

Continuous Improvement Trio



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Trusted Business Partner

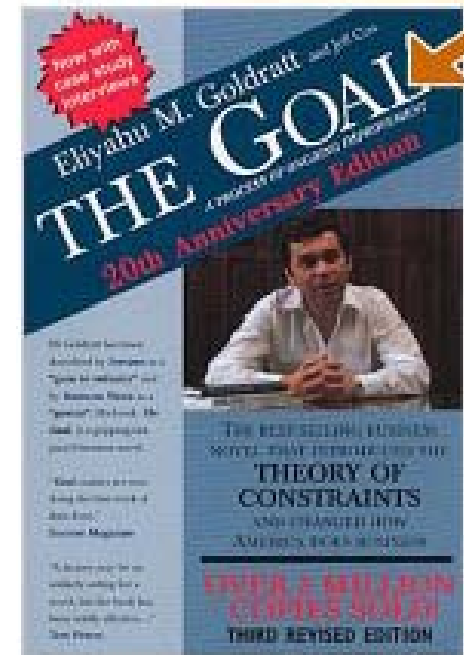
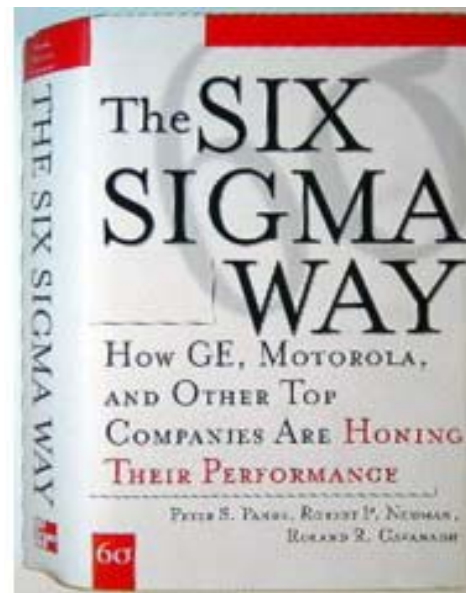
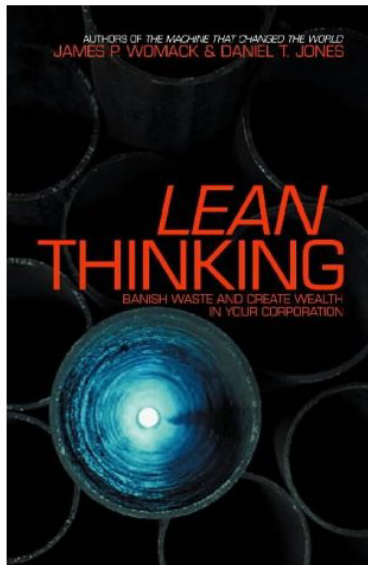
Simply Effective

- **Leveraged Activity**
- **therefore -- Fast Results**

Fast results (PROFITS):

- **Creates Sustainable Enthusiasm**

In Search of Excellence?



India is Hungry too!

Another look at the same thing . . .



Is your organization at the finish line?

Organizations that are using Theory of Constraints



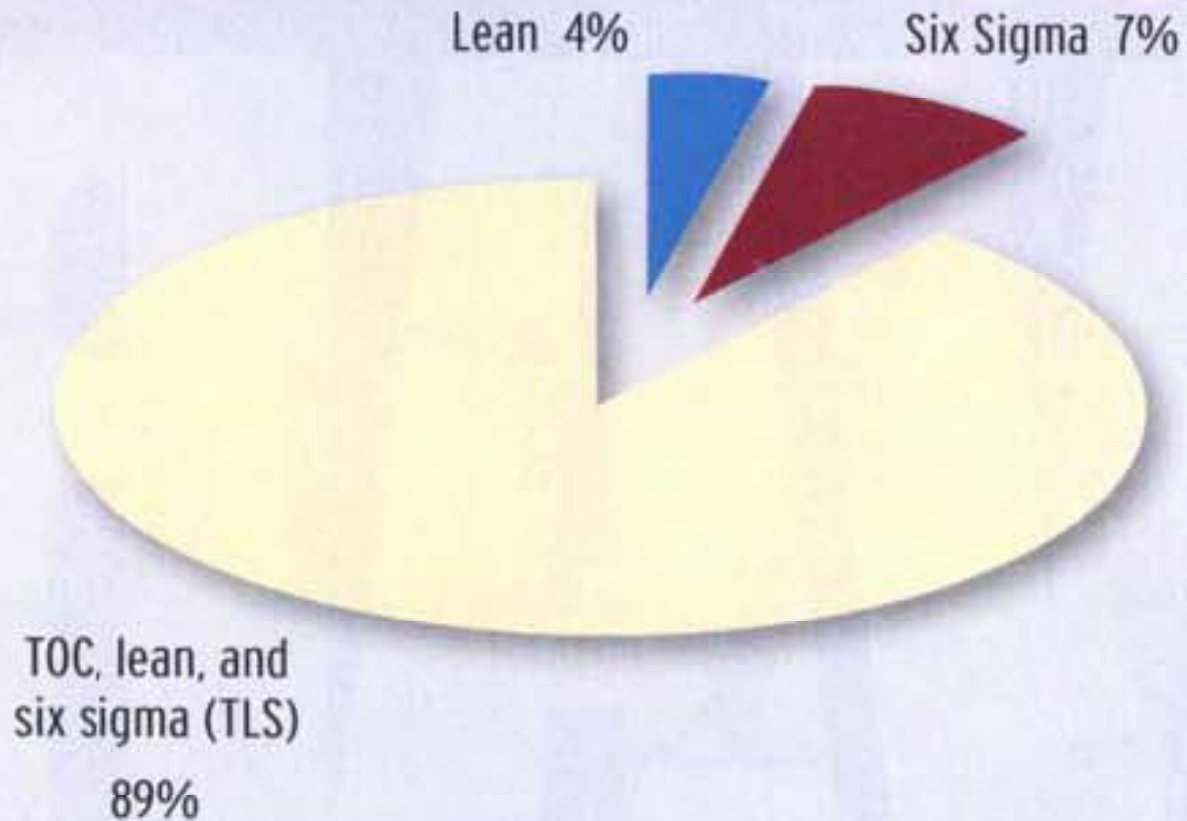
-Courtesy Eli Goldratt-

Midwest Organizations . . .

- Paper and converting
- Printing and book manufacturing
- Job shops/Fab shops
- Discrete/Contract manufacturers
- Chemical, paint, and adhesive
- Mailing Services, Lumber Mills
- Banks, hospitals, and schools . . .

In short, it applies to any organization that has a system of dependent events . . .

Figure 1 Percentage of contribution to savings realized



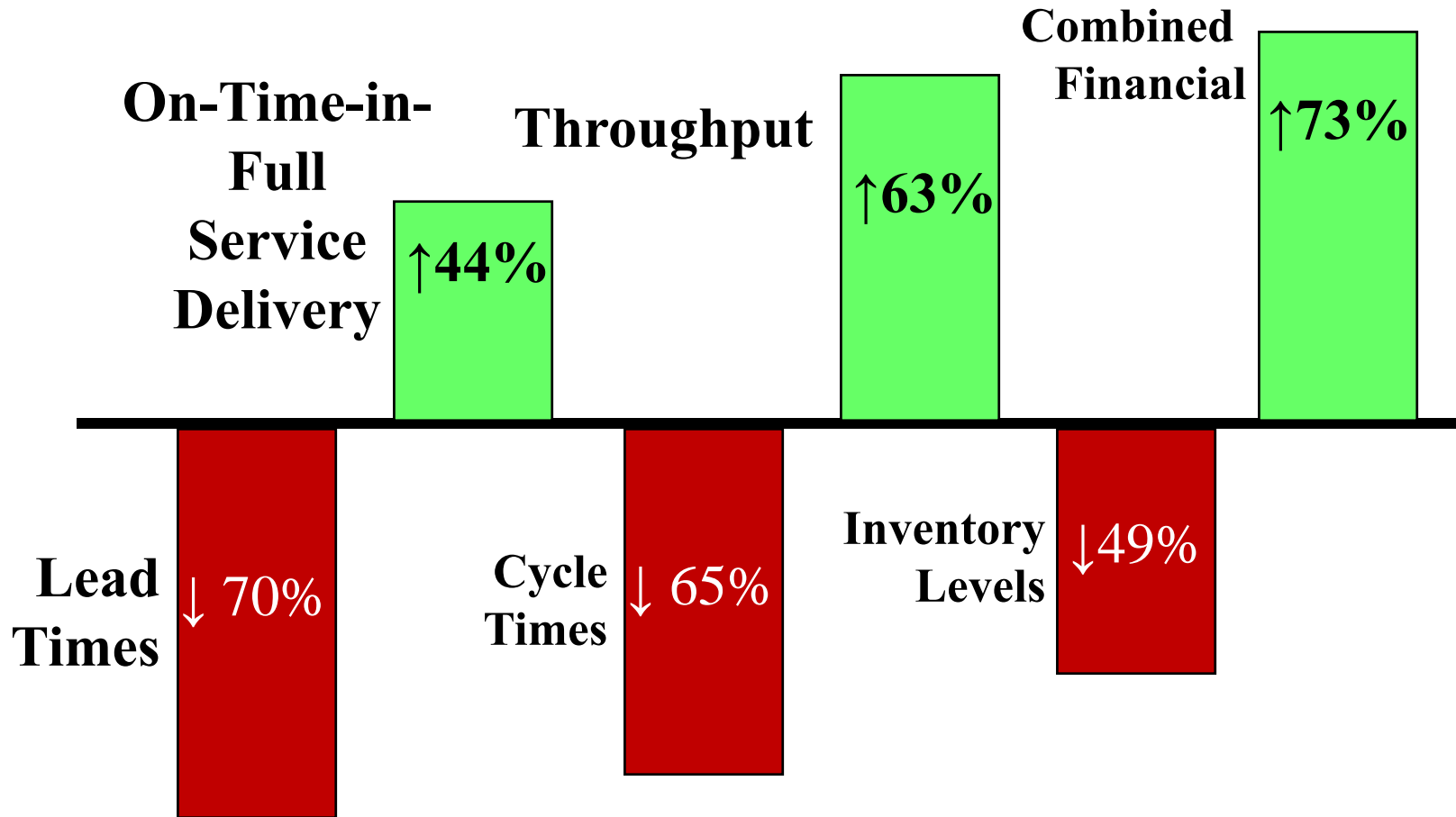
Courtesy APICS

The Specific Steps these companies follow:

- **Define the System** you wish to improve
 - Manufacturing Plant, School, Hospital, Bank.
- **Define the Goal** and the **Goal Units** of the system
 - More profit, Smart kids, Healthy people, Mortgages sold.
- **Identify/Choose the constraint** within the system
 - Critical machine, More Teachers? More Doctors?
- Determine how to **exploit the capacity** of that constraint
- **Subordinate** other non-constraint needs
- **Elevate in ratio – Progressive Equilibrium**
- **Maintain**

The Inherent Potential

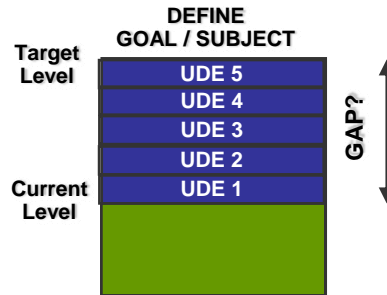
A Review by independent academia of 80 global Theory of Constraint Implementation Case Studies in the Private Sector showed the following results:



Source: The World of Theory of Constraints,
Vicky Mabin & Steven Balderstone, St. Lucie Press, 1999

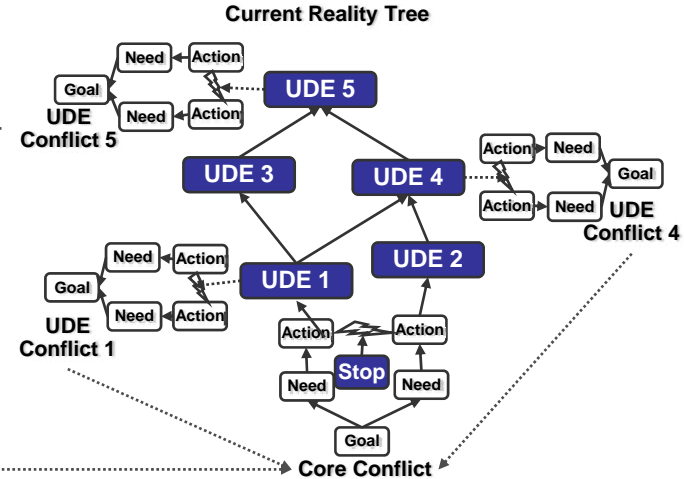
The Analysis:

STEP 1 WHY CHANGE?



