

# Recasting the Time Factor in Lean Planning for Better Performance

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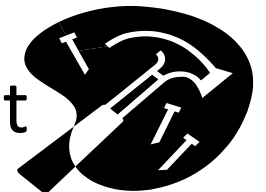
# Kent Vincent

## Post-Election Season Transparency Statement

- Scientifically trained, family of artists, teachers
- Food, chemical, ag, instrument scientist, lab and process control, worked way back up to planning, scheduling (APS, MES), tactical deployment issues
- Worked for IBM, an APS vendor, small consultancies
- Manufacturing, logistics, order fulfillment/back office, defense supply, clinical prof. services
- Industrial/community college trainer, implementer: 6Sigma, lean, QRM, JSL, “Just-Do-Its”, kaizen; I S & R has established and newer, unofficial alliances (TBA)
- APICS, ASQ, ISCEA, SSBB, AME Lean Bronze cert.
- Biased? Yes! Fawning fealty to methodology? No!

# Revisiting Time as a Lever in Planning

- Boat rocking, sink-it-all and start over is popular in books and articles, especially in light of economic pressures 
- Instead let's man the rudder and redirect about 90°   
- In particular, refocus on time, recognize its even greater leverage and impact on our planning and execution than we gave it credit for
- Introduce notions of Quick Response Mfg/Fulfillment, but will not be slaves to it



Concepts are those of I S & R Services together with those of the



Center for  
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**M**anufacturing

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# Production/Logistics New “Influences”

Process Improvement Concepts/Tools

*Total Productive Maintenance* *DFSS*  
*heijunka* **Andon** **Flow** **Takt**  
*Cost Shifting* **Kaizen** *Push vs Pull*  
**Jidoka** **Spaghetti Diagram** **Hoshin**  
*Just-In-Time* **Lean Accounting** **Kanban**  
**JSLean** **Poka Yoke**  
**Theory of Constraints**



# Lead Time Notions and Attitudes

- Of course, faster is better, been there done that. What else ya got, roller skates?
- Everyone from the pocket calendar sales person to the mobile phone vendor promotes time savings. Our eyes glaze.
- If you've done a little lean you know a "Little":  $WIP = LT \times \text{Pace of Production}$ . But I've hit that wall, and my pace is pretty erratic anyway with all the new FG variations demanded.
- It's cost and waste I have to root out, time is a given.
- We offer quality and care, rushing would impact our value.
- Shouldn't it be easy to spot time traps and non-value add portions of the value chain, what's next?

# What is lead time after all? (maybe not so trivial or dull)

- External lead time (perceived by customers)
- Internal lead time (time for jobs to make their way through the organization)
- Quoted lead time: what sales imparts to field
- Planning lead time: chain of times from routings combined with various offsets
- Supplier lead time: time for RM, supplies to get from suppliers to site of transformation

