

***Balance, Bottlenecks, and Triggers***  
***... oh my!***

**Dr. Lars Maaseidvaag**  
**MoreSteam.com**



# Agenda



- Welcome
- Introduction of MBB Webcast Series
  - Larry Goldman, MoreSteam.com
- Today's Session
  - Lars Maaseidvaag, MoreSteam.com
- Open Discussion and Questions



- Founded in 2000
- Trained over 370,000 Lean Six Sigma professionals
- Served over 2,000 corporate customers (including 50+% of the F500)
- First firm to offer the complete Black Belt curriculum online and only firm to offer online DfLSS
- Courses reviewed and approved by ASQ and PMI
- Academic Partnership with Ohio State University

## Select Customers:



# Today's Presenter



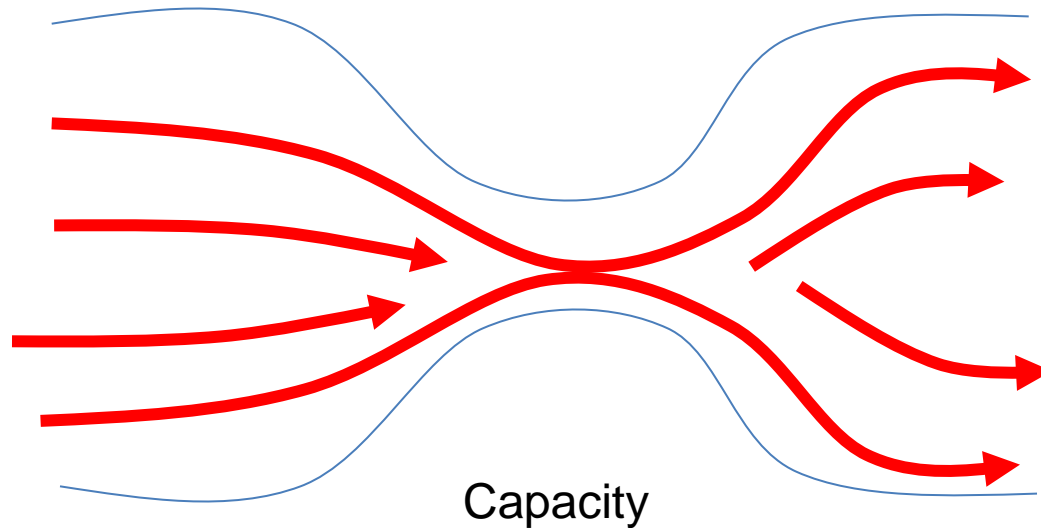
## Lars Maaseidvaag

*Senior Master Black Belt, MoreSteam.com*

- *Leads Lean curriculum development; MBB instructor*
- *Previous Curriculum Director for Accenture/George Group*
- *PhD in Operations Research from the Illinois Institute of Technology; M.S. in Operations Research & Industrial Engineering as well as an MBA from The University of Texas in Austin*

# You Say Tomato...

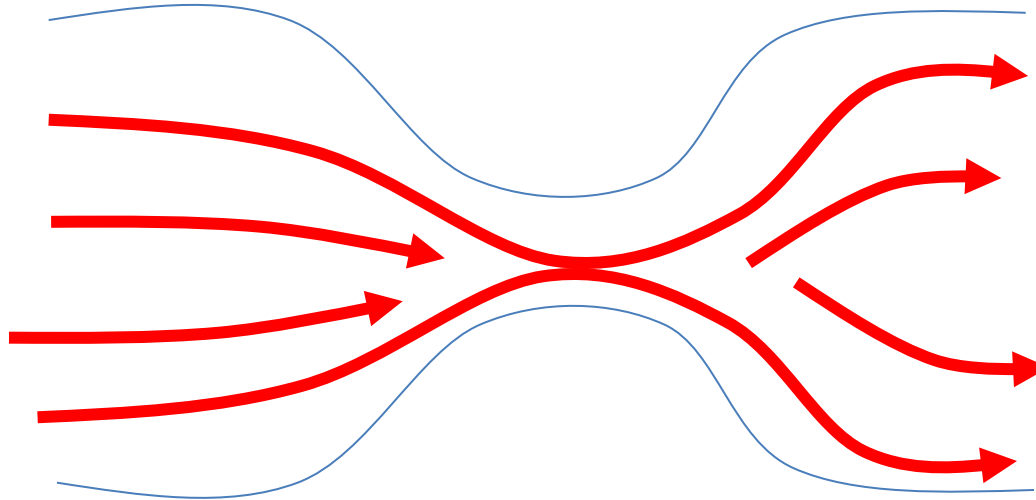
There are many terms used in Lean to refer to two, relatively simple concepts:



and Consumption

# Capacity, a.k.a...

Bottleneck, Time Trap, Herbie...