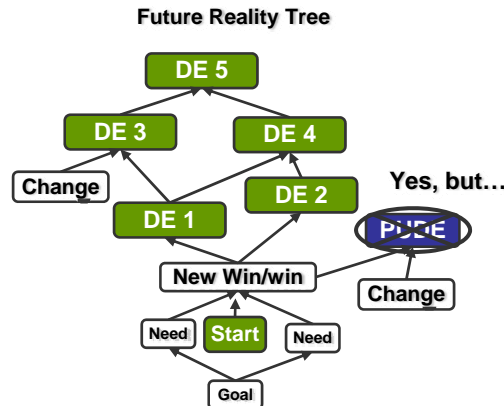
STEP 2 WHAT TO CHANGE?

WHAT TO CHANGE?



STEP 3 WHAT TO CHANGE TO?

WHAT TO CHANGE TO?



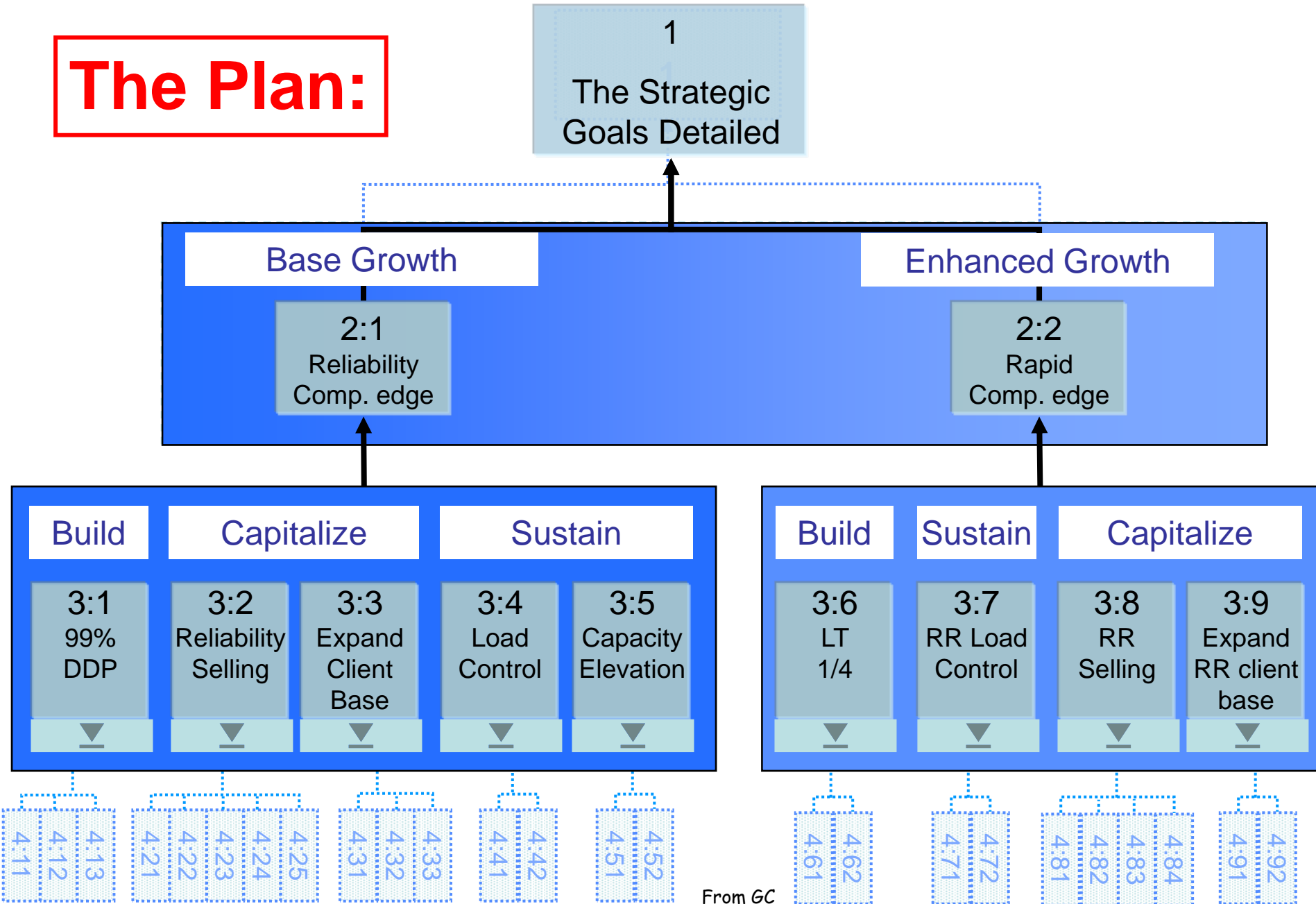
STEP 4 HOW TO CAUSE THE CHANGE?



From www.TOCICO.org

Reliable Rapid Response S&T

The Plan:



Consider our results...

Case 1

\$110 million Chemical Company, Kentucky

Before

- DDP = 68%
- Lead Time = 2-3 weeks
- Inventory Turns = 3
- Dead Inventory = 20%
- Emergency Orders = 15-20

After

- DDP = > 99%
- Lead Time = 4 days
- Inventory Turns = 11
- Dead Inventory = < 10%
- Emergency Orders = 1-2

Across large-scale industries...

Case 2

Fortune 500 Division / Auto Parts Co -Michigan

Before

- DDP = 75%
- Inventory Turns = 6
- Emergency Orders = 60

After

- DDP = 97%
- Inventory Turns = 18
- Emergency Orders = 3

And small-scale ones...

Case 3

\$2 million Machine Shop, Colorado

Before

- DDP = 60%
- Lead Time = 6 weeks
- Somewhat profitable
- Limited market

After

- DDP = 98%
- Lead Time = 1 week
- Profits Quadrupled in 2 months
- Giant Market

All using a common approach...

Case 4

\$45 million Electronics Company, Florida

Before

- DDP = 81%
- Lead Time = 2 weeks
- Inventory Turns = 4
- Emergency Orders = 90-120
- New Products -6 weeks

After

- DDP = > 99%
- Lead Time = 2 days
- Inventory Turns = 13
- Emergency Orders = 6-8
- New Products 1-2 weeks

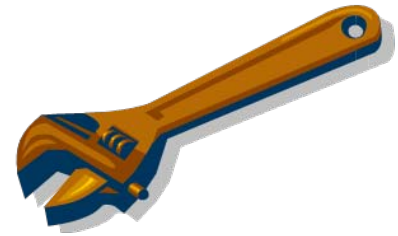
How Does This Happen?

Leverage Exists!

Lever . . .

Archimedes . . .

Root Cause



- Pareto Principle

- 80/20 rule

- Applies to INDEPENDENT events!

- **PARETO RULE for DEPENDENT EVENTS is 99 to 1!**

- **Is your Organization a system of INDEPENDENT events or DEPENDENT events?**

**Organizations that correctly answer this question
come out ahead:**

How to decide on
what behaviors to change **where**?

How difficult can it be?

We have no shortage of 'suggestions'!

Where should we improve first?

(We can't fix everything everywhere now)



Unhappy Customers



Unhappy Investors

Let's Look at Reality

Can any one person
“see it all”
?

Usually not, so we
“divide and conquer”

And “Silos” start to form . . .

Is

**‘everyone come up with a list of
their problems and improvement
actions’**

going to get us there?

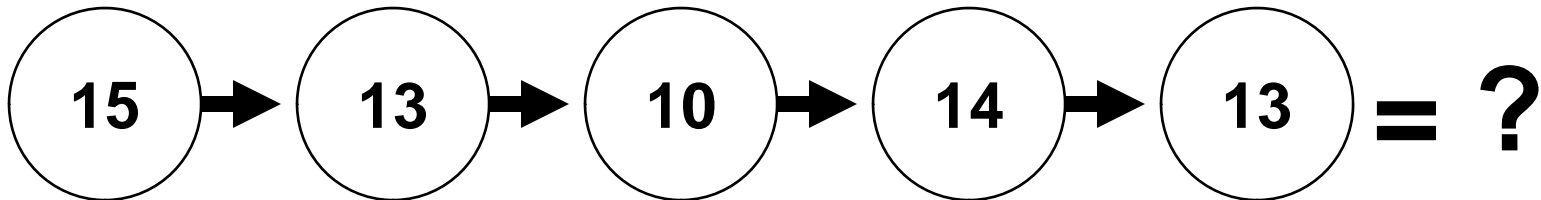


WHERE is the leverage point in improving the strength of a chain?

Why not fix every link?

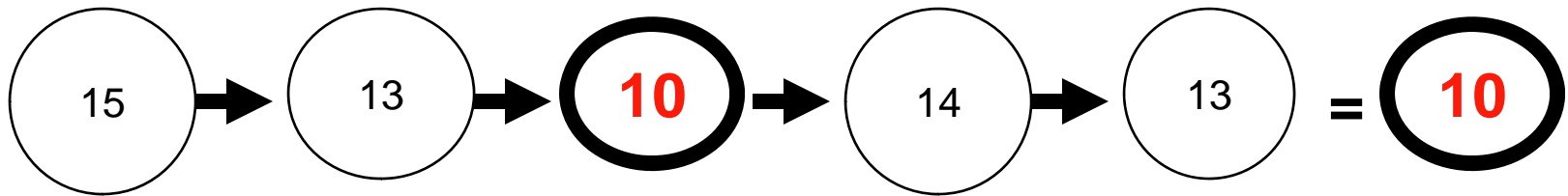
Finding the RIGHT spot (problems) to spend your precious resources on:

Any system of dependent events:



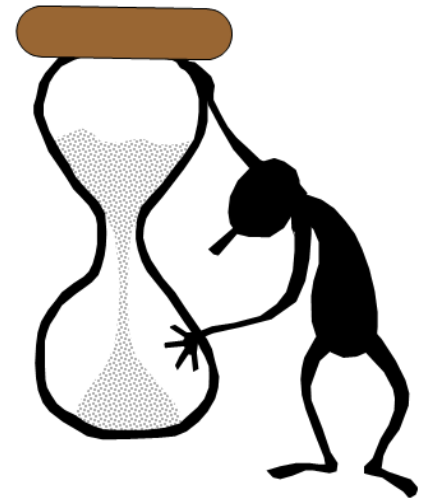
Each circle represents a resource; the number inside the circle represents the relative capacity in '**Goal Units**' produced per hour

What is the 'Goal Unit' capacity of this system?