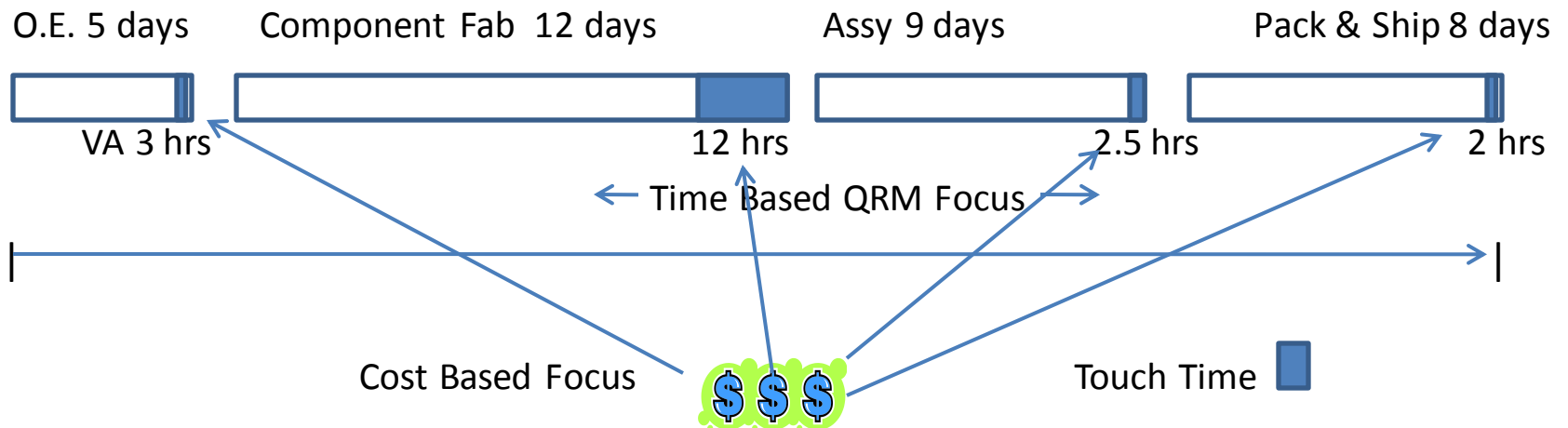


# A Subset of Other Basic Beliefs (Institutional, not personal level)

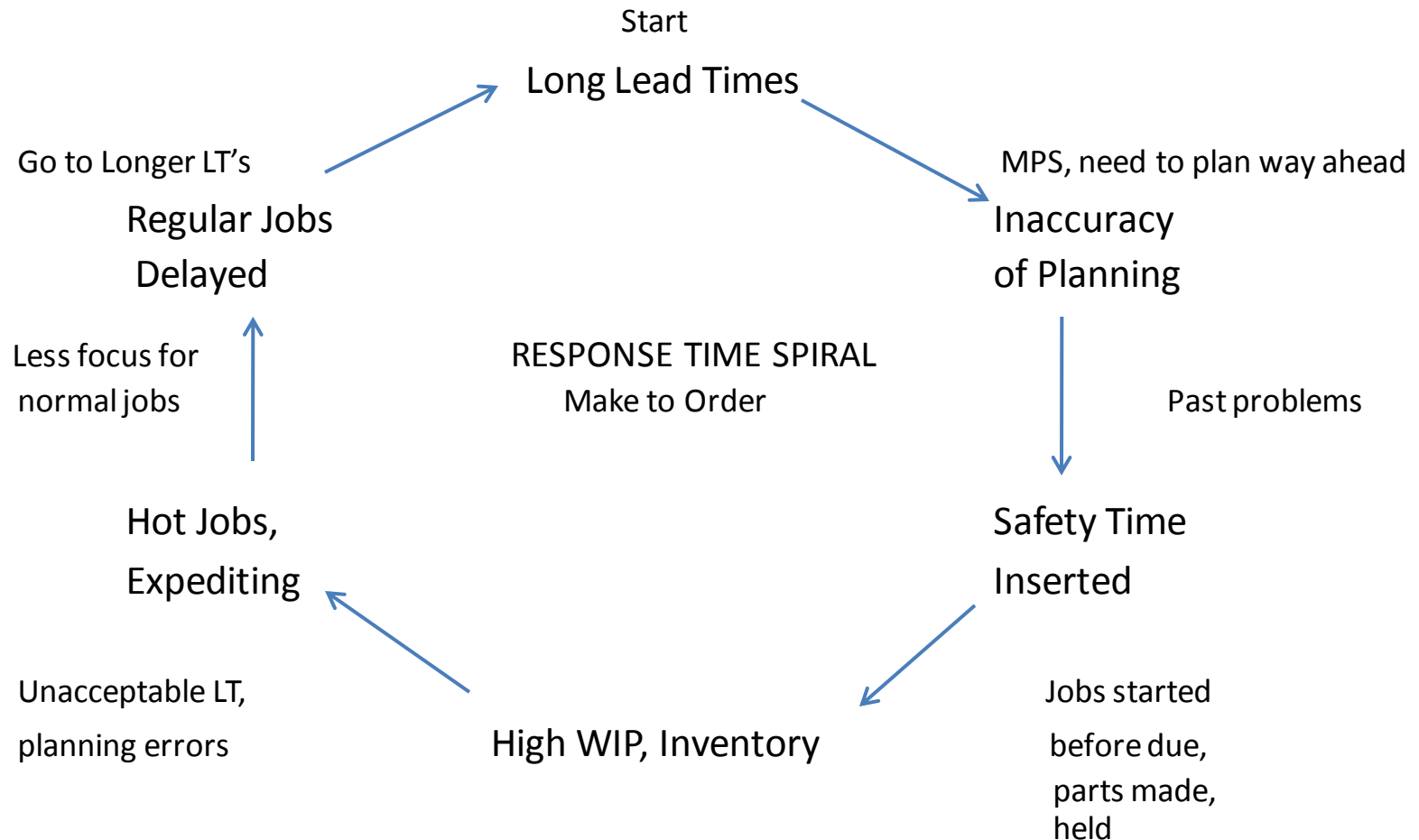
- Everyone will have to work faster, harder, and longer hours, in order to get jobs done in less time. True \_\_\_ False \_\_\_
- To get jobs out fast, we must keep our machines and people busy all the time. True \_\_\_ False \_\_\_
- In order to reduce our lead times, we have to improve our efficiencies. True \_\_\_ False \_\_\_
- On-time delivery performance is the standard to use for your company and your suppliers. True \_\_\_ False \_\_\_
- Relying on a MRP or ERP system will always help in reducing lead times. True \_\_\_ False \_\_\_
- Long lead time items should be ordered in large quantities with quantity discounts, and customers should be encouraged to buy in large quantities with incentives in the form of price breaks True \_\_\_ False \_\_\_

# Answers to All

- A bit maybe, but not so much, i.e. False
- In fact, time in the fulfillment chain is like water to a chemist (bias!): it can appear in obvious form sloshing around in a bucket or as embedded and hidden as the water of hydration in a crystal or bonded tightly to a somewhat dry food morsel. It is for the most part a hidden entity and unexploited lever in attacking waste, deficient quality, and costs and in improving profit and competitiveness.



