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# BIG 3, LEAN – 6 SIGMA – TOC
# SHARPENING YOUR SAW

Understanding and Comparing Lean, Six Sigma and TOC

by Mastermind Group, LLC – SupplChainPro2Know

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APICS GREATER NORTH JERSEY CHAPTER

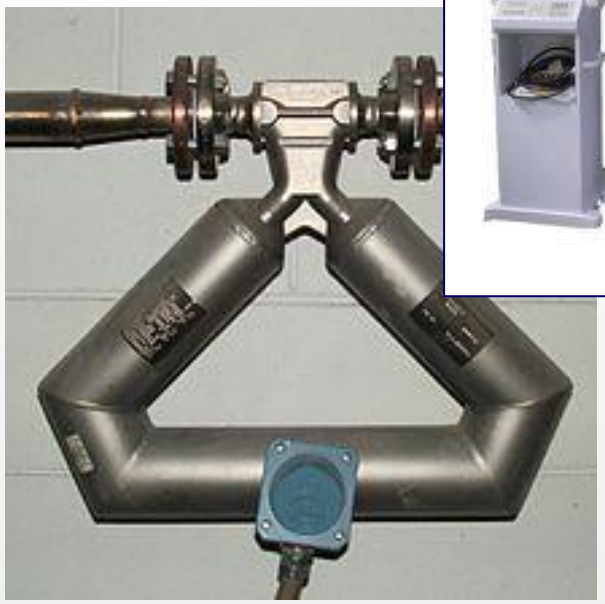
# SupplyChainPro2Know

1. **Welcome**
2. **Introductions**
3. **Expectations**

**Q&A at the End**

**Learn Debate Apply**

# Who Is Bob Forshay?



# Big 3 - History
# Lean
# Six Sigma
# TOC

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# Lean vs. Six Sigma vs. TOC?

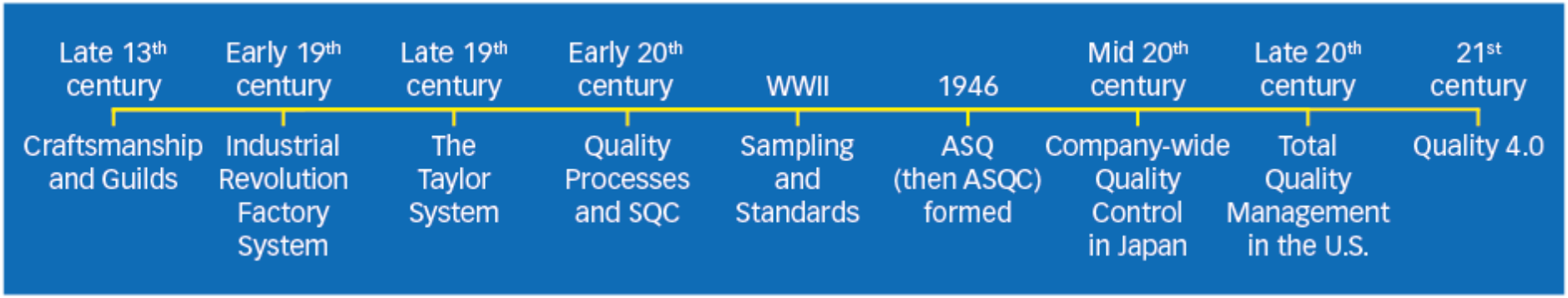
- Applying improvement practices can be confusing.