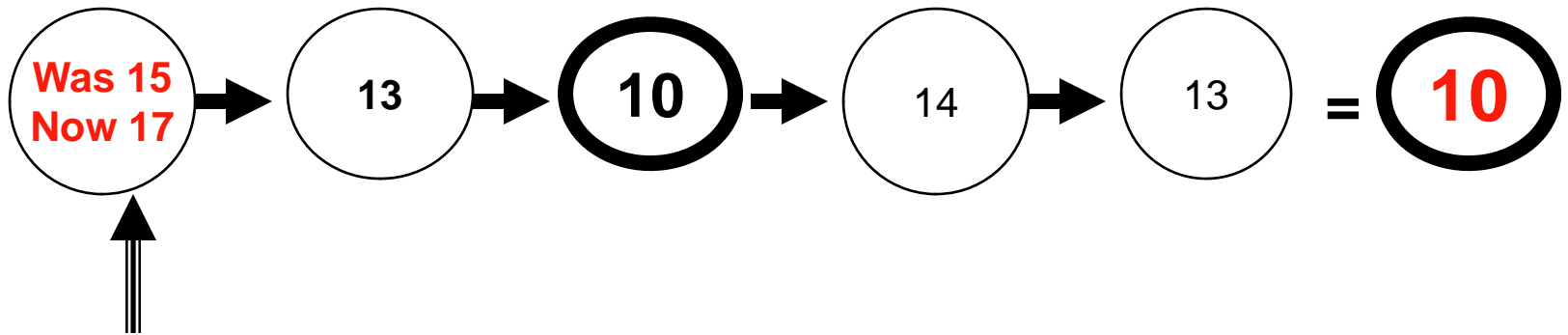


The profit of your organization is dictated by your unique

Enterprise Constraint

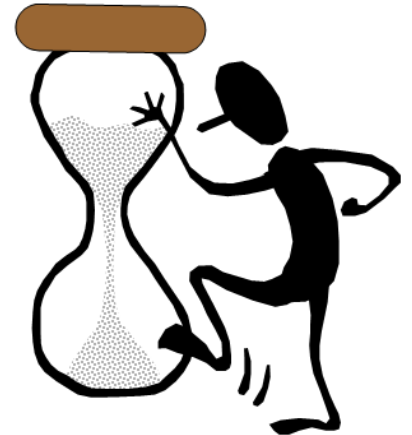


Profit Leverage Point?

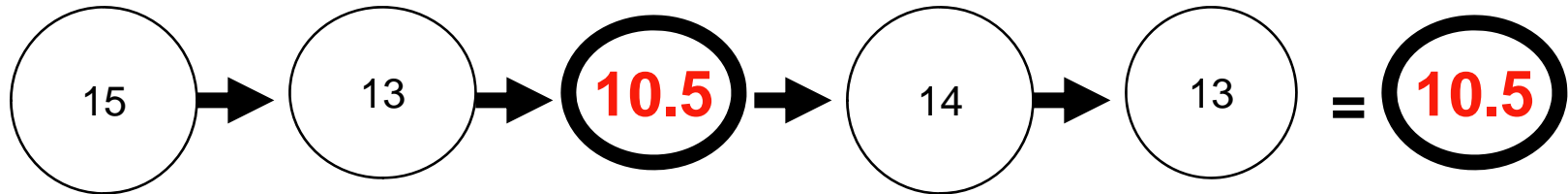


What if we improve a NON-Constraint from “15” to “17”?

Does our “**Goal Attainment**” improve?



YOUR Profit depends on it!

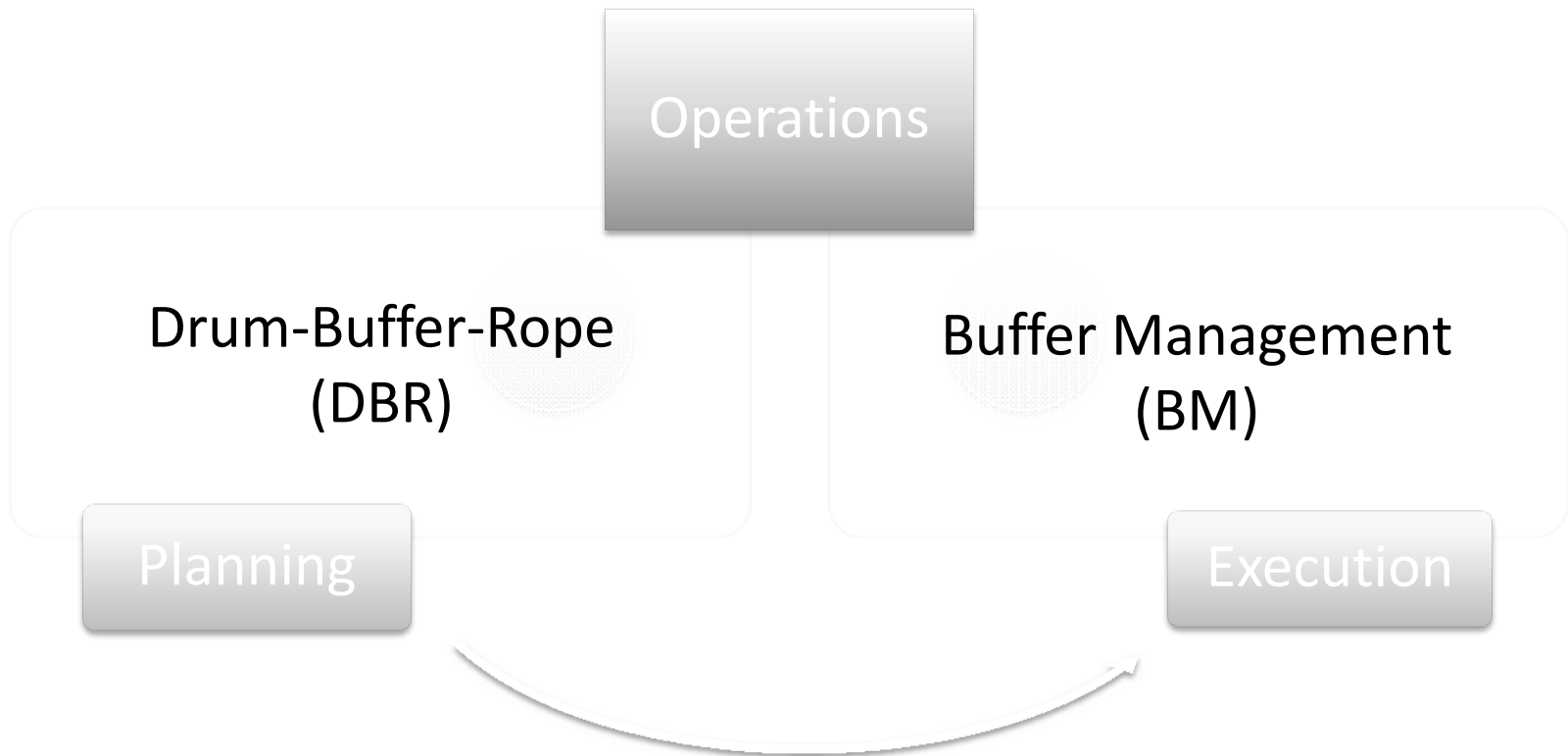


What if you improve your constraint even a little?
You get fast results!

The Specific Steps

- **Define the System** you wish to improve
 - Manufacturing Plant, School, Hospital, Bank.
- **Define the Goal** and the **Goal Units** of the system
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- **Maintain**

Operations Application



Even with Murphy! →

A Daily Execution Agenda



DBR

- is the planning of balanced flow, but we know Murphy will hit us, so we use...



BM

- as the execution agenda for all flow activities today (*not just on the shop floor*)
- is based upon reality that happens—not an old plan
- provides a guide for root-cause driven improvements

Some Definitions (from 'The Goal' by Eli Goldratt)

Drum

The Capacity Constraint Resource (CCR), or the physical flow constraint, which should be subordinated to the market/sales constraint.

Drum Beat

The pace at which the organization should 'march'.
Marching faster = extra (WIP) inventory. Marching slower = lost sales.

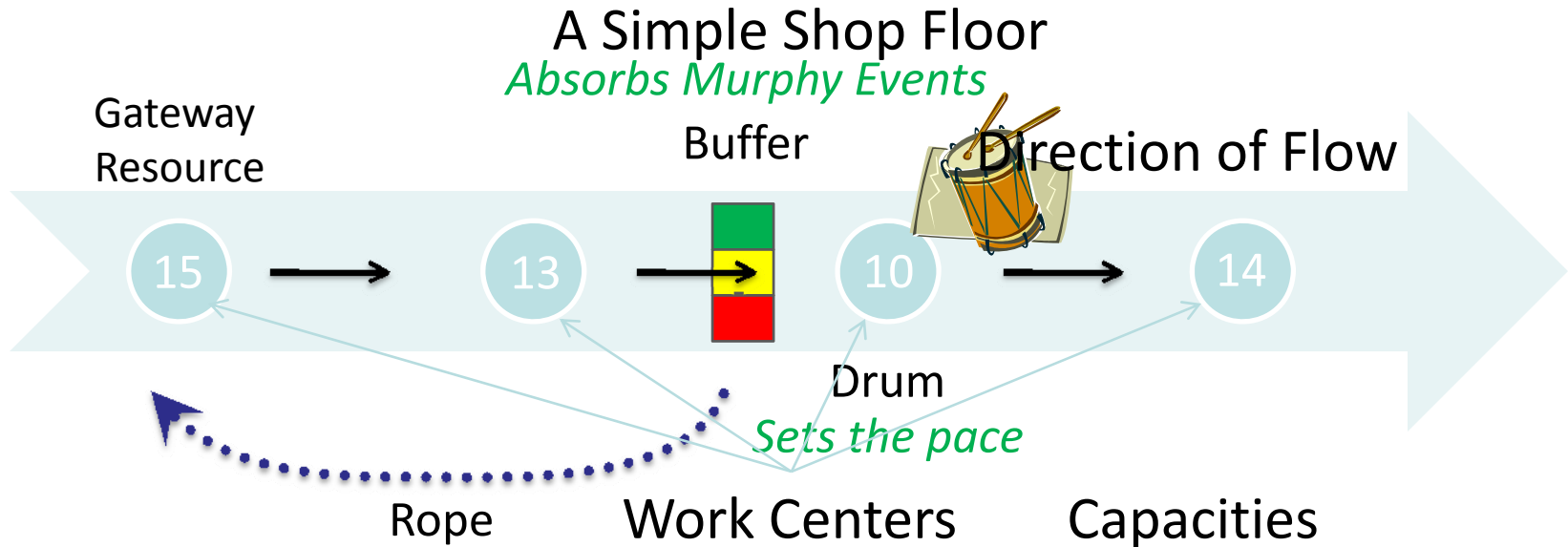
Buffer(s)

Of several types: finished goods, constraint, assembly, space. Primarily used to accommodate 'Murphy' events. All are Time Buffers at their core.