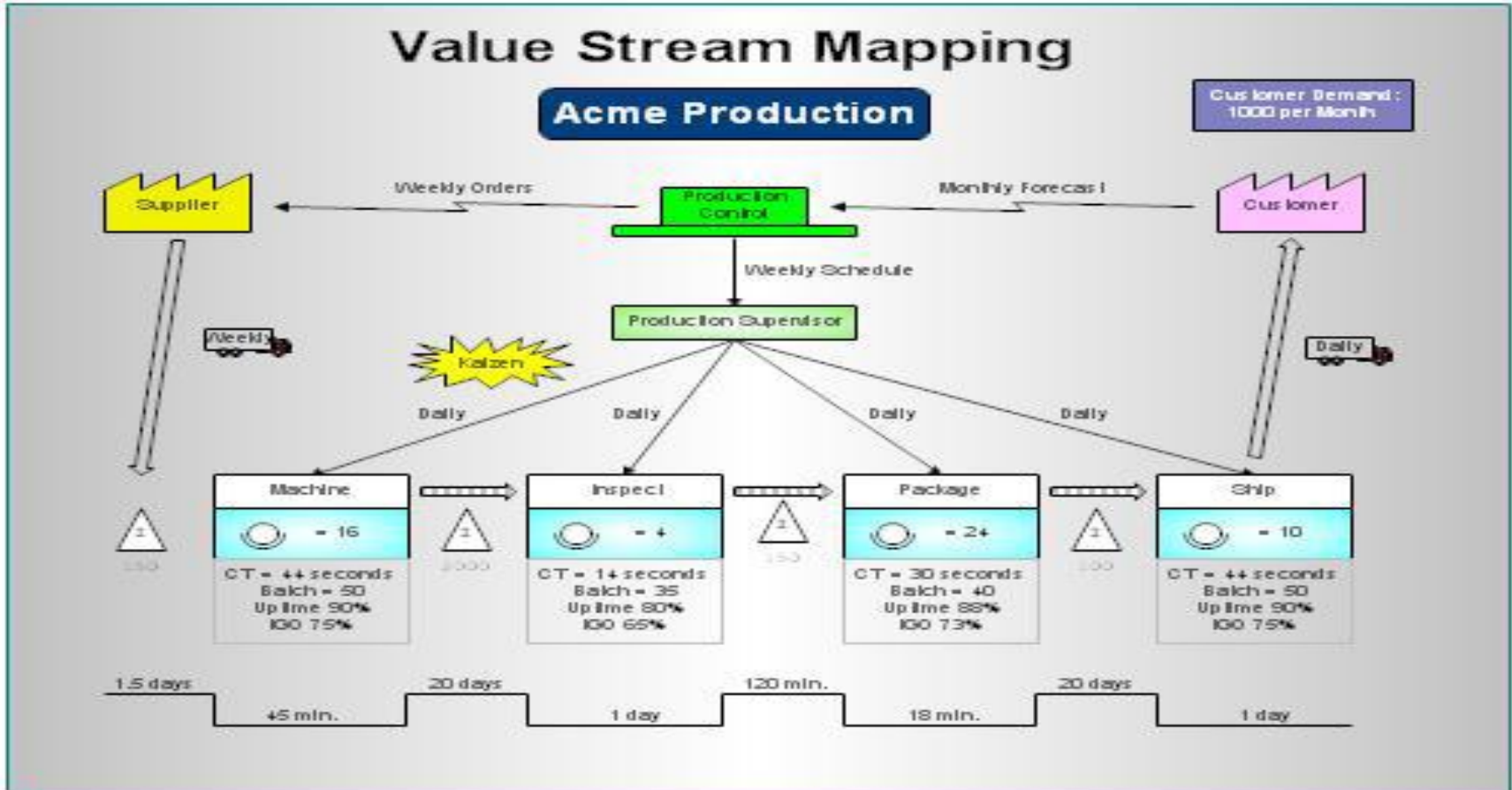
In terms of planning, time does not so much span a race from point to point as it does impart momentum to a spiral (physics?)