All of these names refer to the step in the process which defines the maximum capacity or throughput of the process – or more simply, the  
**RATE OF PRODUCTION**

# Consumption, a.k.a.

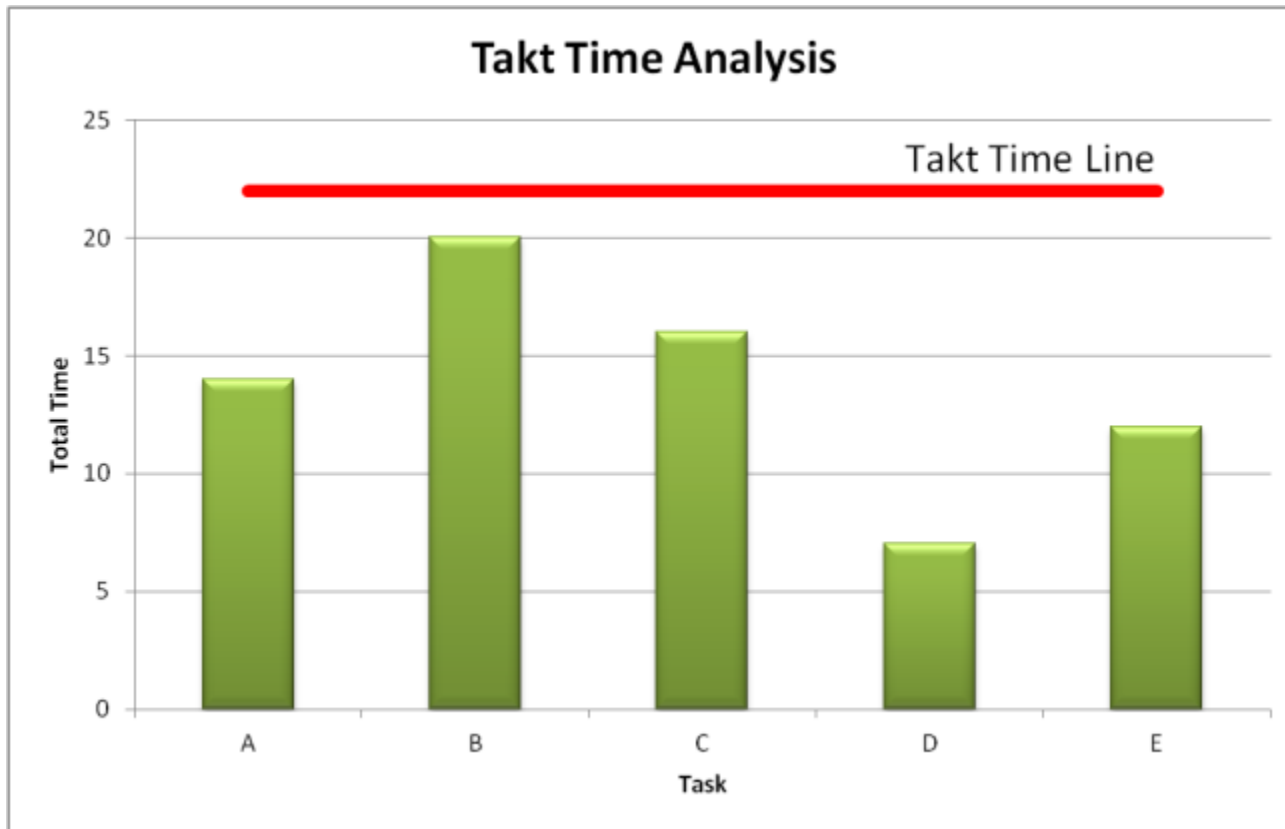
Trigger, Takt Rate, Pacemaker Process...



All of these names refer to the RATE OF CONSUMPTION and where that consumption signal is delivered to the process