Rope

The communication tool used to "meter-in" or release work into the system based upon constraint performance.

DBR – Planning Balanced 'FLOW'

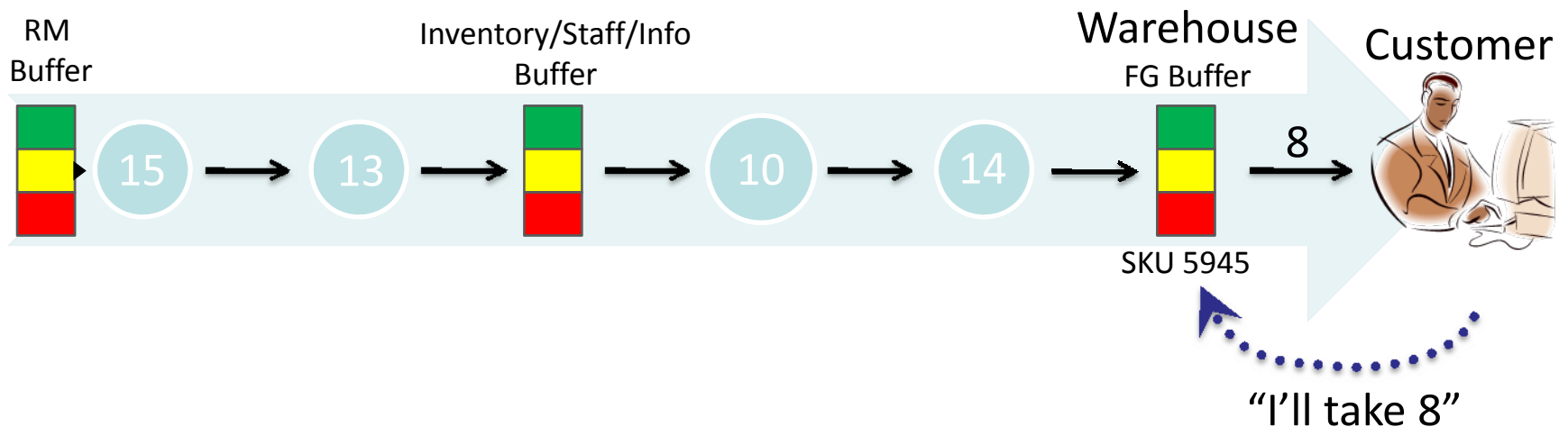


A more or less daily communication

- From:** The buffer or constraint group
- To:** The gateway resource
- Subject:** How many constraint hours to release tomorrow

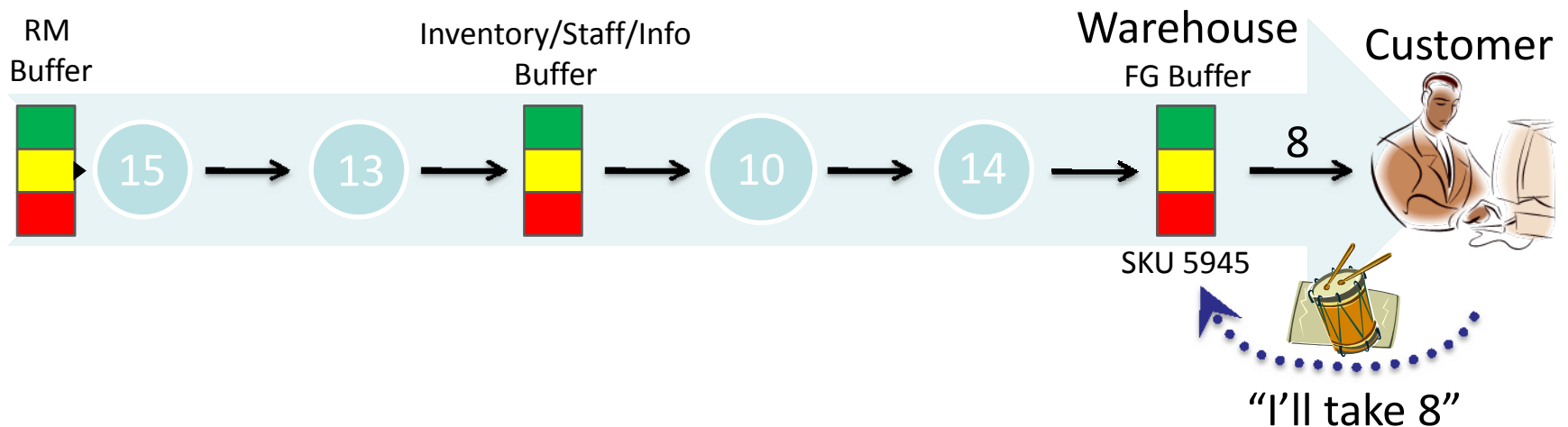
Where is the constraint??

DBR in a Plant + Warehouse



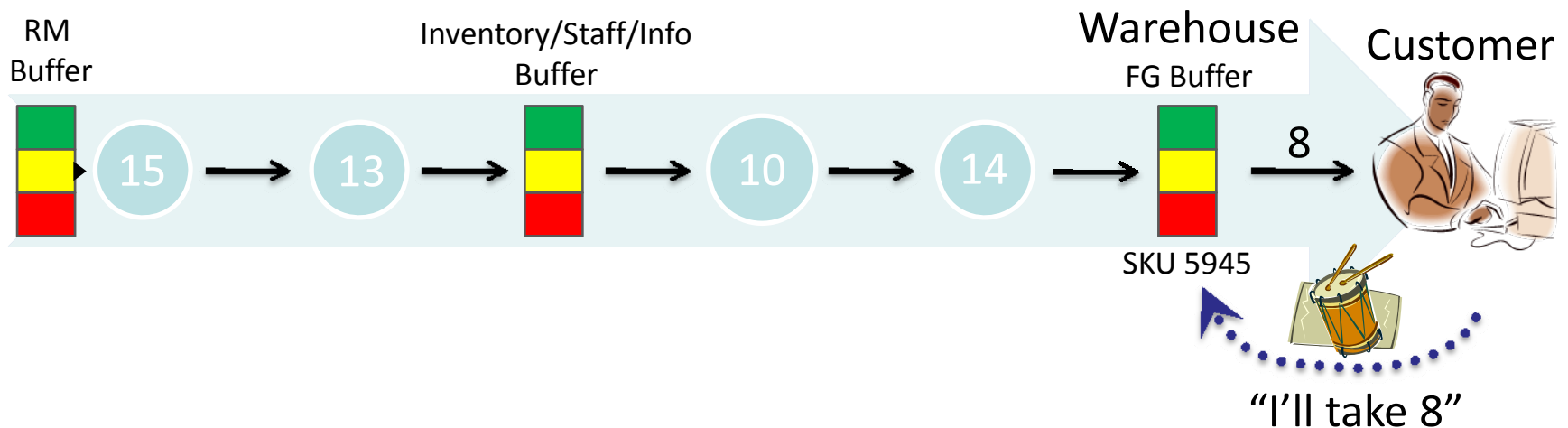
What is the Drum here?

DBR in a Plant + Warehouse



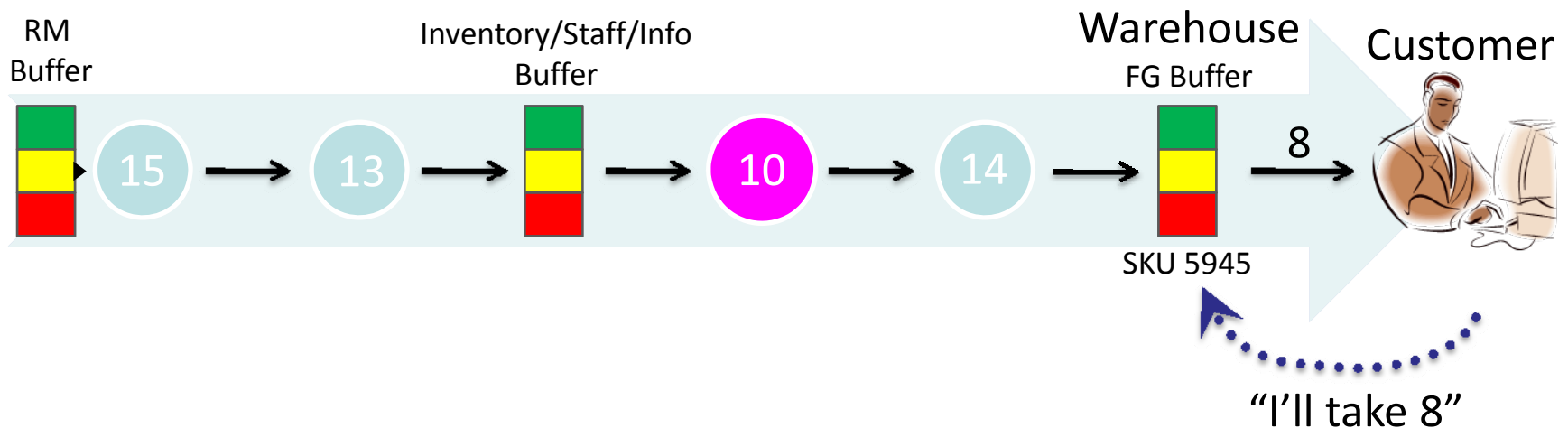
What is the Drum here?