## Move away from ambiguous Lead Time measures to a comprehensive measure: MCT

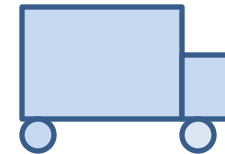
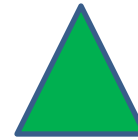
- Manufacturing (or Fulfillment) Critical Time is the typical minimal calendar time required for a customer order to traverse the critical path through all stages of production and fulfillment assuming every component is provided from scratch (i.e., assume no work-in-process inventory) until the first piece is delivered. Add in all normal queuing, waiting, and move delays plus time spent at stocking points, etc.

# Value Stream Map



# Key Components of MCT

$$MCT_{TOTAL} = MCT_{RAW\ MATL} + MCT_{OPERATIONS} + MCT_{CONTINGENCY} + MCT_{LOGISTICS}$$



$$MCT_{RESPONSE} = MCT_{RAW} + MCT_{OPERATIONS} +$$



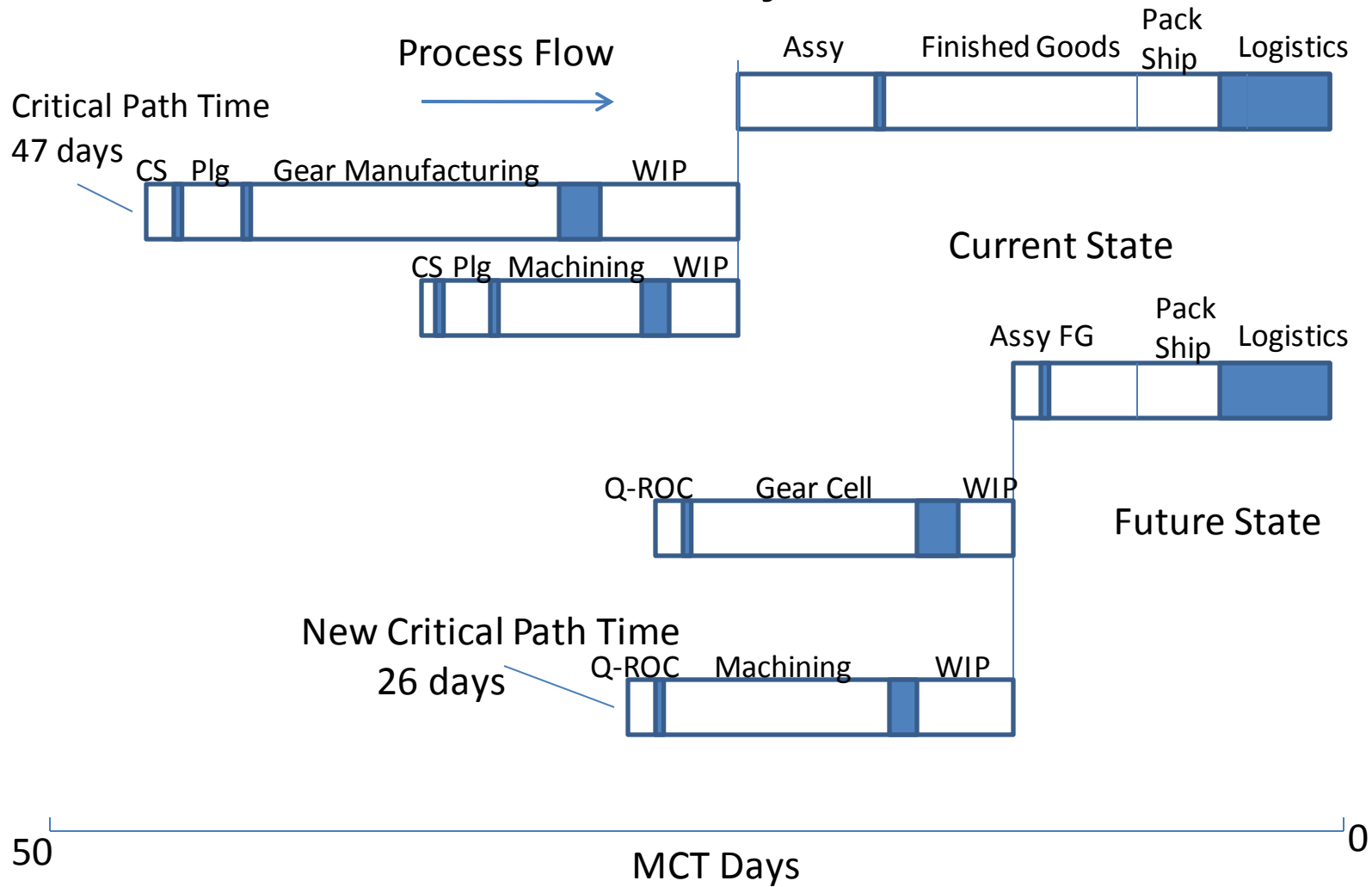
If needed

$MCT_{LOGISTICS}$

# MCT Map- a Complement to a Value Stream Map

- Combines features of a Gantt style chart with a critical path chart
- White space- unexploited time- comes out in relief, proportionately, and receives focus, rather than a blue-print style rendering
- Depicts the critical path through all the processes
- Highlights the are opportunities for improvement more so than blueprint style VSM
- A single number can be devised to summarize performance