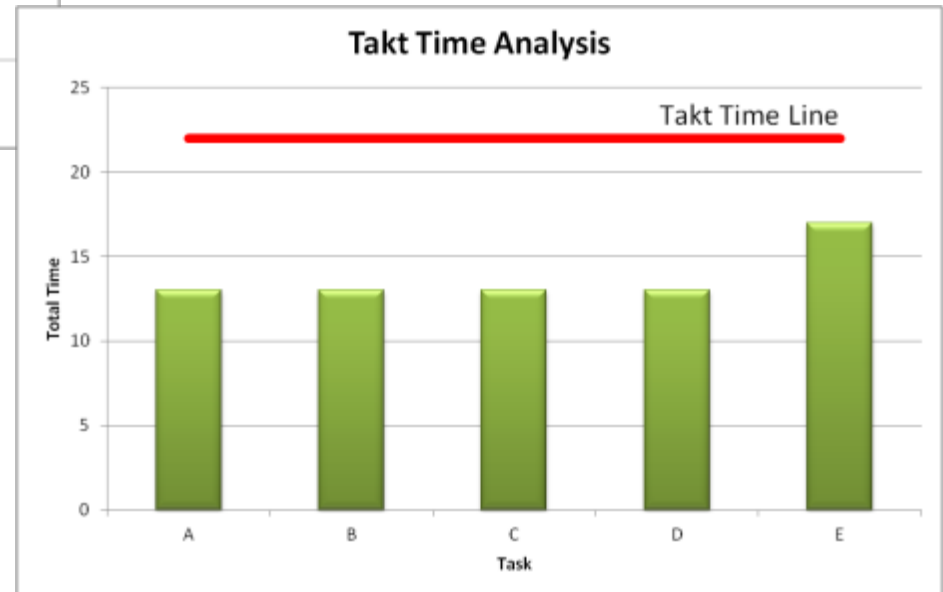
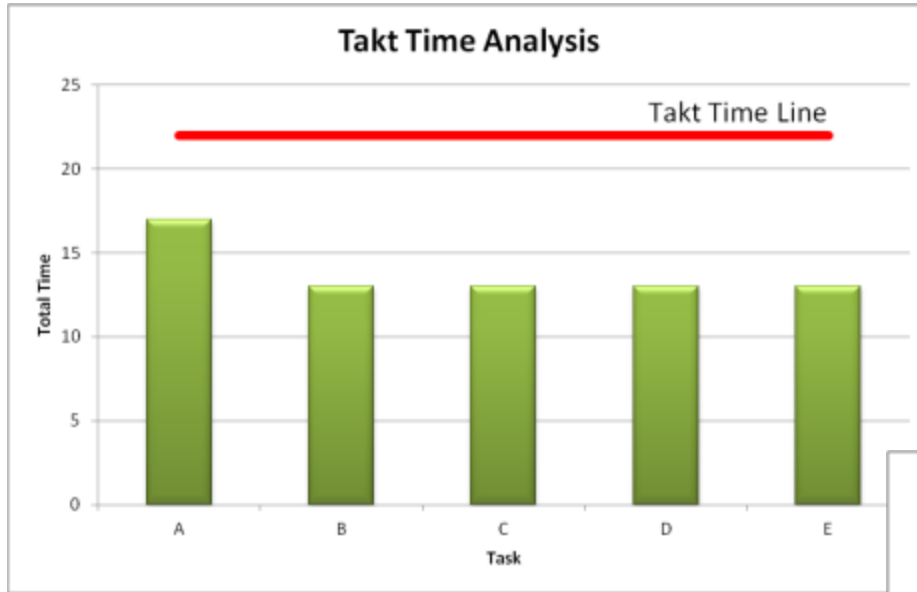
Analyzing consumption versus production is often accomplished with the Lean Takt Time analysis

# Takt Time Analysis

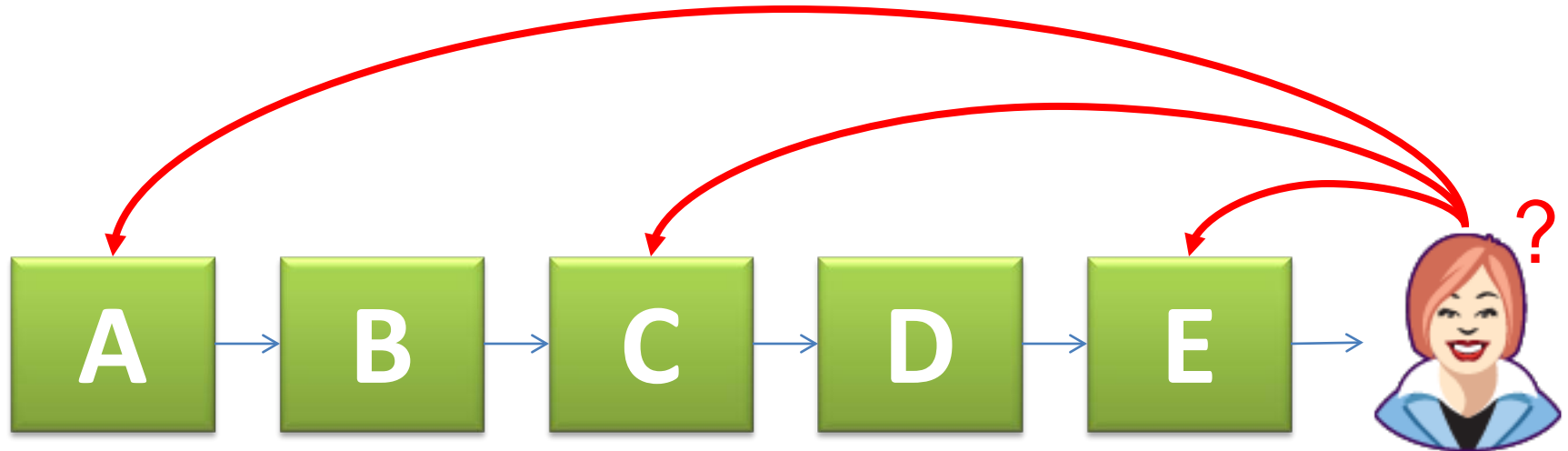




# Better 1, or Better 2?



# Where to Send the Trigger?



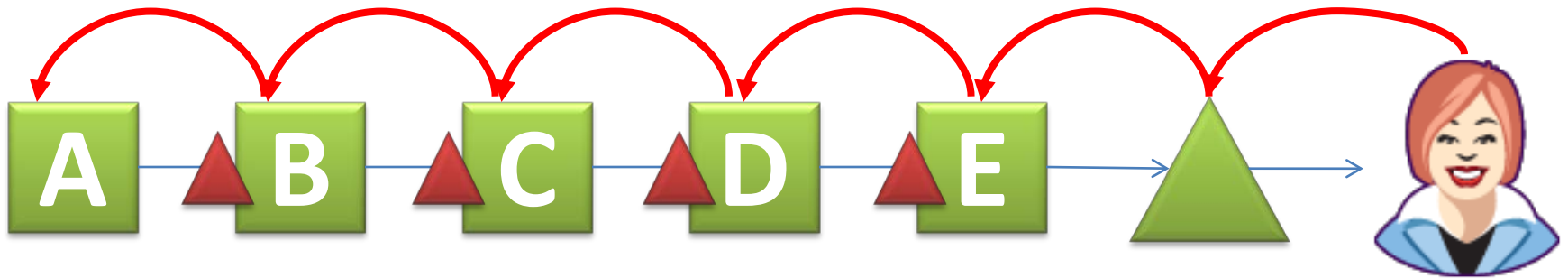
Considerations:

Repetitive make-to-stock or make-to-order?