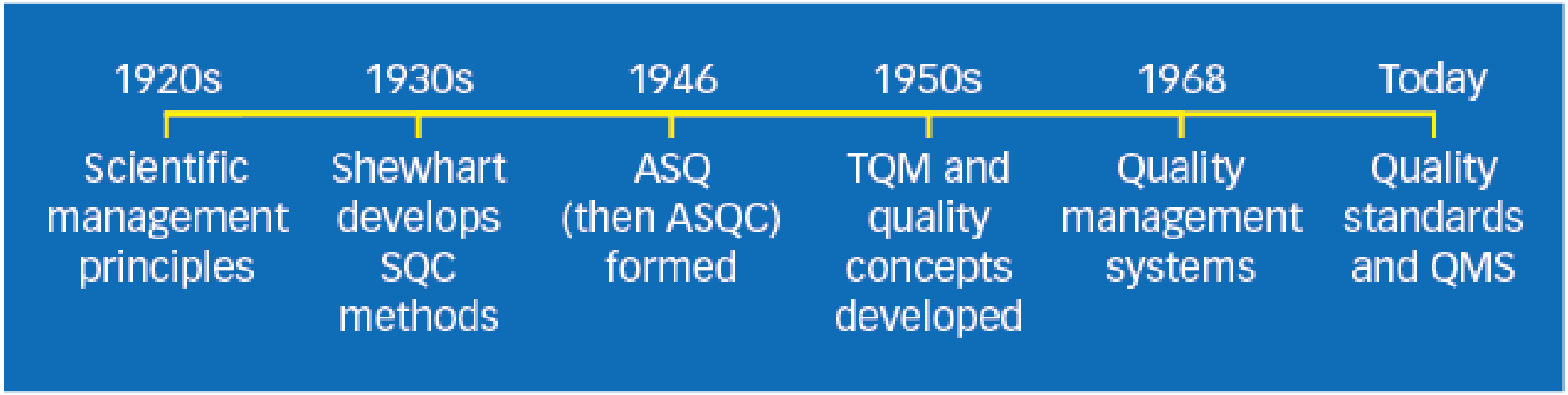
- How / Where did you first learn about your practice?
- Many varied experiences from our past.
- Not all the same!

- Consultants can make things complex!
- Some “Experts” try to re-assign definitions making it worse.

# History of Business Improvement

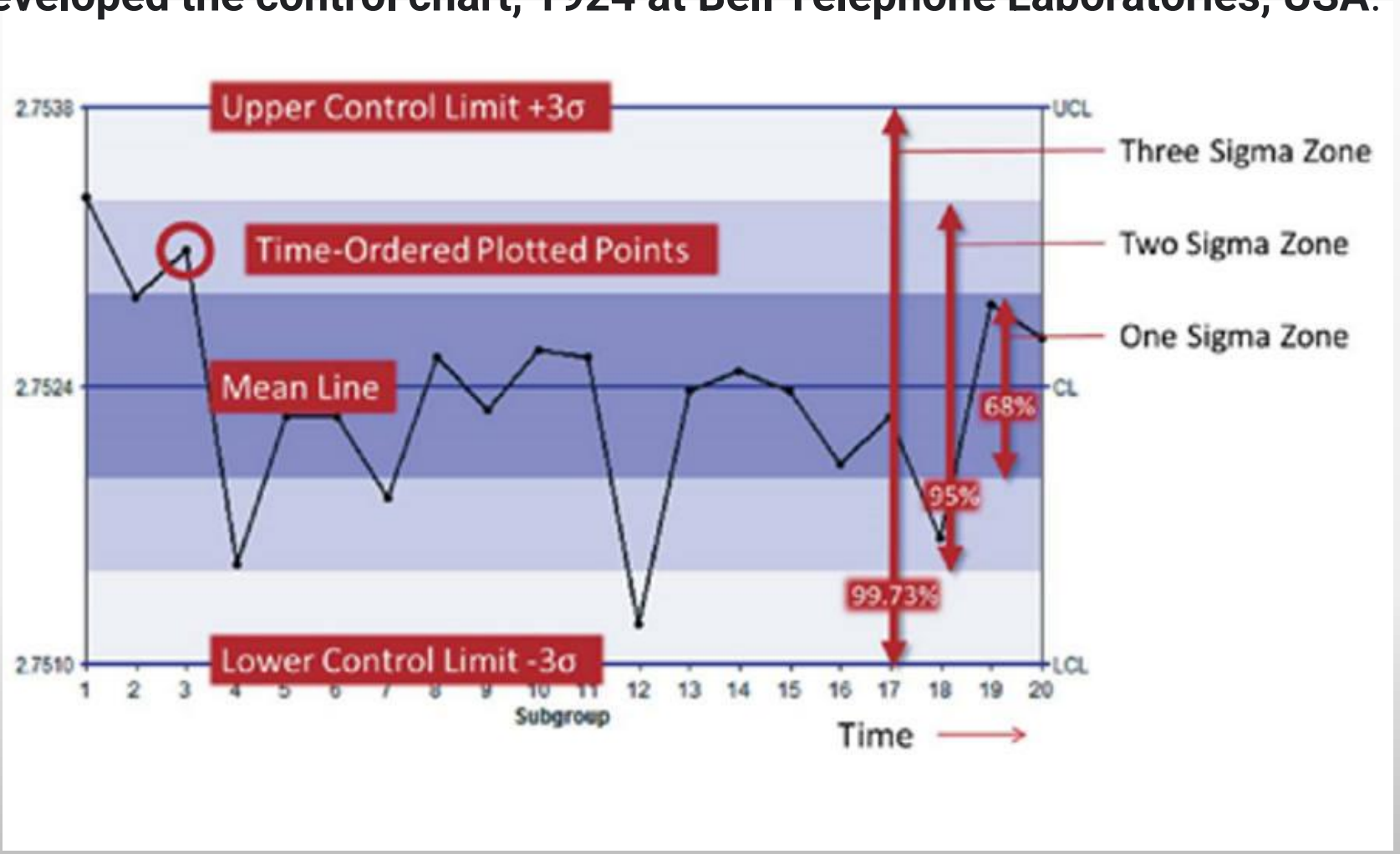
- Control, became Quality Control, then SQC - Statistical QC
- Total Quality Management Evolved – Process Reporting to QMS