# Current and Future State MCT Maps for Proposed Project



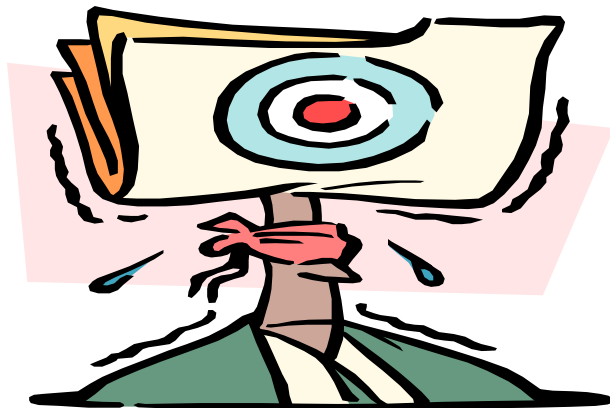


# Operations where QRM is Most Effective

- Low volume, highly variable demand, large number of product or service specs
- Highly engineered products in small batches
- Greatest opportunity for overhead reduction

# Other Key QRM Characteristics

- QRM and its underlying theory of Systems Dynamics gives great weight to the inherent fluctuations and extremes in order arrival time, task time, “flow time” (queue time plus time to complete job) and the effect of heavy resource utilization, especially in less rhythmic, high variety/low volume product mixes.
- Averages are one thing, but unmanaged extremes can be damaging.



## High Utilization

### Lean

Over production

Violates Pull

Smallest batch best

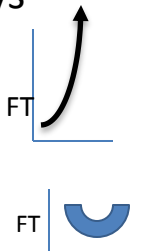
### QRM

Lead Time Magnifier

Queuing Theory says  
time skyrockets

Batch has mini-

mum optimum size



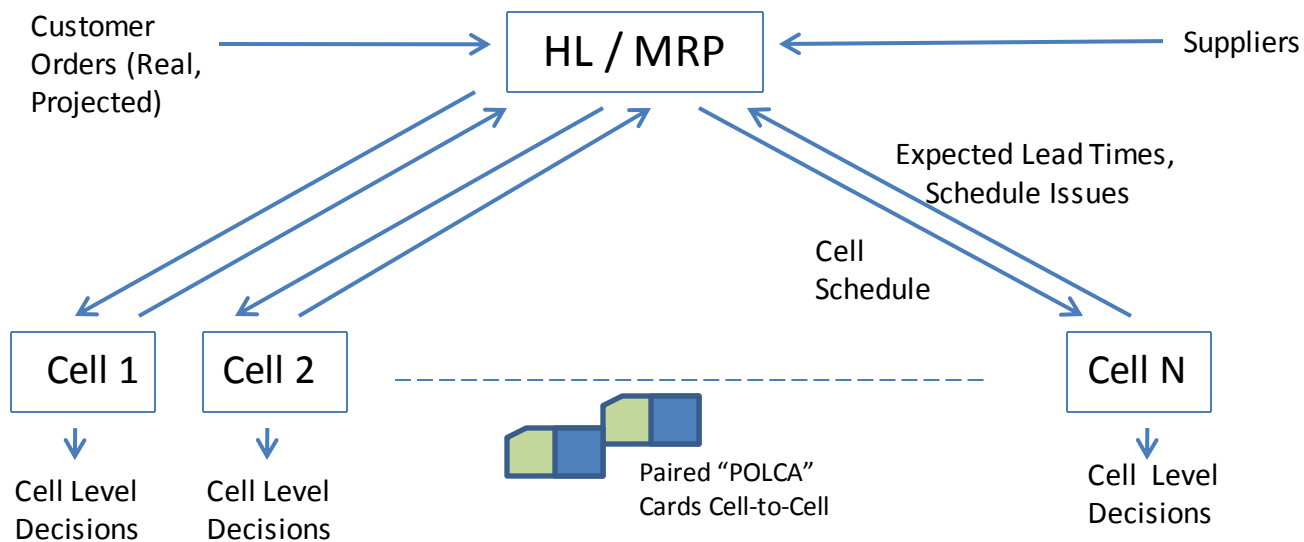
# *Which Leads Us to ERP...*

- QRM makes use of its gross planning capability, but makes it sit quietly in the corner at other times:
  - Objects to additive time bucket work load idea– need to factor in fluctuations and queues when resources tied up
  - You declare a flow or routing step time without factoring in decisions (exceptions are out there)
  - No changes to lead times based on capacity utilization
  - No adjustment for arrival time fluctuations at w/c's: fewer or more jobs than expected can arrive
  - Can't help with reducing flow times, does not account for the cost of long MCTs or place enough value on responsiveness
- At the same time, it does not favor Advanced Production Scheduling systems to correct this or cope with it. (I differ.)