DBR in a Plant + Warehouse



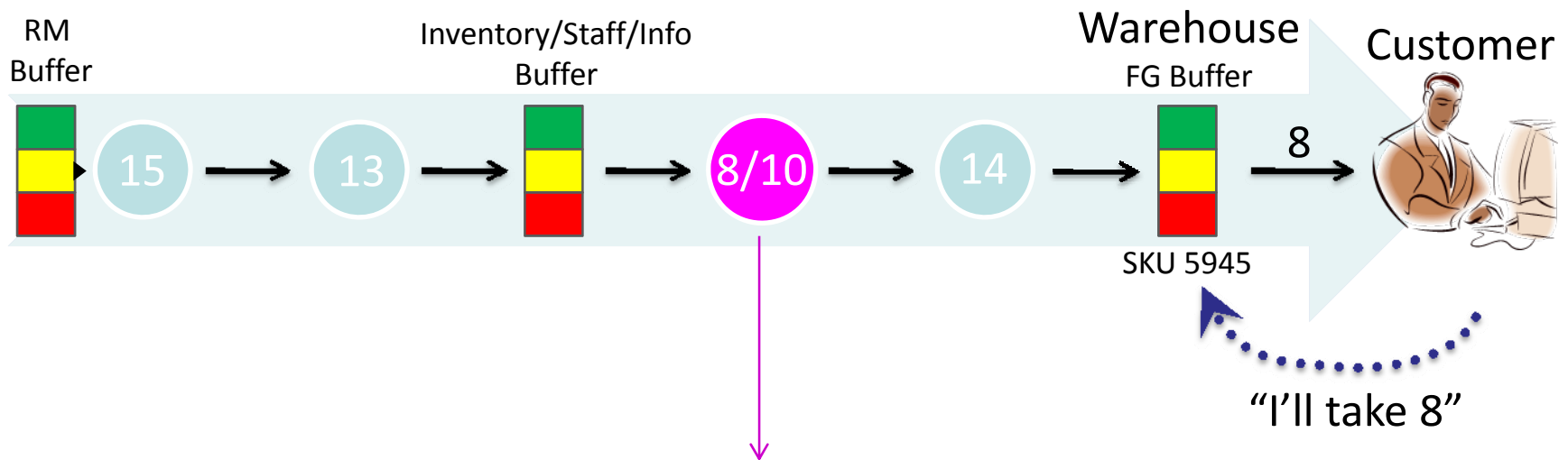
Which is the constrained resource?

DBR in a Plant + Warehouse



Which is the constrained resource?

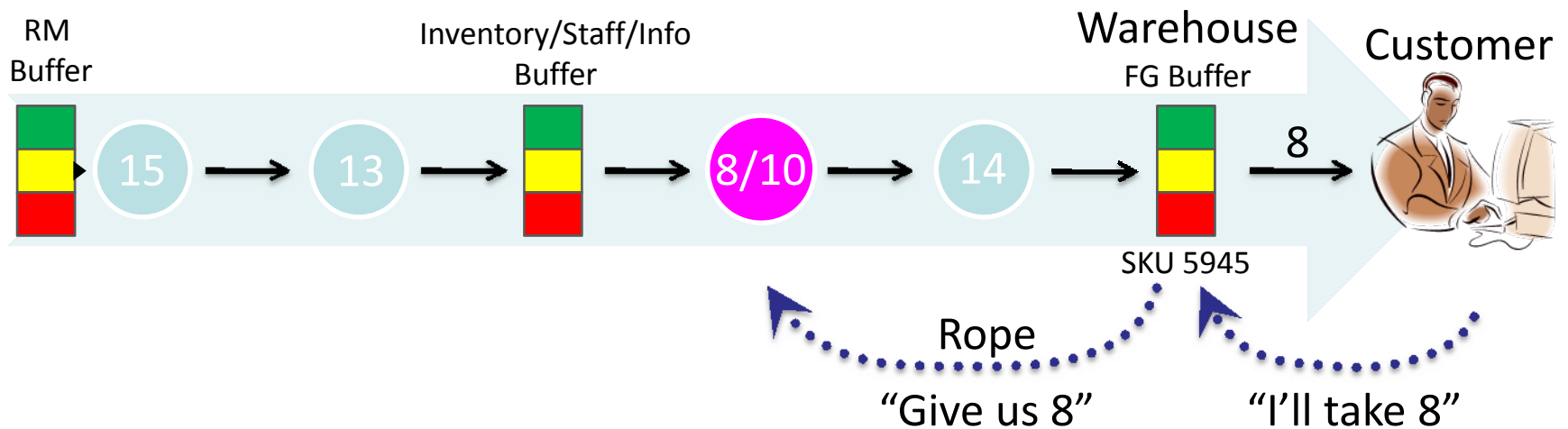
DBR in a Plant + Warehouse



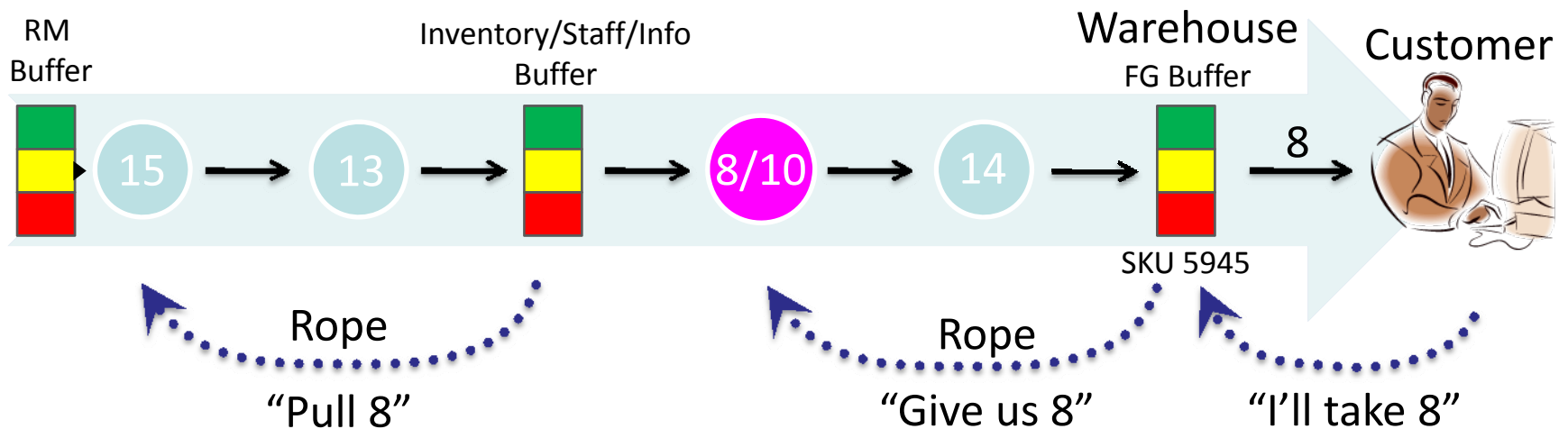
Subordinating the constraint to the constraint!

8/10 on the internal constraint Indicates that we have the internal capacity to build '10' but we are subordinating to the market demand, based upon customer pulls from our distribution network. So, we schedule 8/10 of our capacity to refill the warehouse buffers.