# Managing by Measuring

**Walter A Shewhart,**
**developed the control chart, 1924 at Bell Telephone Laboratories, USA.**



# Deming & Japan towards TQM

- W. Edwards Deming, 1960s **helped set Toyota on the path to what became known as Total Quality Management**
- Deming introduced the Japanese to **a product design cycle of Shewhart,** what the Japanese later came to call the plan-do-check-act cycle - **PDCA**

- Dr. W. Edwards **Deming asserted** that organizations that focused on improving quality would automatically reduce costs while those that **focused on reducing cost would automatically reduce quality and actually increase costs** as a result

# TQM Takes Shape

- Total Quality Management for Japanese companies is inseparable from **Kaizen culture**
- **Japan applies the principle of customer satisfaction, Quality Function Development (QFD), employee empowerment, continuous improvement**

# LEAN is Born

- **Lean roots traced back to Venice in the 1450s – Ship Building**
- **Sequencing, and standardizing - move ships through their entire production line in an hour**

- LEAN is a way of thinking
- Focus on **eliminating waste and streamlining processes** to save time, space, materials and money

# History of Theory of Constraints

- **Eliyahu Goldratt** and Creative Output developed software, Optimized Production Technology (OPT), 1980's
- **OPT** - first software to provide finite capacity scheduling for production environments.
- Formed the early seeds of the Theory of Constraints.
- The Theory of Constraints (TOC) was introduced in 1984 by Dr. Eliyahu M. Goldratt in his bestselling business novel "The Goal, 1984

# Big 3 Compare
# Lean
# Six Sigma
# TOC

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# Choosing the Right Tool?




# Review 3 Tools or Approaches

- **Six Sigma,** based on TQM, is founded in process and control charting to **measure variation**.

- **LEAN** introduced the focus of **flow** to increase velocity **by reducing waste** and reducing materials in process. Waste comes in many forms, sometimes resulting from poor quality with high variation.

- **TOC**, Theory of Constraints was the first to **focus on imbalances** rather than balancing of resources, which are not always possible. **Takt Time** is the demand, **Cycle Time** is the supply.