# Pull System Variations to Accommodate Lean and QRM

- Use a available capacity signaling system instead of a sku based signaling system (conventional kanban), because
  - Variations are numerous and infrequent; *takt* times are not stable or meaningful
  - Routings vary and pathways fork and branch
  - Work centers are directed to work in pairs on consecutive steps for an order using the same cards, then releasing them when done
- Potential for increasingly custom-oriented production and high variety batch/formula processing

# Use a “High Level” MRP- Cell Level Dispatch List Combo for Executing Customer Orders



## Customer Order Dispatch List

Cell 1 Date: January 15, 2011

Job ID	Auth Date	Next Cell	Other Job Data
~~~~~	Jan 13	4	~~~~~
~~~~~	Jan 15	4	~~~~~
~~~~~	Jan 16	4	
~~~~~	Jan 17	4	

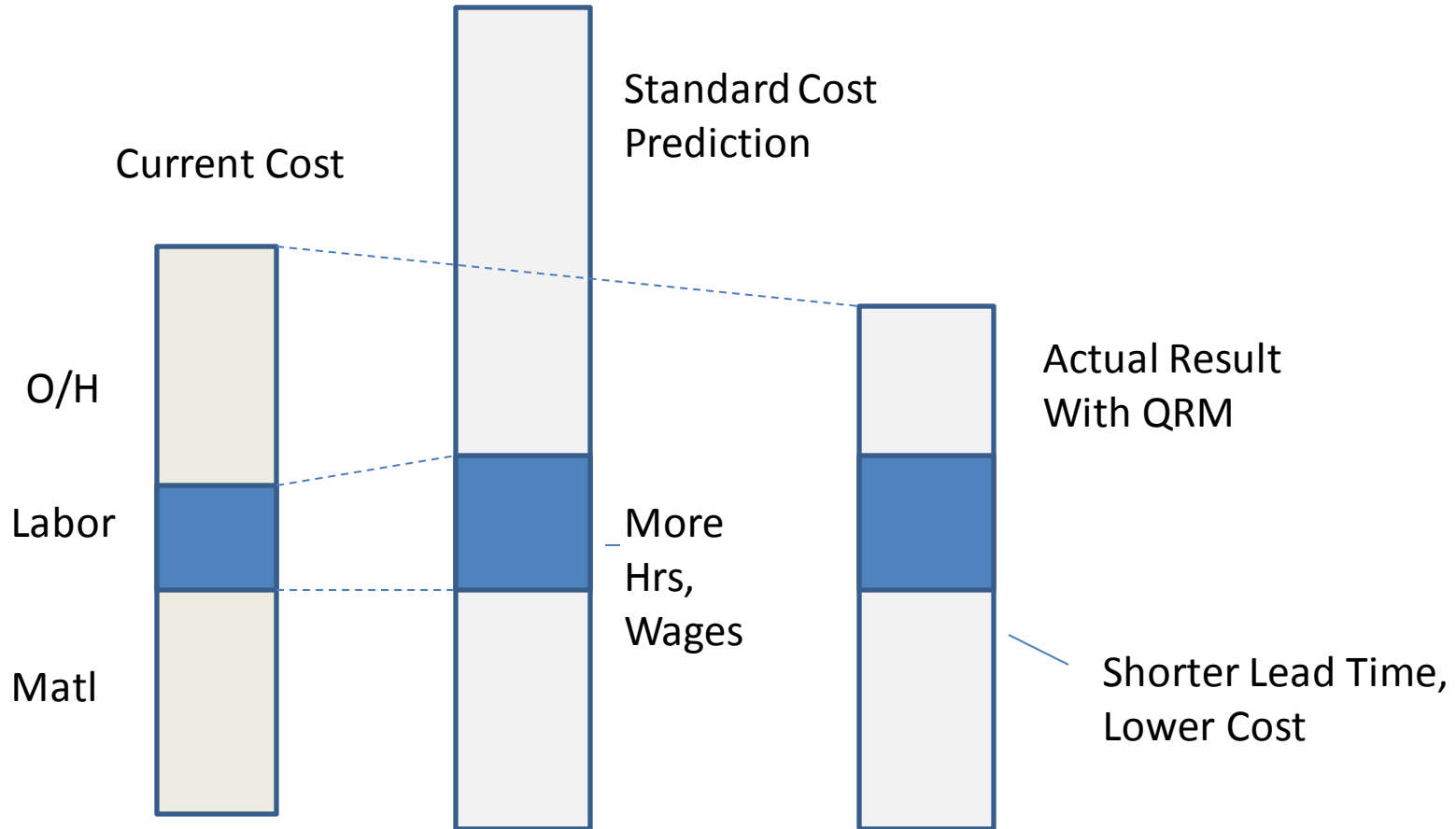
### Food for Thought Questions:

- Mfg Orders vs Customer Orders?
- Planning BOM's vs Production BOMs
- Where does “S & OP” Come In?
- Does “High Level” have Meaning for Specific Customer Orders?
- ..... Etc.

# Steps to Implement

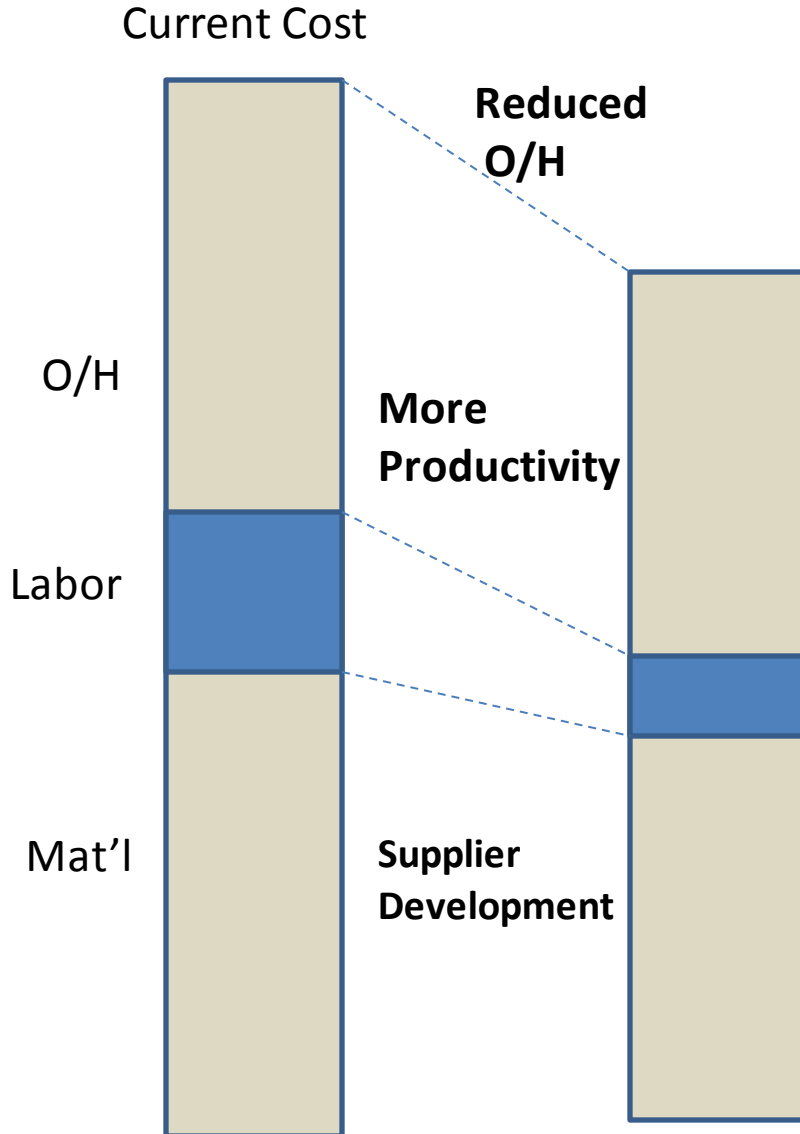
- Find a “Focused Target Market Segment” as a starter thread in the operation
- Try cellularizing an area based on time reduction and pathway tightening, not on technology
  - Office based order processing is fair game in the form of a “Q-ROC”: paperwork is confined to loops among specialists in co-located desk area
  - Apply Systems Dynamics, especially to build in spare capacity; attack bottlenecks by attacking variability
  - Kick in flow control concepts such as POLCA, other; fuse with Lean, TOC, and other relevant programs
- Roll out enterprise-wide, broadening coverage of office and supply chain