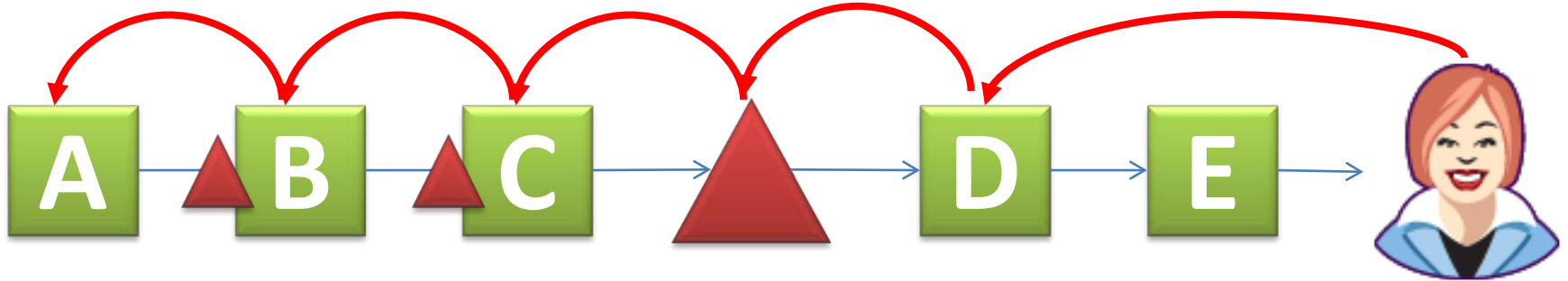
Customer expectation of lead time?

The point where the trigger is received will set the pace or rhythm of the process, unless the process is capacity constrained!