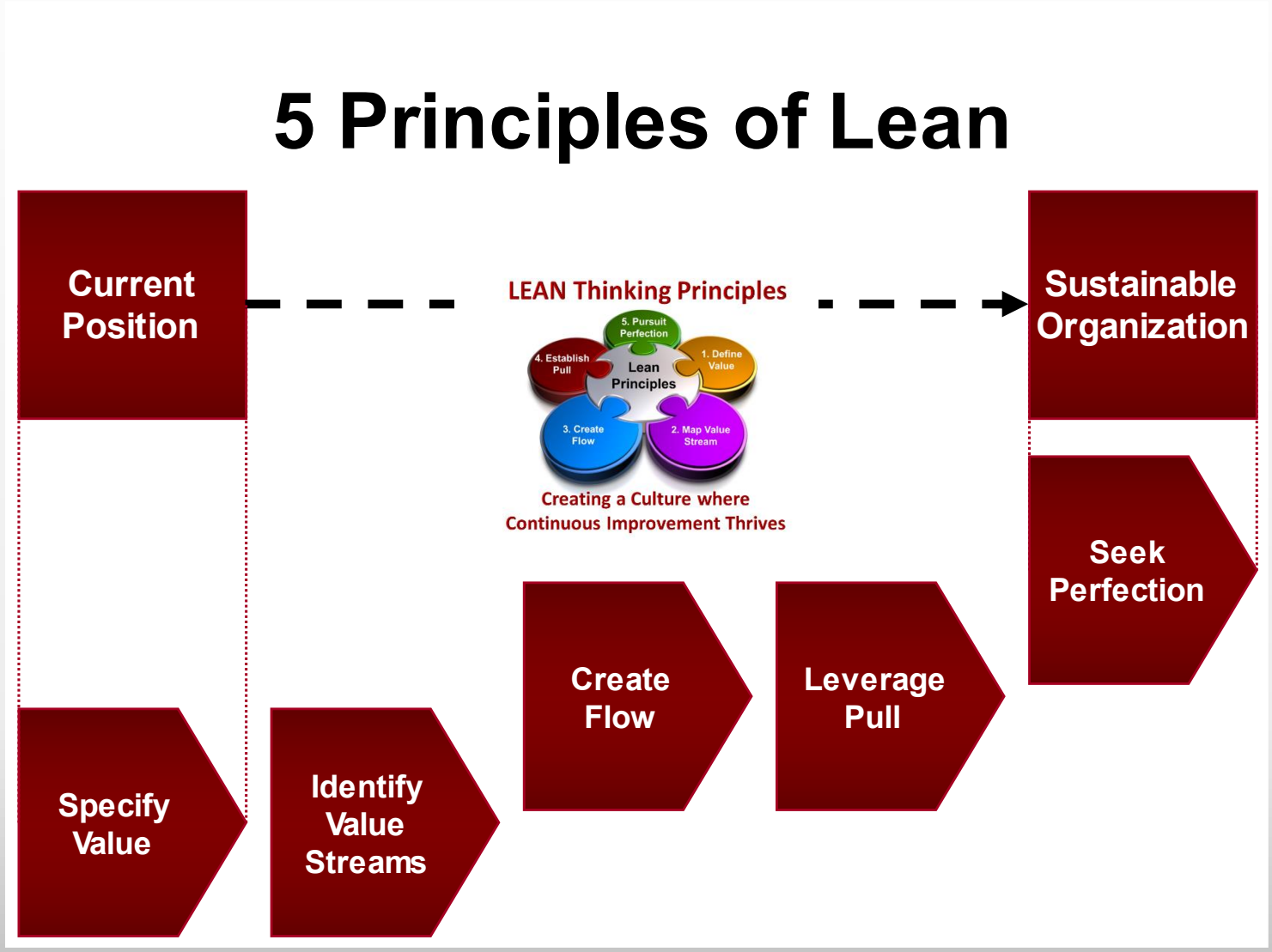
# 3 Approaches to Continuous Process Improvement

