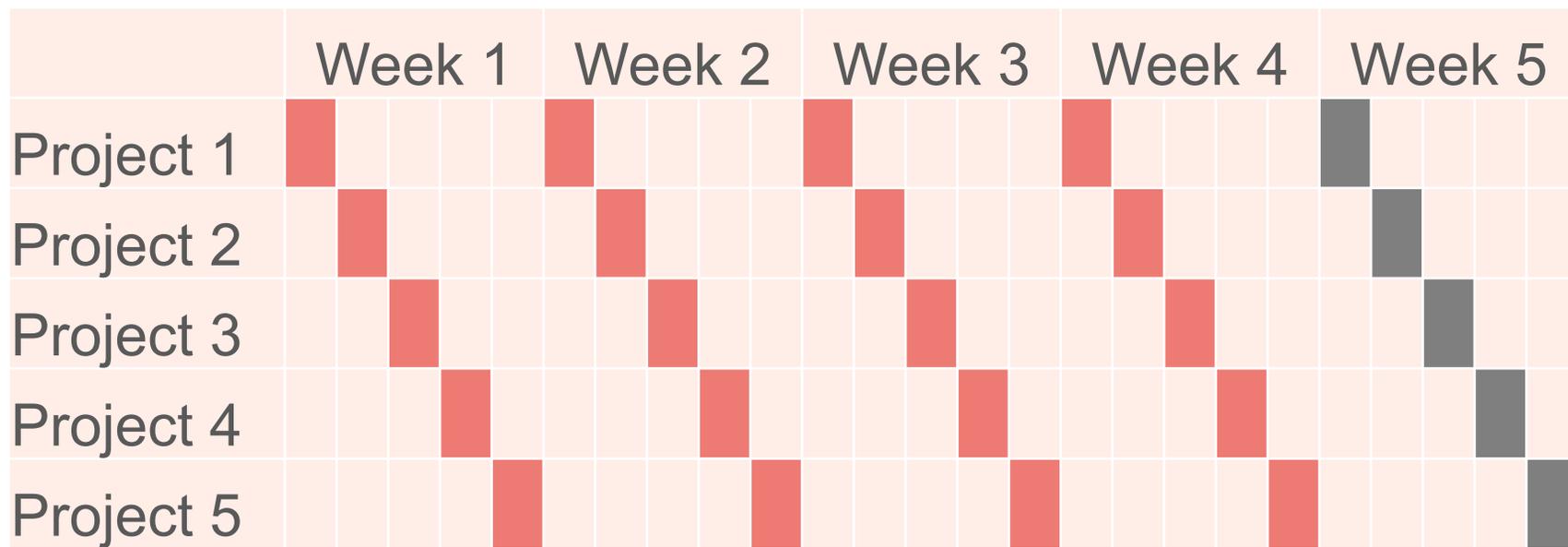
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- ▶ First, we pad task durations to provide safety (assurance) for completion dates; we increase duration!
- ▶ As a result, the schedule lengthens (1.64/.61)
  - Ex.: 90 days (50%) becomes 148 days (95%).
- ▶ Then, the safety is consumed by human behavior:
  - Student Syndrome: procrastinate.
  - Parkinson: let the work expand to time provided.
  - Multi-tasking: spread the time across more jobs.

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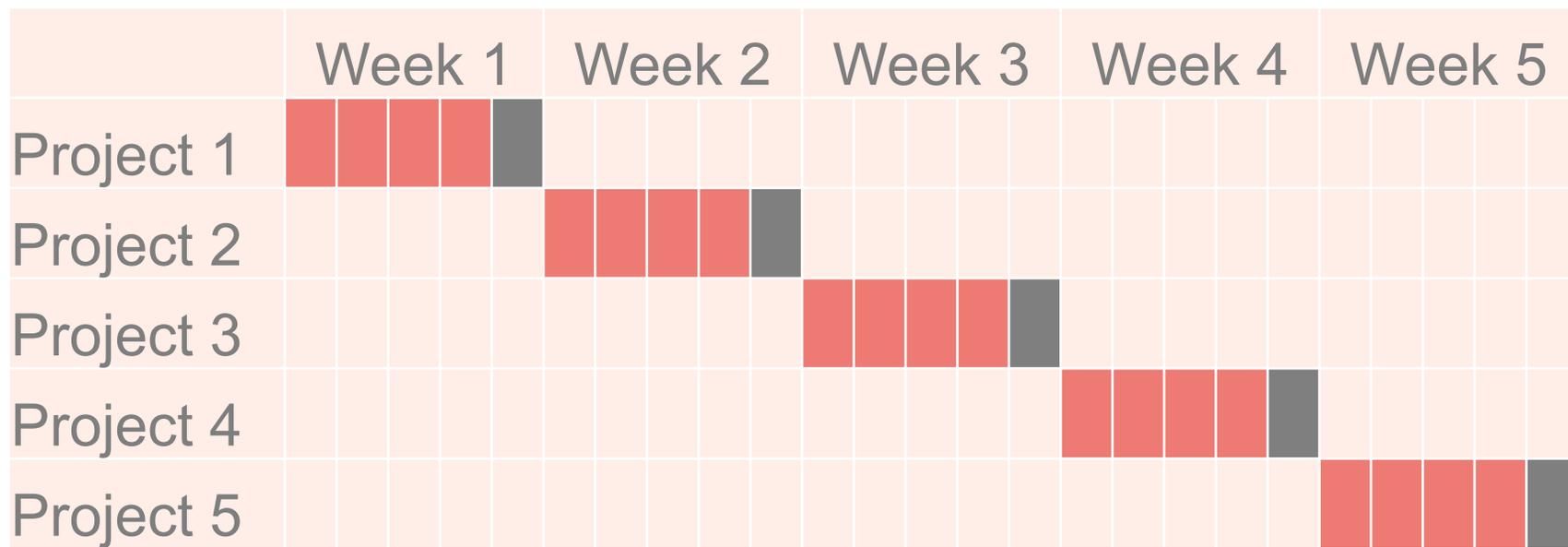
# Project Portfolio Management: Multi-tasking