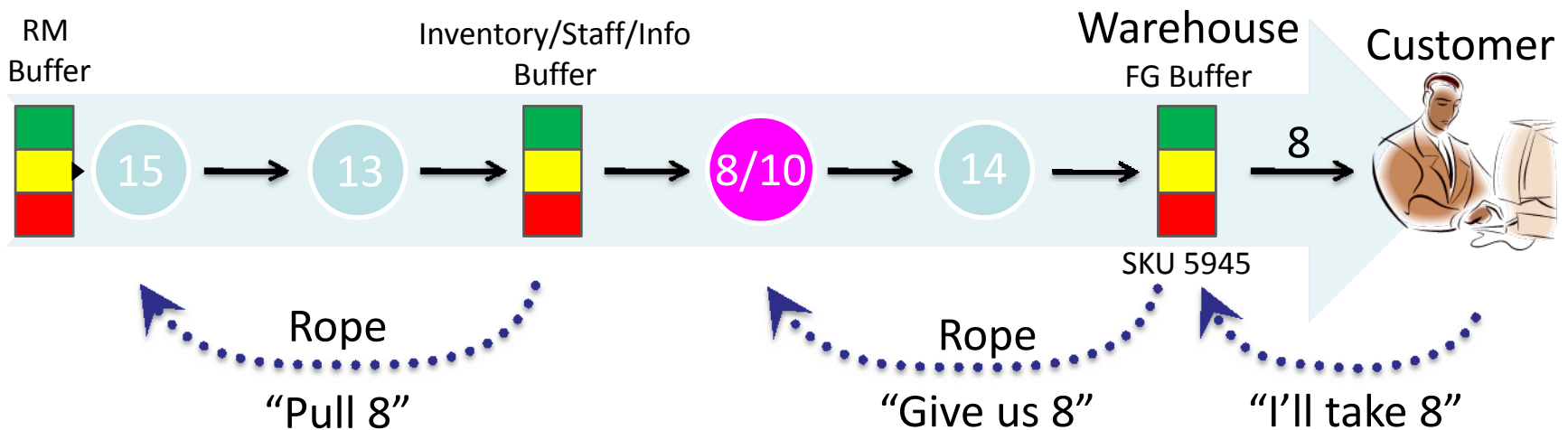
DBR in a Plant + Warehouse



DBR in a Plant + Warehouse



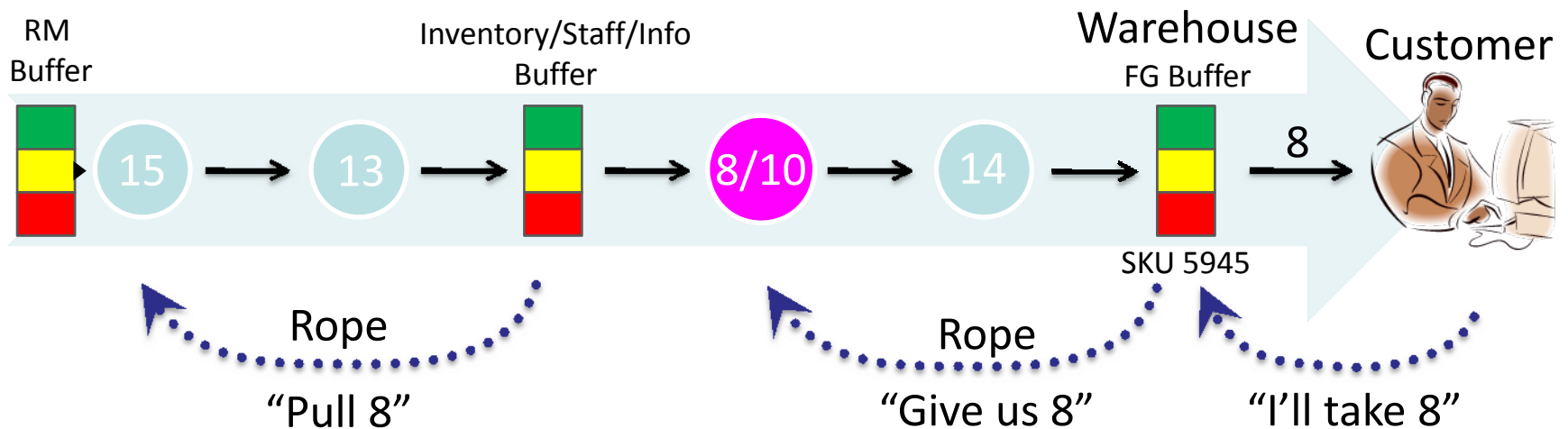
DBR in a Plant + Warehouse



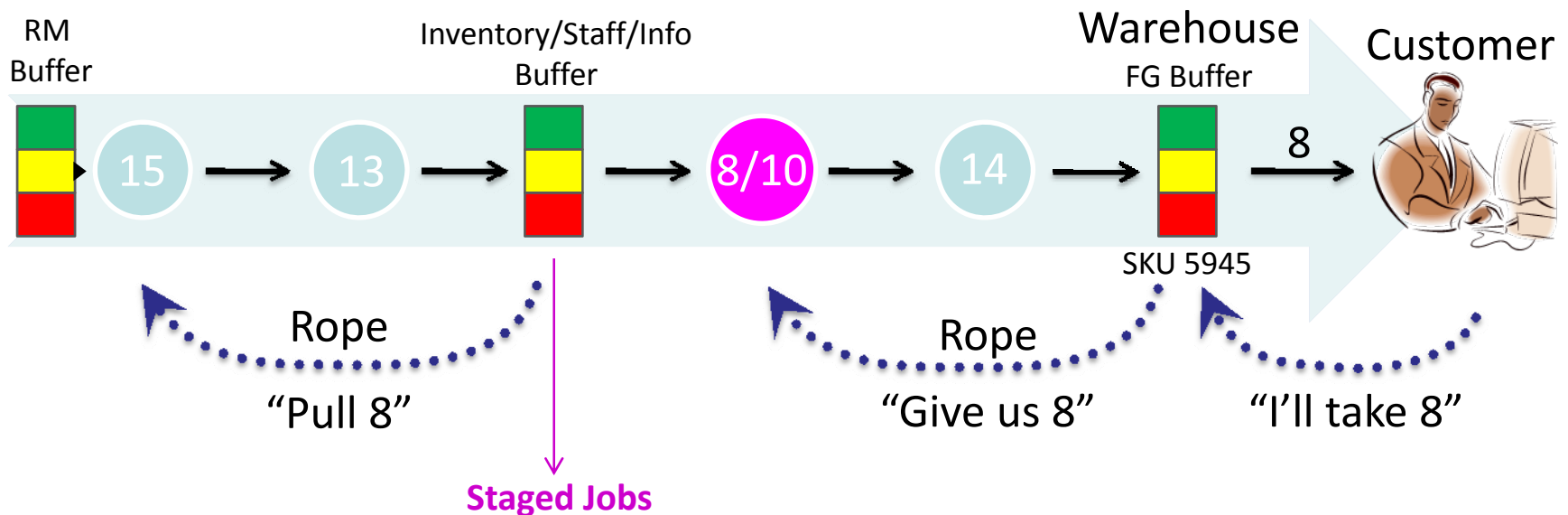
'8' : Sensible batch sizes

These are calculated by Throughput Metrics and are used in production as well as in orders to our suppliers.

DBR in a Plant + Warehouse

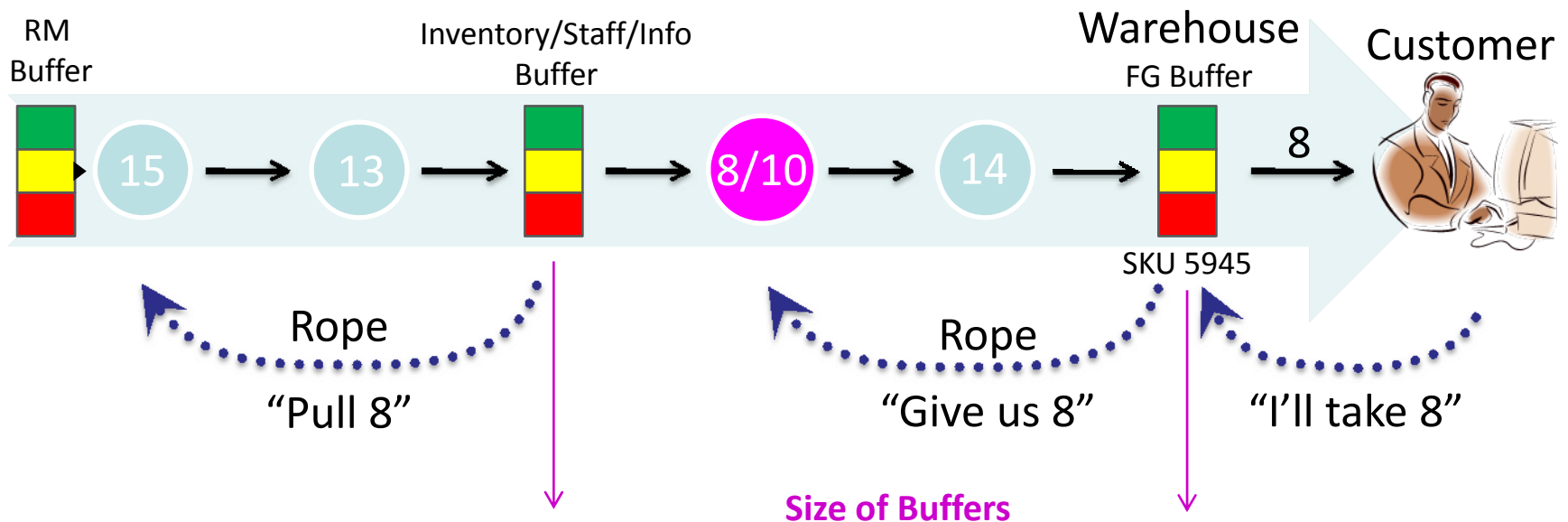


DBR in a Plant + Warehouse



Info and Materials are ready so that no production lead-time is wasted in getting a job ready – allows smaller buffers in the warehouse.
Daily audit of desired plan compared to actuals.

DBR in a Plant + Warehouse



The size of all buffers is largely determined by something in our control—‘replenishment time’. Batch sizes, campaigns, equipment reliability, quality, etc. are all things we control that **dictate our inventory position**. We capture metrics to identify and attack the most pressing of these problems in the ‘right’ priority.

Buffer Profile and Subsequent Action

Warehouse Buffer for Item XYZ:

Top of Green = 9 units

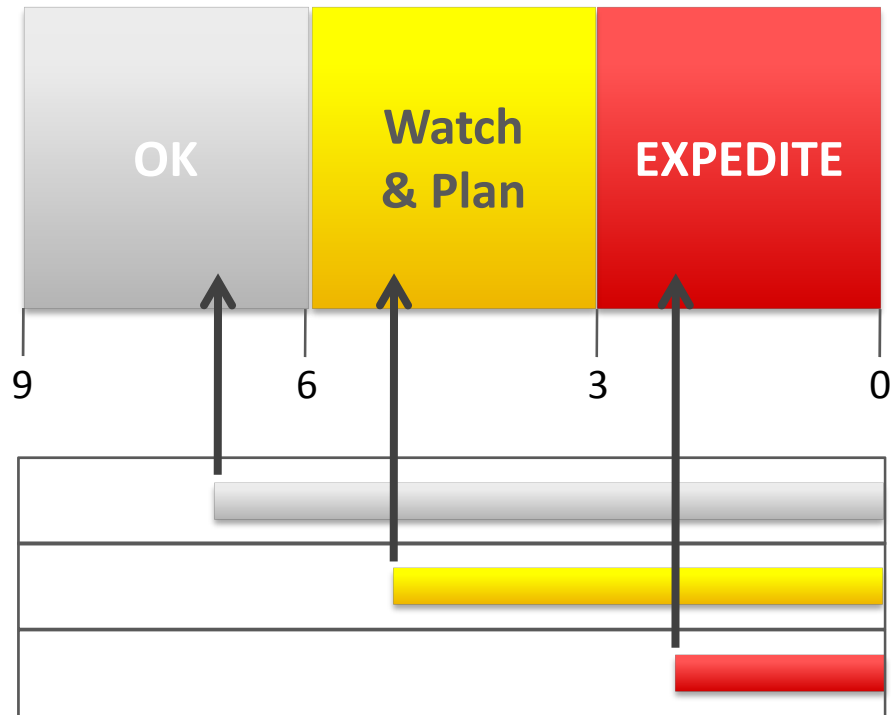
Top of Yellow = 6 units

Top of Red = 3 units

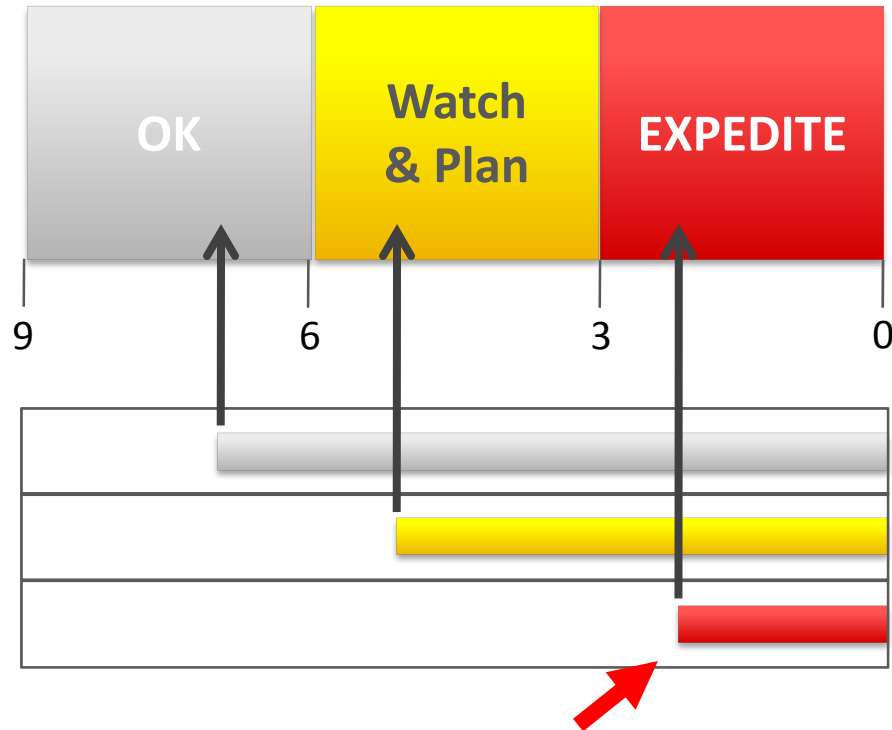
2 days penetration

4 days penetration

7 days penetration



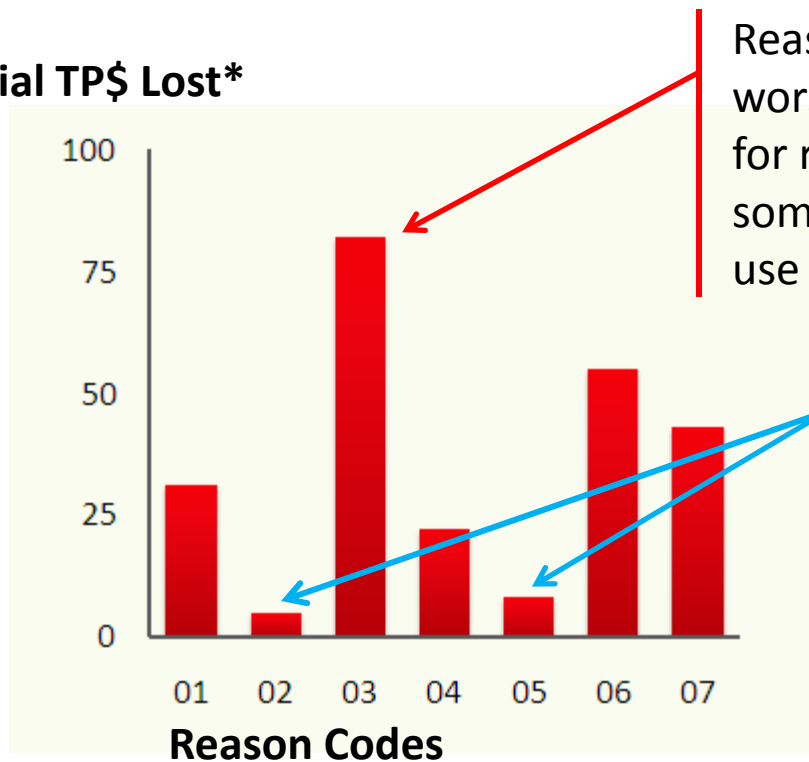
RED Zone Violation



RED ZONE VIOLATION : This is too close to a stock-out! WHY DID THIS BUFFER GET SO LOW? Find exact root cause. Track each of these Reason Codes in a Pareto Chart.