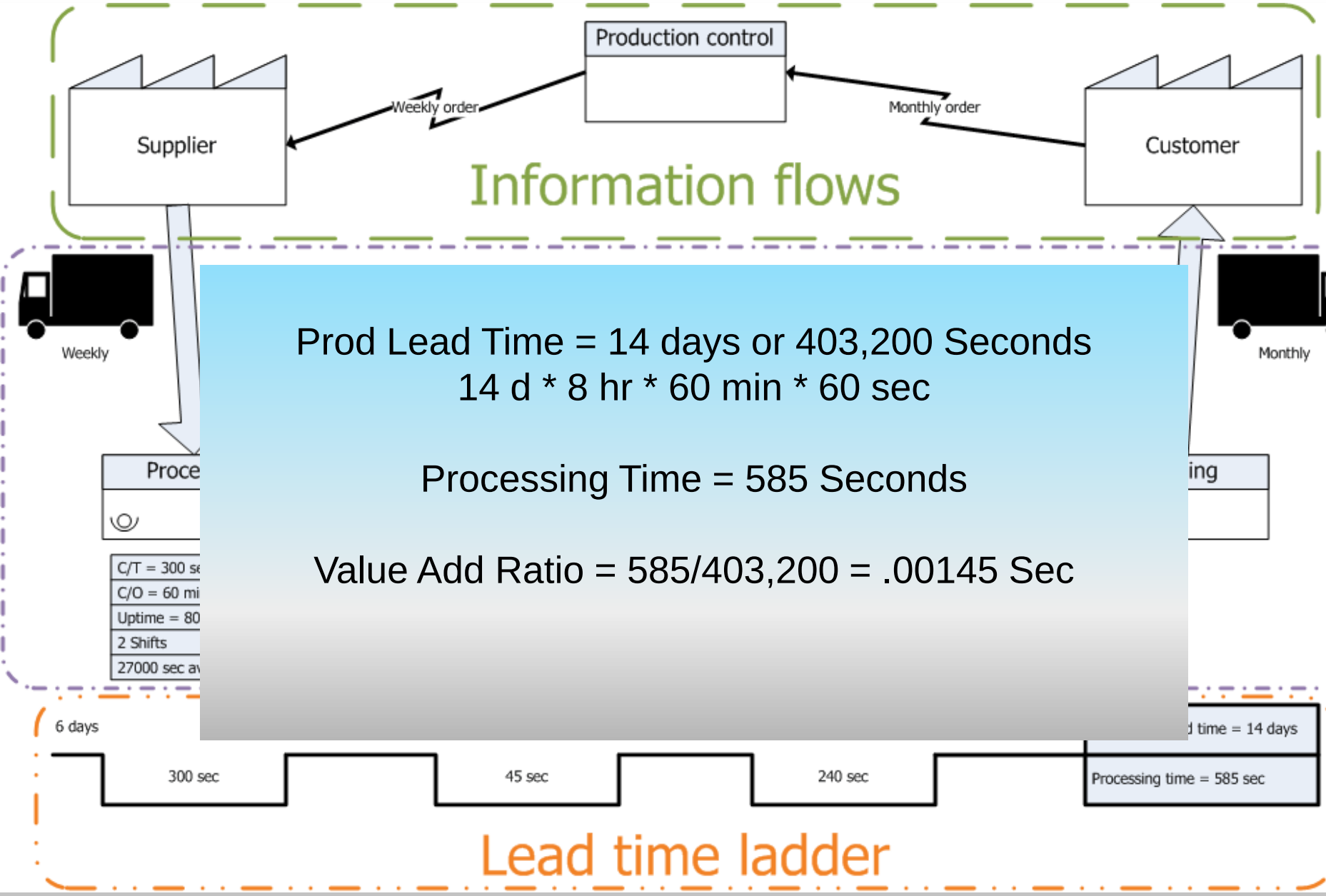
- Early Six Sigma, We ask, how **can we make a process better?**

- LEAN would first ask, not how to make it better or cost less, **but why do we have that process at all?**
  - Does it add value to the end result?
  - And this generally will exceed expected cost savings by permanently removing waste.