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# Project Portfolio Management: Single-tasking

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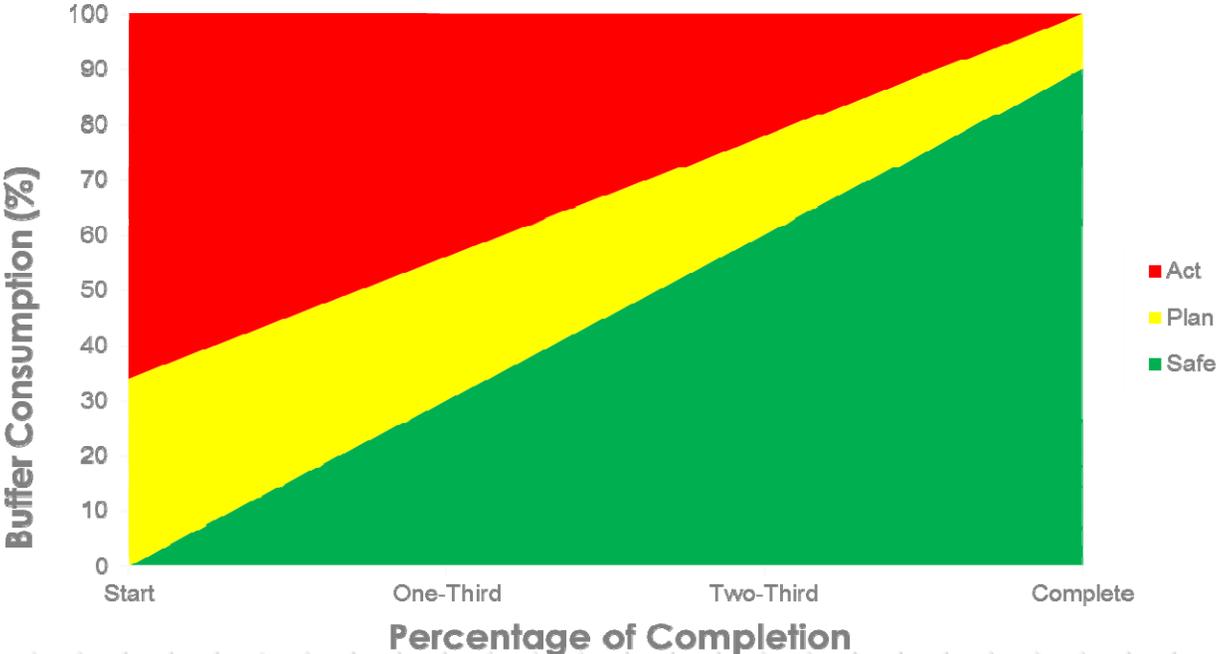
# RB Builders: Critical Chain Project Management

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In preparation for implementing CCPM, your team has been given a representative job schedule that you must reduce from 120 days to 96 days, with no negative impact on the reliability of the completion date.

- ▶ How will you modify the WBS to meet the new requirements, in terms of project duration and reliability?
- ▶ What element of the WBS is missing. How will your team account for it?

# Project Buffer Fever Chart



# RB Builders: Managing the Project Buffer

Job	% of schedule used	Days of schedule left	Days of buffer used	% of buffer used	Condition (progress-adjusted)
Smith	80%	20	0	0%	Green
Jones	60%	45	5	45%	Yellow
Thomas	50%	45	-5	0%	Green
Bradley	40%	72	12	68%	Red

Explain the condition of the schedule for each of the four jobs. Based on the buffer report, what actions are required? Where does the attention need to be focused?

# Actions that enable Critical Chain

(1)

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- ▶ Specify durations with 50/50 probabilities – no task safety, presuming:
  - have everything you need.
  - no multi-tasking – focus only on the task at hand.
  - no surprises.
- ▶ In the WBS, require ALAP task starts, and eliminate ASAP task starts.

# Actions that enable Critical Chain

(2)

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- ▶ Eliminate task due dates.
- ▶ Concentrate safety in the project buffers.
- ▶ Eliminate the behaviors (Parkinson, Student Syndrome, multi-tasking).
- ▶ Resolve the resource contention.
- ▶ Manage the buffer penetration.

# CCPM Technology: Options

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- ▶ What are the options – the approaches – for replacing scheduling apps that use Critical Path algorithms with scheduling apps that use Critical Chain algorithms?

Thank You

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