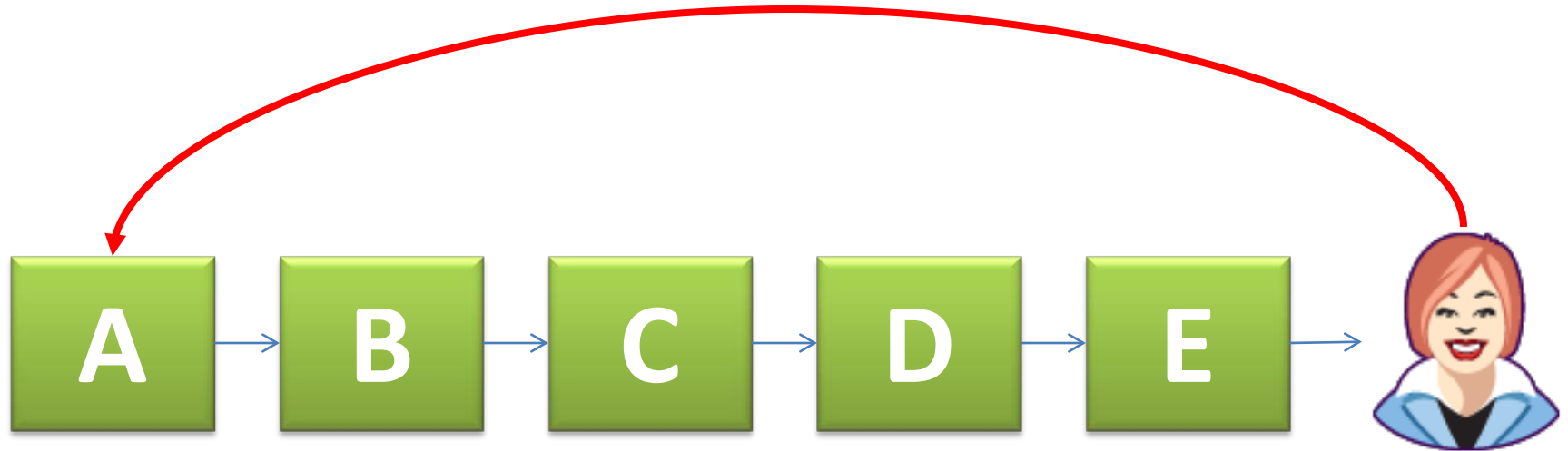
# Make to Finished Stock



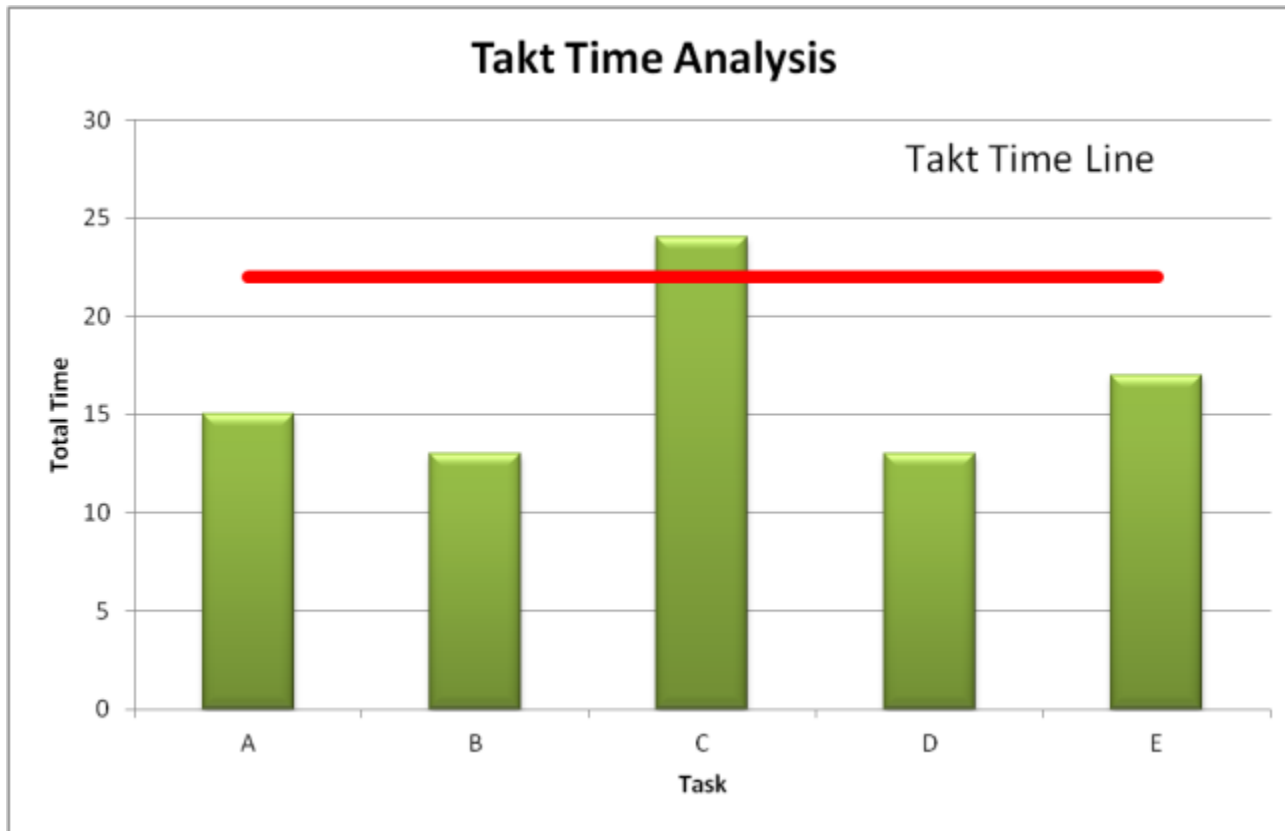
# Make to Semi-Finished Stock



# Make to Order

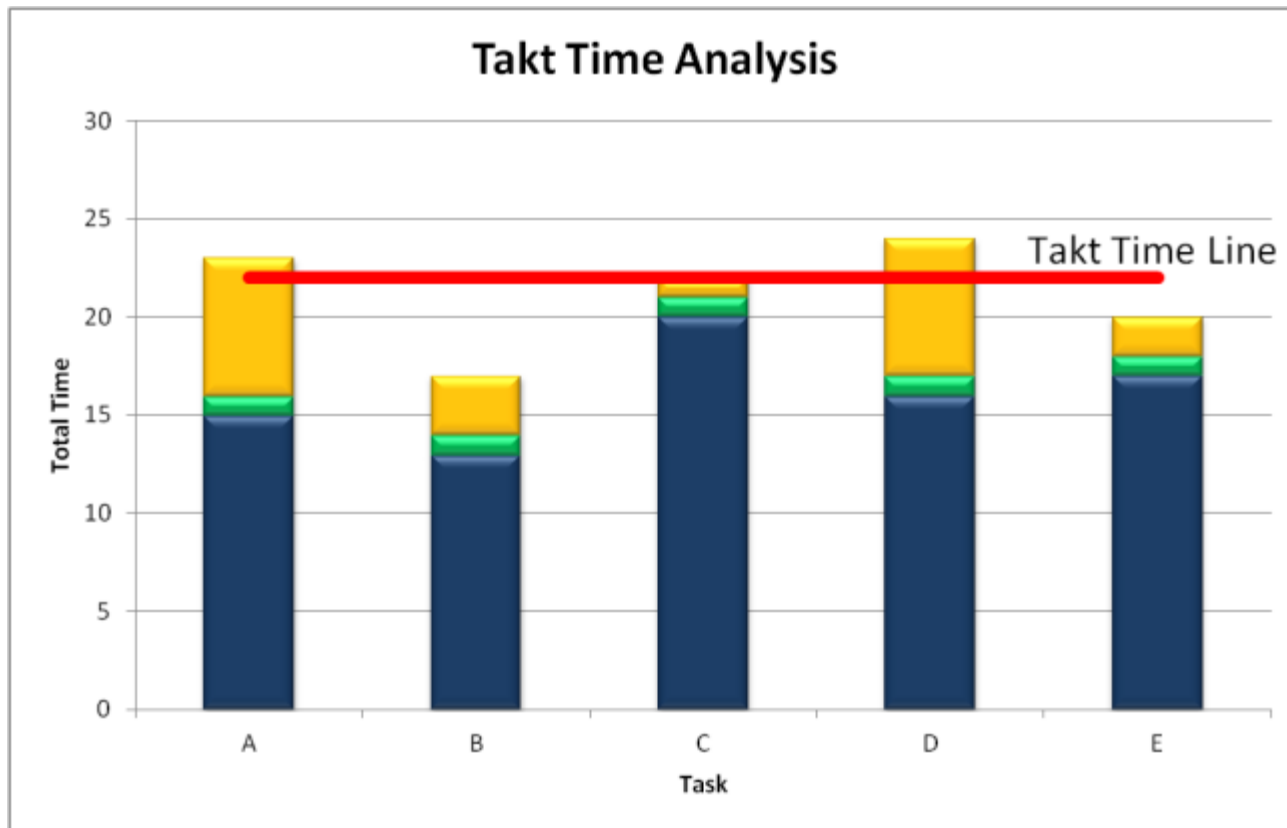


# Capacity Constrained



# Questions?

# What About Variation?



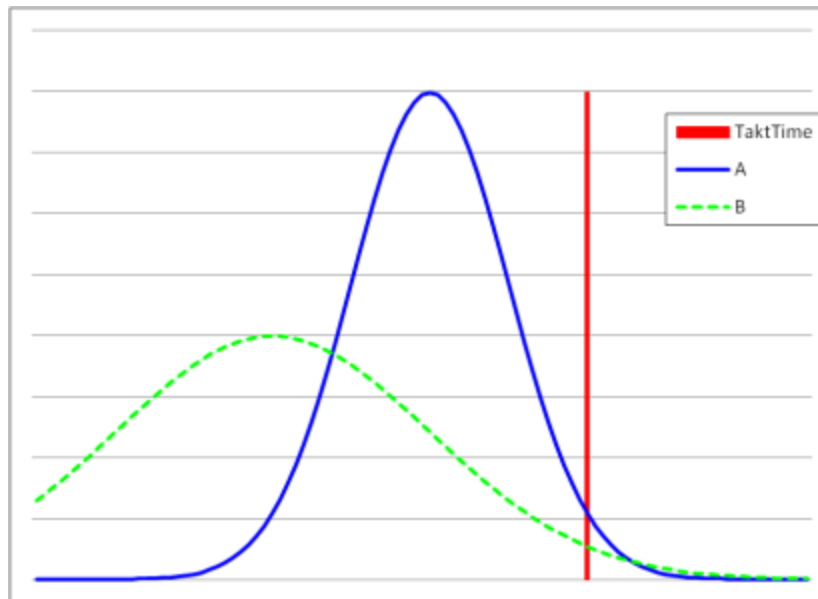


# Adding Process Capability to Takt Time Analysis

We are only concerned with task times which go above takt time, so we are only concerned with the Upper Spec Limit

Upper Spec Limit (USL) = Takt Time

$$C_{PU} = (USL - \text{Task Time Mean}) / 3 \times \text{Task Time Std Dev}$$



# A Four Step Process Example

Takt Time 7

	Mean	Std Dev	Cpu	p(>TaktTime)	p(<=TaktTime)
Step 1	4	2	0.50	6.7%	93.3%
Step 2	5	1	0.67	2.3%	97.7%
Step 3	6	1	0.33	15.9%	84.1%
Step 4	3	2	0.67	2.3%	97.7%

RTY: 75.0%



# Independence?

Is each step of the process truly independent of the previous step?

Yes?