- TOC would ask, **where/what is the constraint** and how does this affect the total output/**throughput**?

# Lean – Reduce Waste, Improve Flow

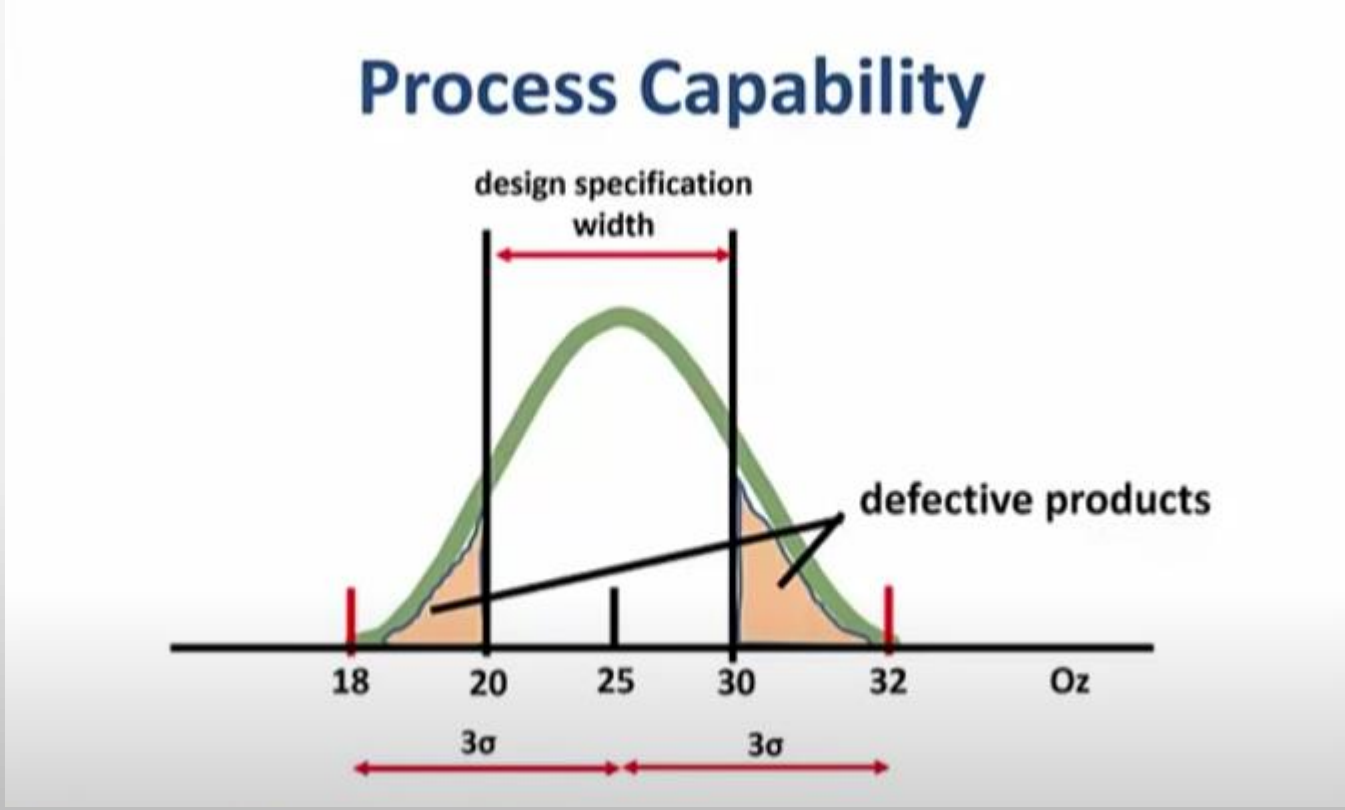




# Six Sigma – Measuring Variation

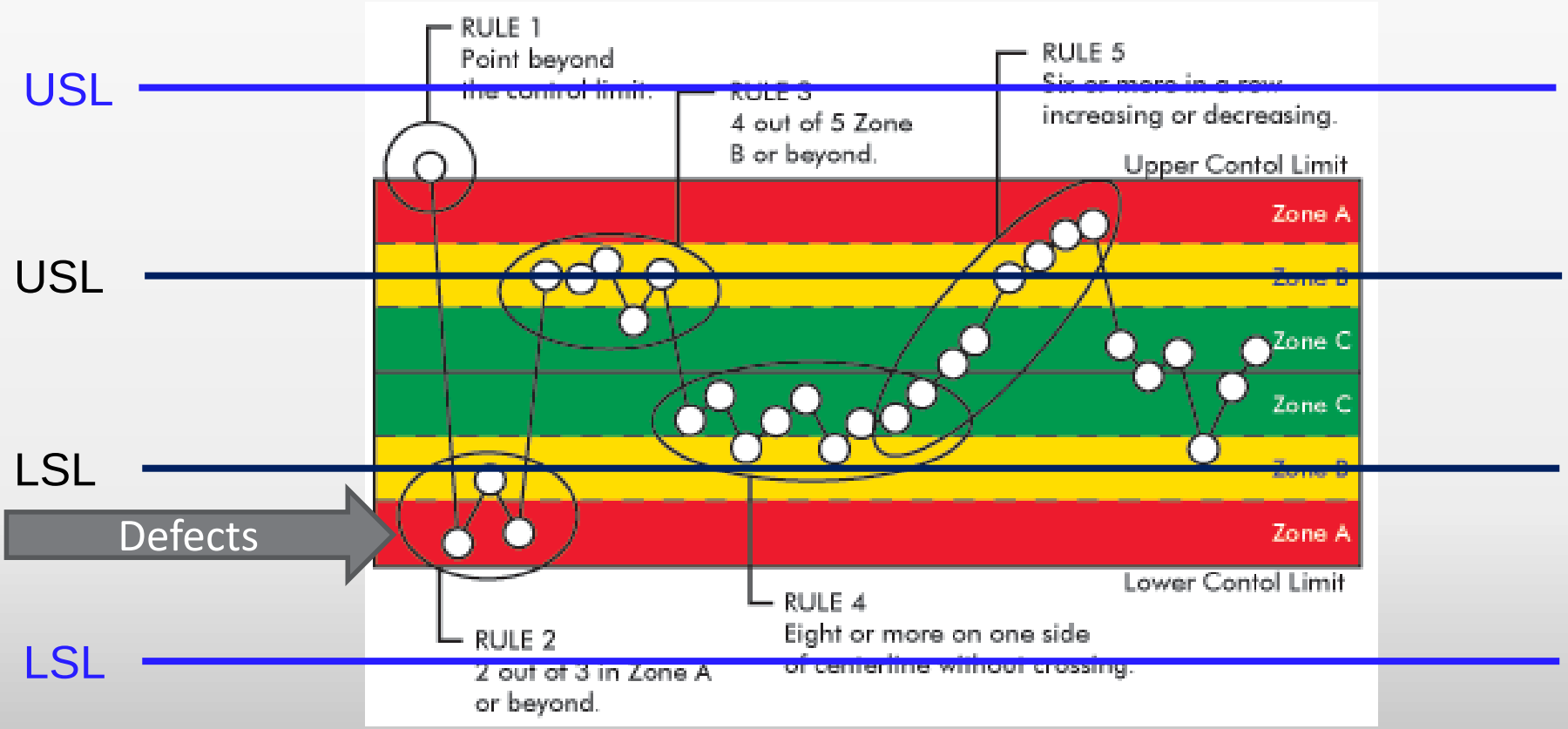
# Understanding/Reducing Variation

- **Measuring data to understand variation -** to identify root causes
- **Statistical Process Control**, measuring to identify and eliminating defects
- **Reducing process variability**. 6 Sigma = 3.4 defects/Mil. Most require 3 SD