BM – Scientific Improvement

Potential TP\$ Lost*



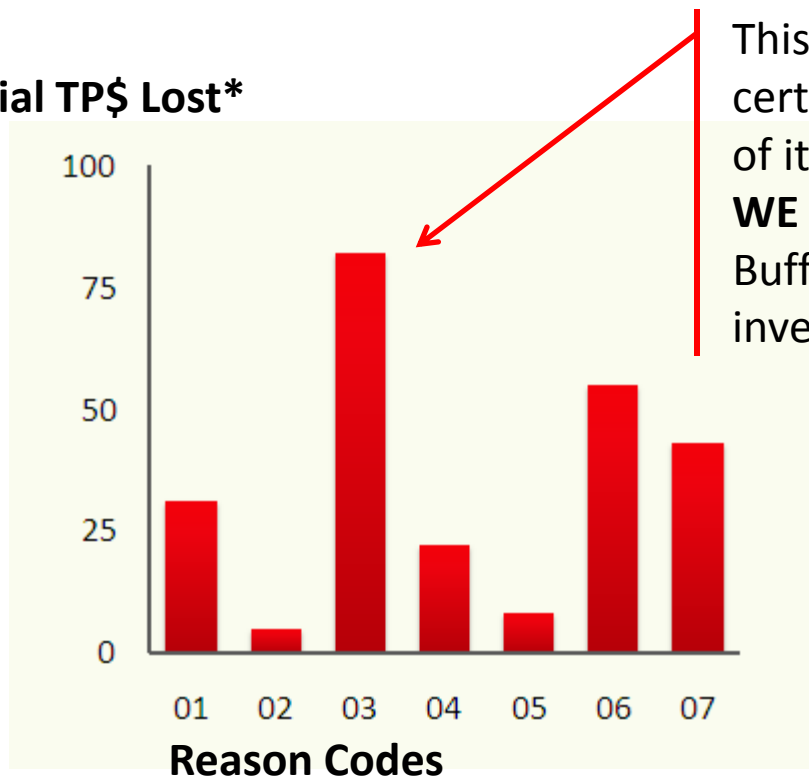
Reason Code # 03 is reliability's worst enemy. Do we know any tools for reducing variability? Six Sigma or some of the Lean tools are great to use here.

But what would happen if we used our Six Sigma and Lean tools to focus on Reason Codes # 02 and # 05?

**Many metrics can fit here: number of occurrences, amount of Inv held...*

BM – Scientific Improvement

Potential TP\$ Lost*

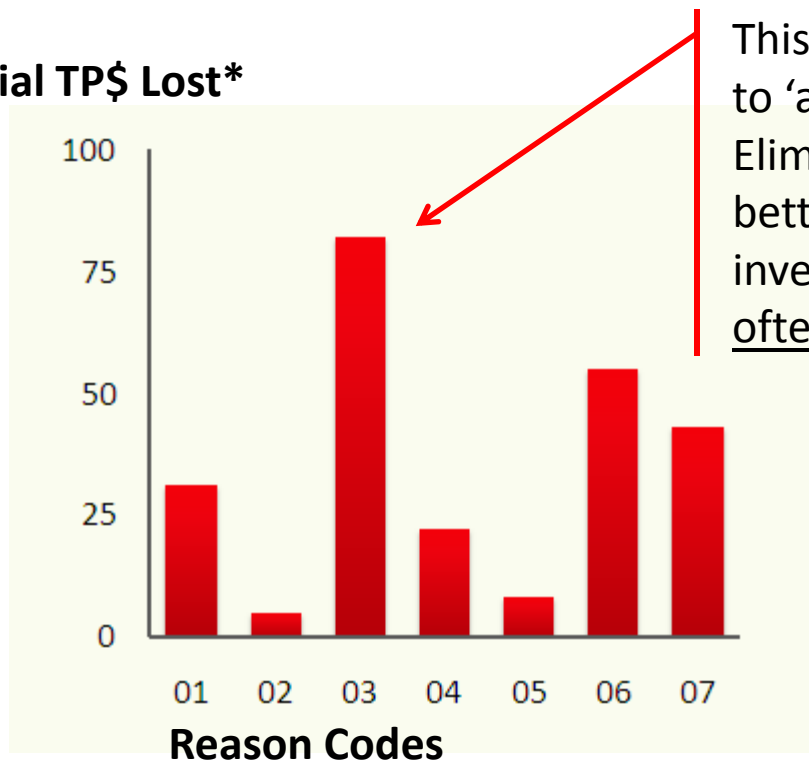


This reason code CAUSED us to hold a certain amount of inventory because of it. When we eliminate this cause, **WE EARN THE RIGHT** to reduce the Buffer Profile (Size). THAT is scientific inventory reduction!

**Many metrics can fit here: number of occurrences, amount of Inv held...*

BM – Scientific Improvement

Potential TP\$ Lost*

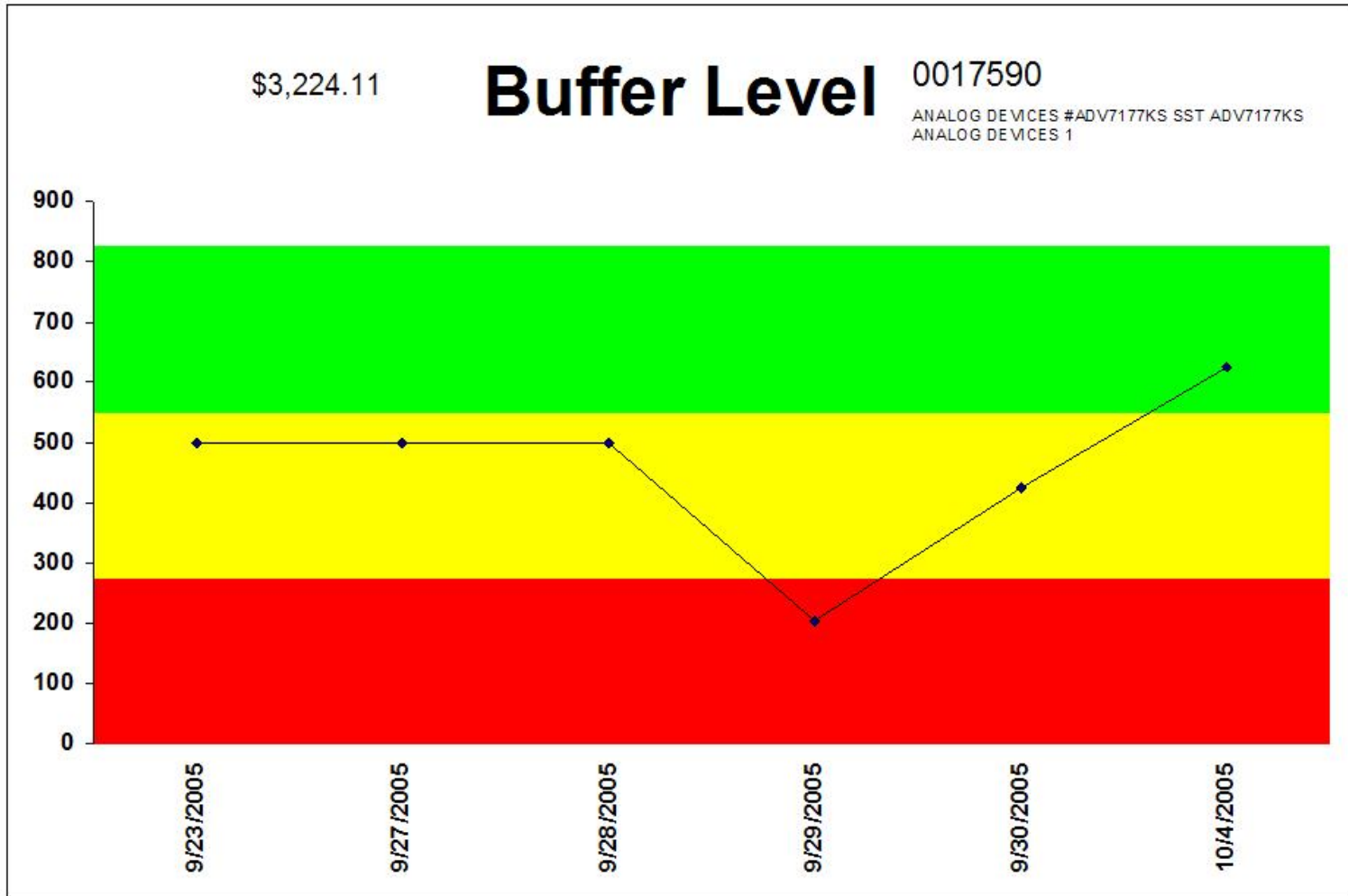


This reason code also CAUSED us to 'almost miss' an order THE MOST. Eliminating this reason code causes better reliability and allows less inventory. This same chart is also often done on 'late orders'.

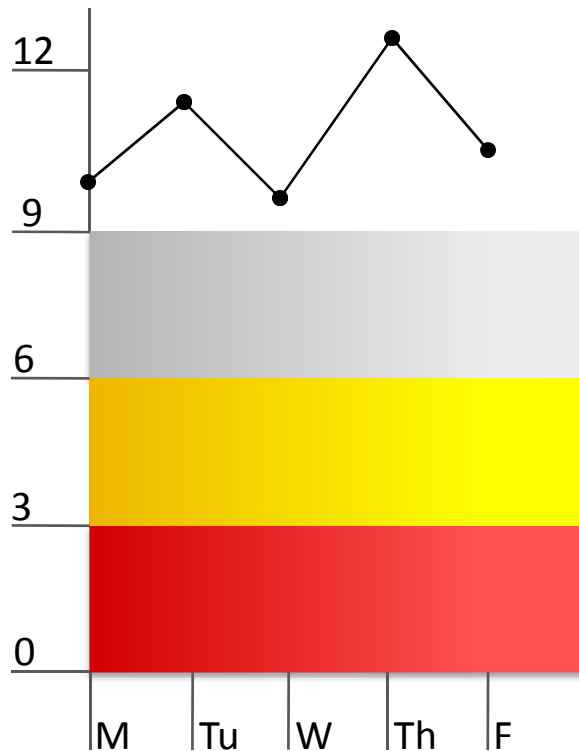
Similar to Red Zone violations, can we also track Over Green Zone violations? What kind of improvements can they drive?