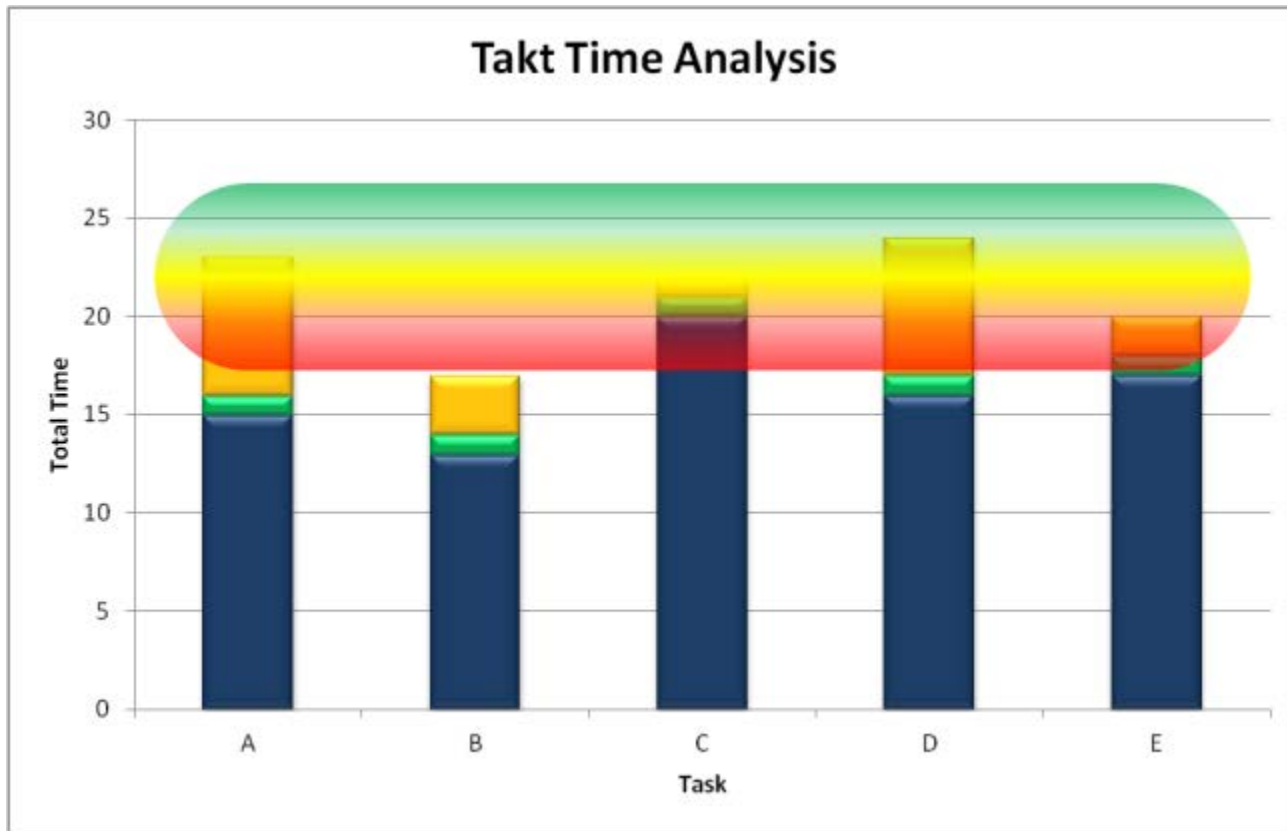
No?

Is each piece of work independent from the previous piece?

Yes?

No?