# Back End Benefits of QRM



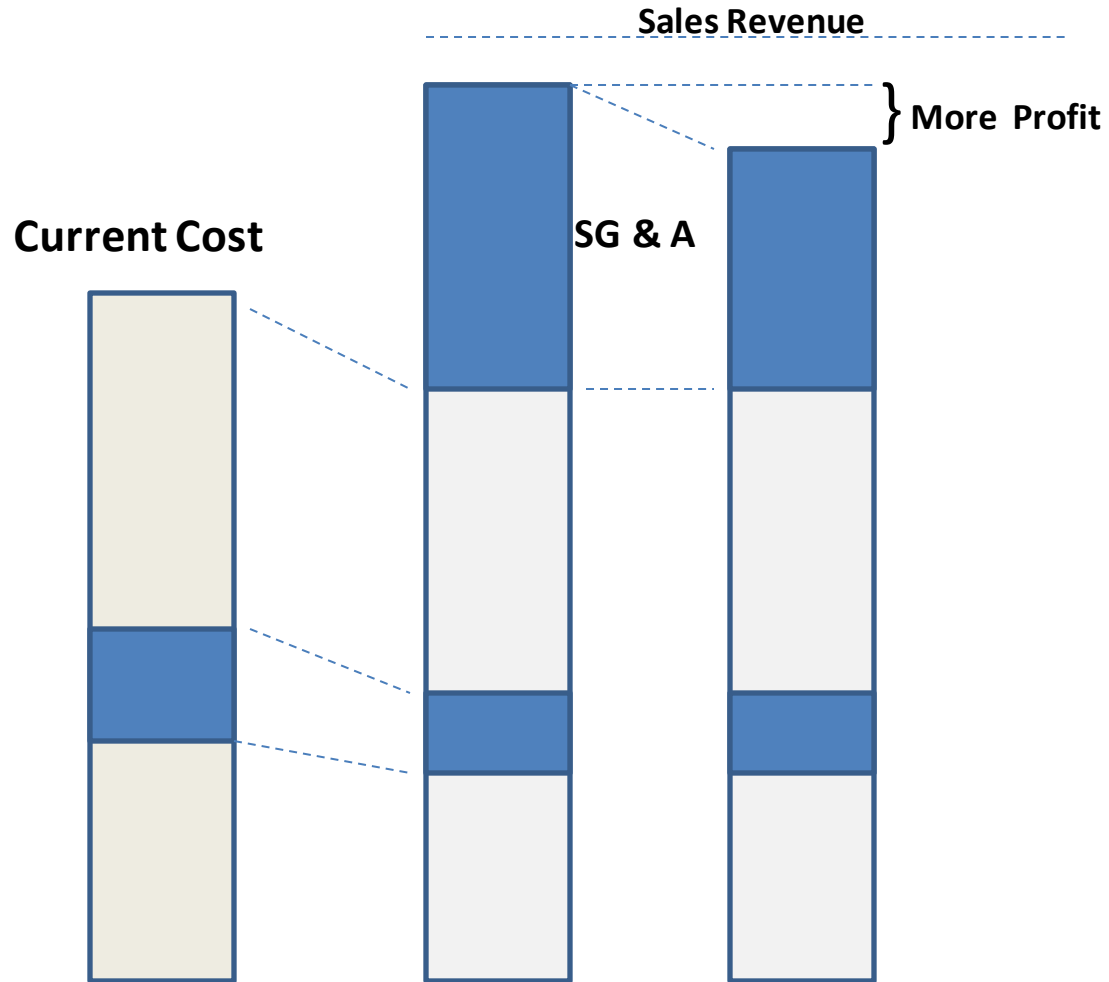
New, cross-trained team, multiple opns/cell

# More Benefit





# Still More Benefit



# Additional Points on Quick Response vs. Lean

## LEAN

## QUICK RESPONSE

Toyota based; High Volume/Repetitive

Designed from ground up for high Variety/Low Volume Custom Engd

Level, standardize, eliminate variability

- Eliminate undesirable variability
- Preserve strategic “variability”

Focus on 7-8 Wastes Reduction

Reduce lead time, critical time

Rigid, standardized cells

Flexible Cells, multiple flow schemes

Pull mechanisms sku based, kanban

Pull mechanism is capacity based, Exploits variable routings

Capacity planned around *takt*, pace  
Predictable demand, limited variety

Capacity driven by lead time, variety, need to allow for spare capacity, responsiveness

Four-walls oriented, coordination  
With non-mfg, supply chain challenges

Enterprise-wide, global outlook,  
More unity around time-based policies

# Final Take Aways

- Time is a bigger lever in planning and execution than we think— not so humdrum
- Metrics questioned (OTD vs “true” Lead Time)
- Critical time fulfillment flow path is more all inclusive
- 90° shifts in roles of ERP and production planning
- Lean concepts preserved, just twisted and extended vis a vis time, money, cost, waste with time as the pre-eminent factor
- Time driven financial impact is significant— minor adjustments and recasting compared to wrenching Lean Accounting restatement/rework