**Many metrics can fit here: number of occurrences, amount of Inv held...*

Another Buffer Profile



Over Green Zone Violations

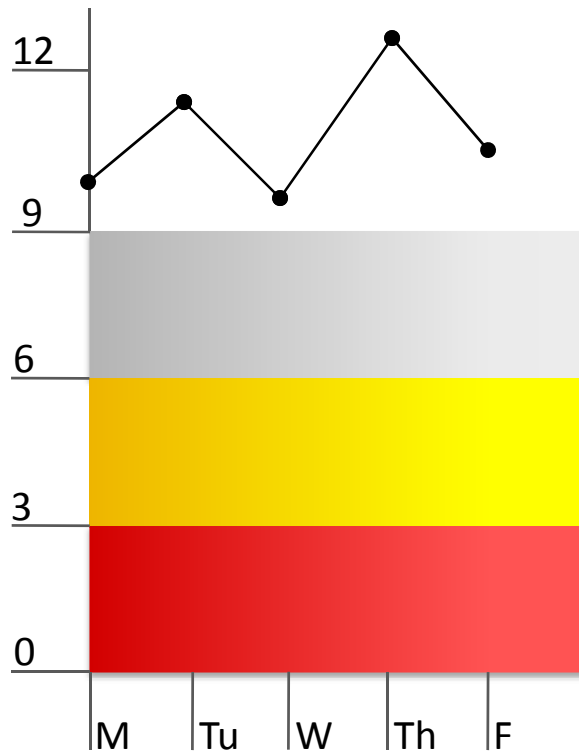


If Daily Inventory Plots are “Over Green” it means we are producing **too much too fast!**

And consequently suffering the evils of too much inventory that’s totally un-needed!

It’s only purpose here is to satisfy customer demands AND deal with Murphy effectively at the same time.

Over Green Zone Violations



If Daily Inventory Plots are “Over Green” it means we are producing **too much too fast!**

Probable Action: Act on these only after Red Zone Violations are being aggressively addressed! Then work on the reasons this SKU is usually ‘Over Green’.

Batch size is often the issue here. Use Lean, Six Sigma or any tool to reduce the batch size.

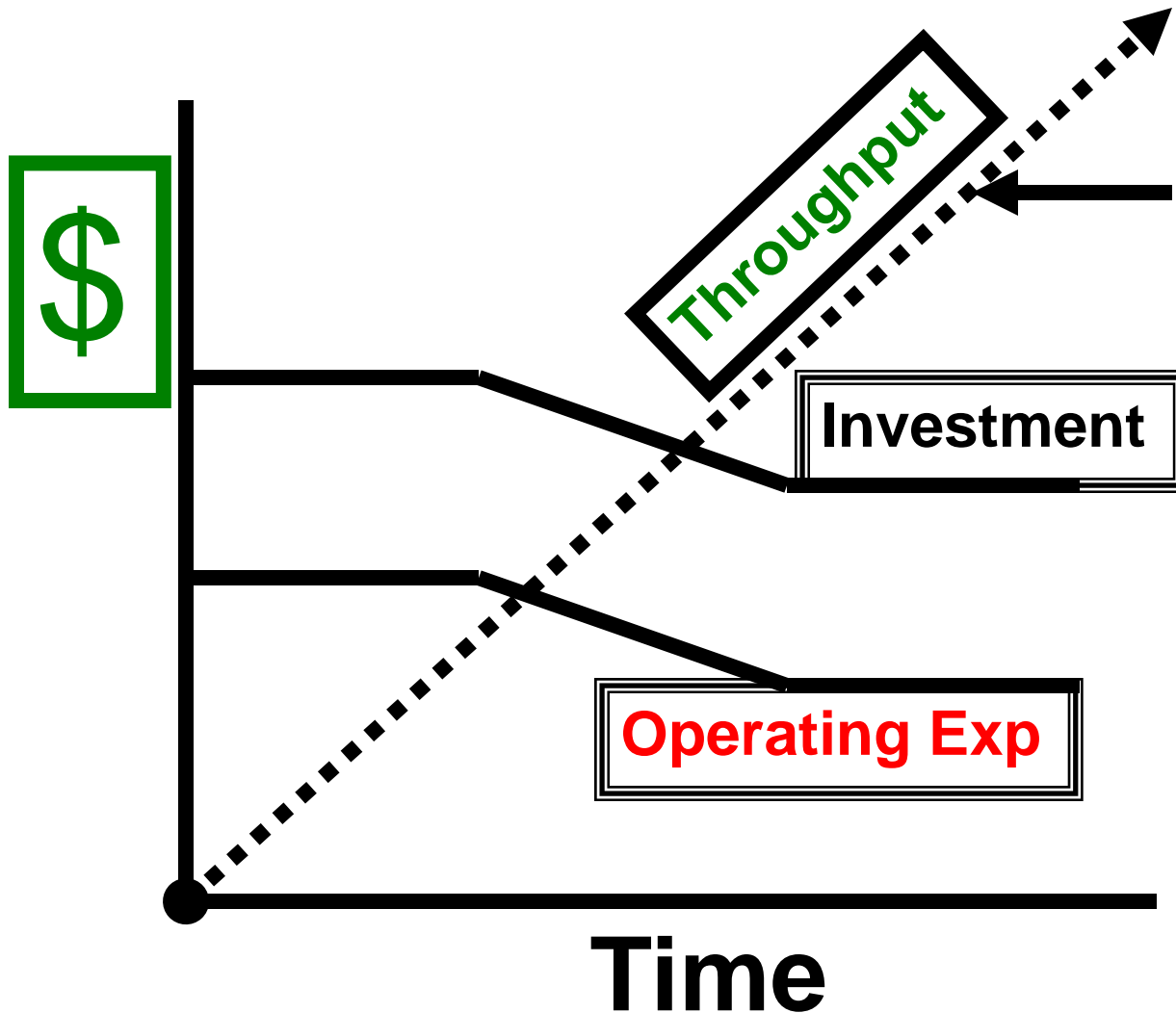
Does this look familiar?



- ***MORE inventory/investment***
- ***MORE new products***
- ***MORE incentives***
- ***...***

- ***LESS inventory/investment***
- ***LESS new products***
- ***LESS incentives***
- ***...***

View your decisions via **Delta T,I,OE**



T – only limit is market size.
Greatest opportunity for profit improvement

I – Reducing investment will increase ROI. Limits to how much Investment can be reduced before negative impact to business

OE – Reducing cost will increase profit. Limits to how much costs can be reduced before negative impact to business

Where is Your
Profit Leverage Point?

The Exact Steps we follow:

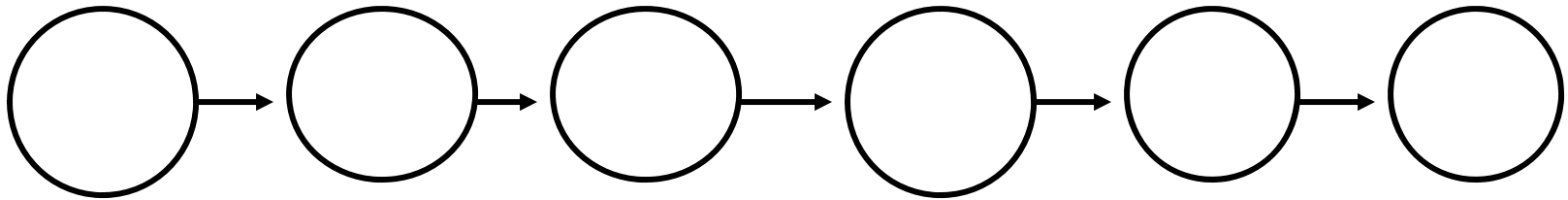
Prerequisites

- **Define the System** you wish to improve
 - Manufacturing Plant? Supply Chain? School?
- **Define the Goal** and the **Goal Units** of the system
 - More profit? Smart children?

TOC FOCUSING STEPS 1-5

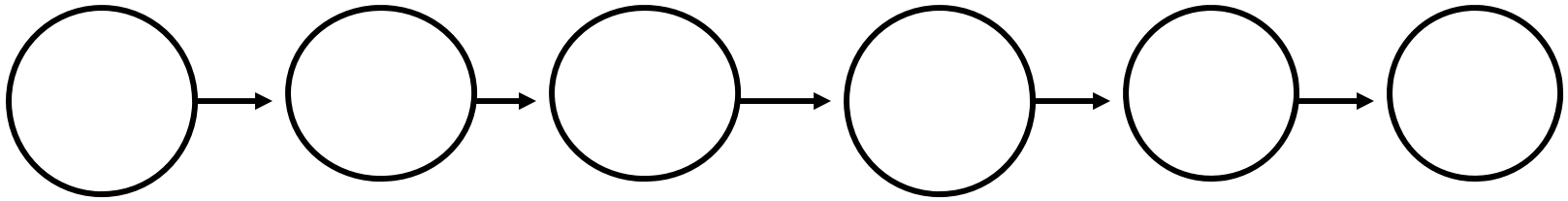
- **Identify/Choose** the constraint within the system
 - Critical machine? Acceptable Sales? Teachers?
- **Exploit** the capacity of that constraint – what are those new behaviors in constraint groups? Use your tool kit - Lean and 6 sig right here FIRST!
- **Subordinate** other non-constraint needs – what are the new behaviors in Non-Constraint groups?
- **Elevate (in ratio)**
- **Repeat**

Map out your system of dependent events



Take 5 minutes and detail your organization flow

Then, decide which resource in your organization is the physical flow constraint.



Using your map and your Identified Constraint, write down:

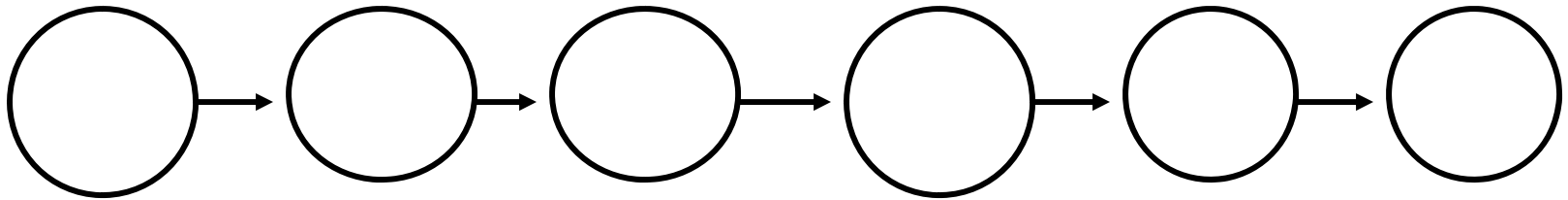
2 Exploitation actions

WITHIN the **Constraint** resource, what specific actions will produce MORE output

2 Subordination actions

What actions from NON-Constraint resources, UPSTREAM of the **Constraint**, would make life easier for the Constraint?

Write your specific steps **within production** in the circles below (or make your own map):



Of those steps, which is likely the physical-flow Constraint?

Need Buy-In?

Try this Process

WHY change?

WHAT to change?

What to change **TO**?

HOW do we cause the change?

Summary

The Continuous Improvement Trio need a leader

TOC is that leader – let the 5 focusing steps guide your improvement efforts

Direct your Improvement Teams to improve your leverage point

Kaizens, 5S, . . . Should have a Constraint Focus