# What About Demand Variation?



# Adding Demand Variation

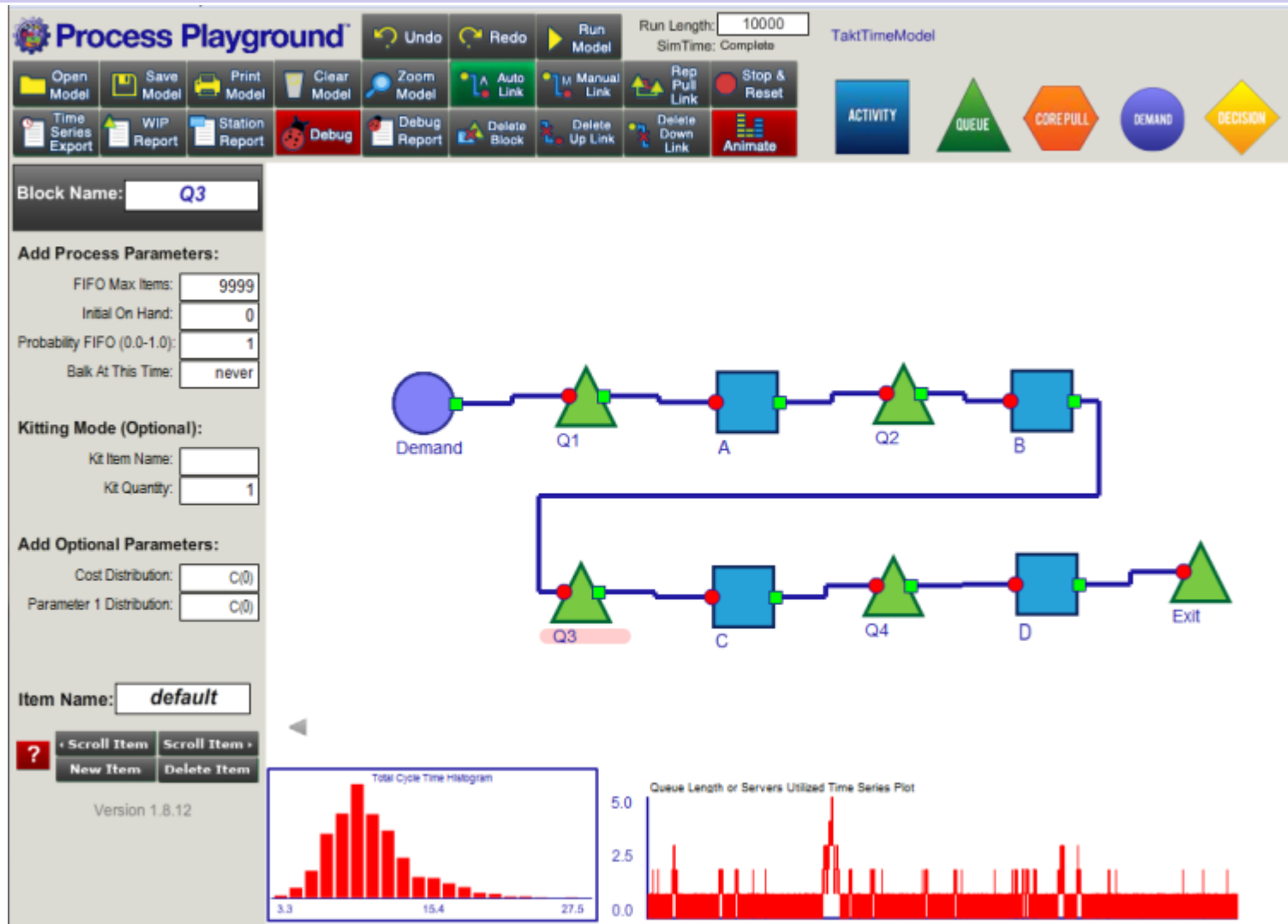
Takt Time 7

	Mean	Std Dev	Cpu	p(>TaktTime)	p(<=TaktTime)
Step 1	4	2	0.50	6.7%	93.3%
Step 2	5	1	0.67	2.3%	97.7%
Step 3	6	1	0.33	15.9%	84.1%
Step 4	3	2	0.67	2.3%	97.7%

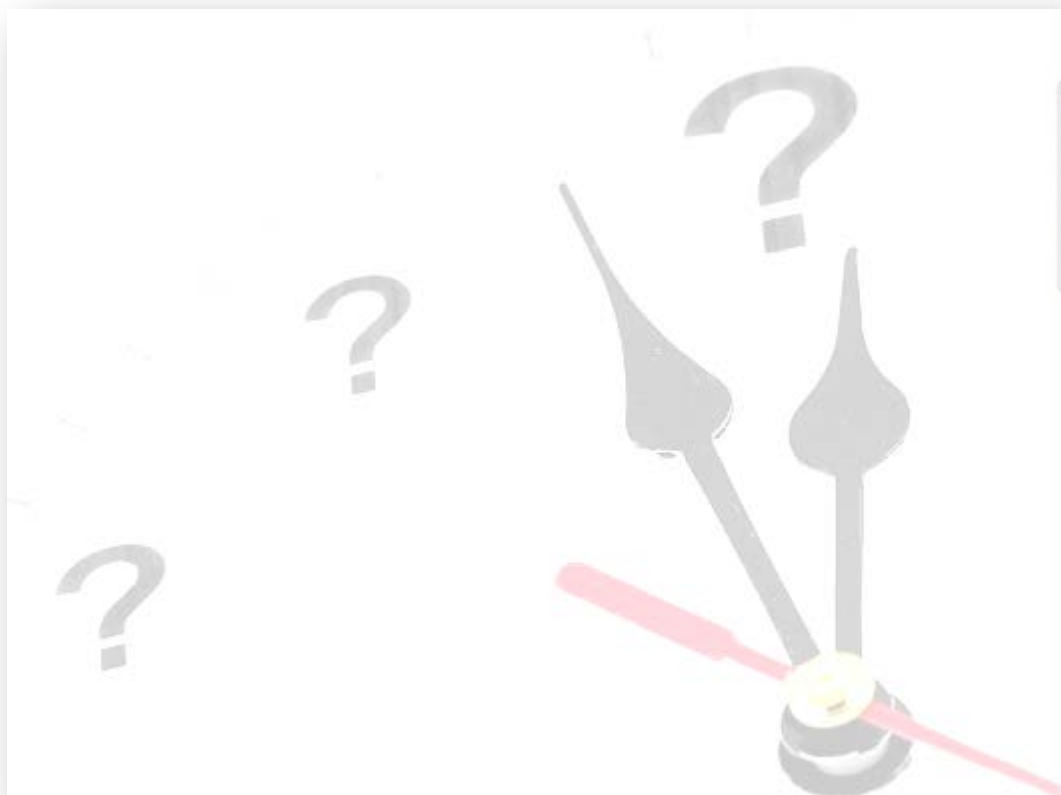
RTY: 75.0%



# Takt Time Analysis Simulation



# Thank you for joining us



A screenshot of the GoToWebinar software interface. The window title is "Attendee List (2 | Max 201)". It features several panels: "Attendees (1)" with a search bar; "Audio" settings showing "Use Mic &amp; Speakers" selected and a "MUTED" status; "Questions" panel with a "Questions Log" containing the question "Q: Is there a volume discount?" and a "Type your question here." input field with a "Send" button. The bottom of the interface displays "Webinar Now" and "Webinar ID: 731-938-951". The GoToWebinar logo is at the bottom.

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- Covers the [MBB Body of Knowledge](#), topics ranging from advanced *DOE* to *Leading Change* to *Finance for MBBs*





# Resource Links and Contacts

***Questions? Comments? We'd love to hear from you.***

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Larry Goldman, Vice President Marketing – MoreSteam.com  
[lgoldman@moresteam.com](mailto:lgoldman@moresteam.com)

***Join us for our next Webcast on October 31<sup>st</sup>:***

“A3 Reports: Polishing the Elevator Speech” – Tor Chamberlain,  
Coplay

***Archived presentations and other materials:***

<http://www.moresteam.com/presentations/>