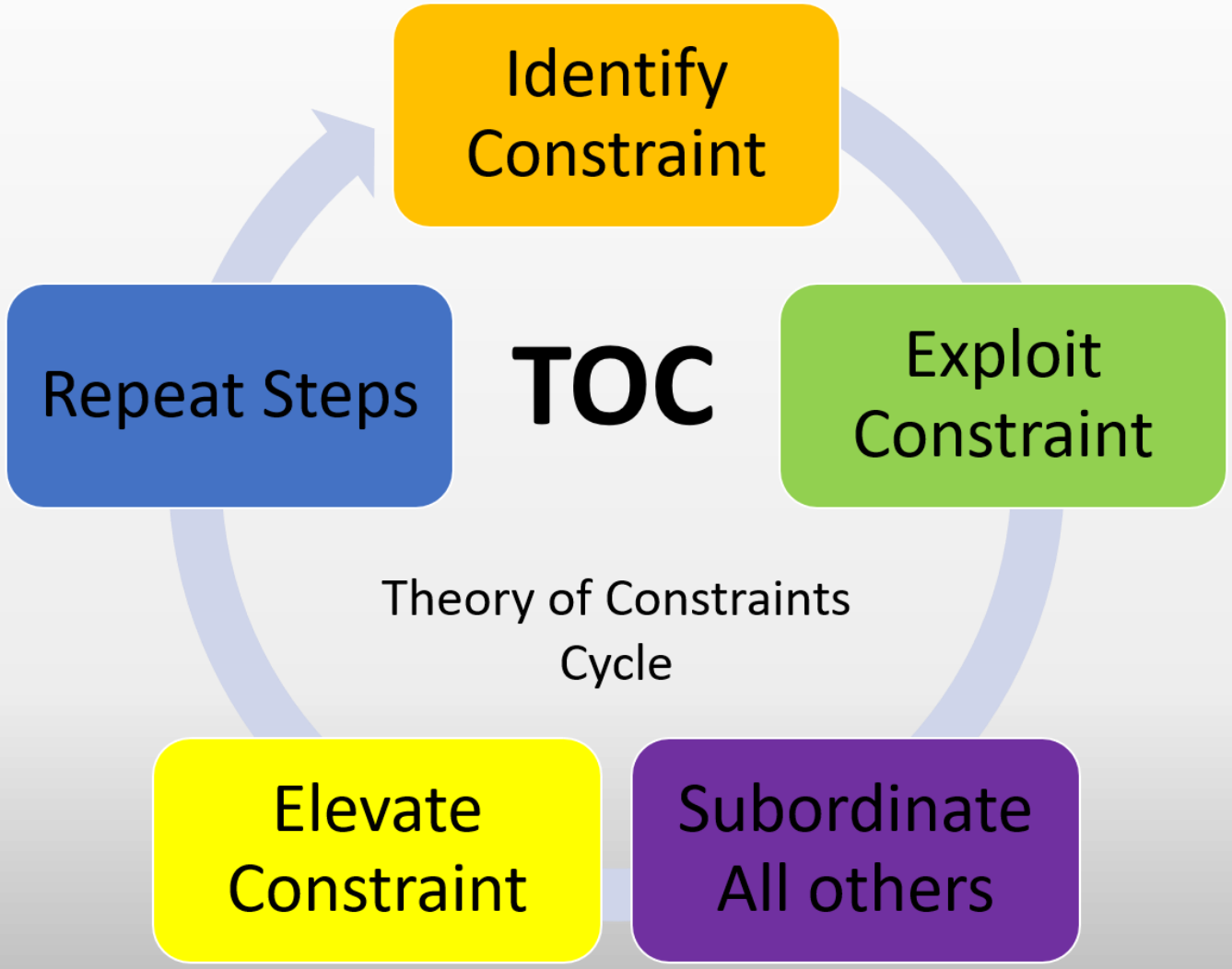


# Understanding/Reducing Variation

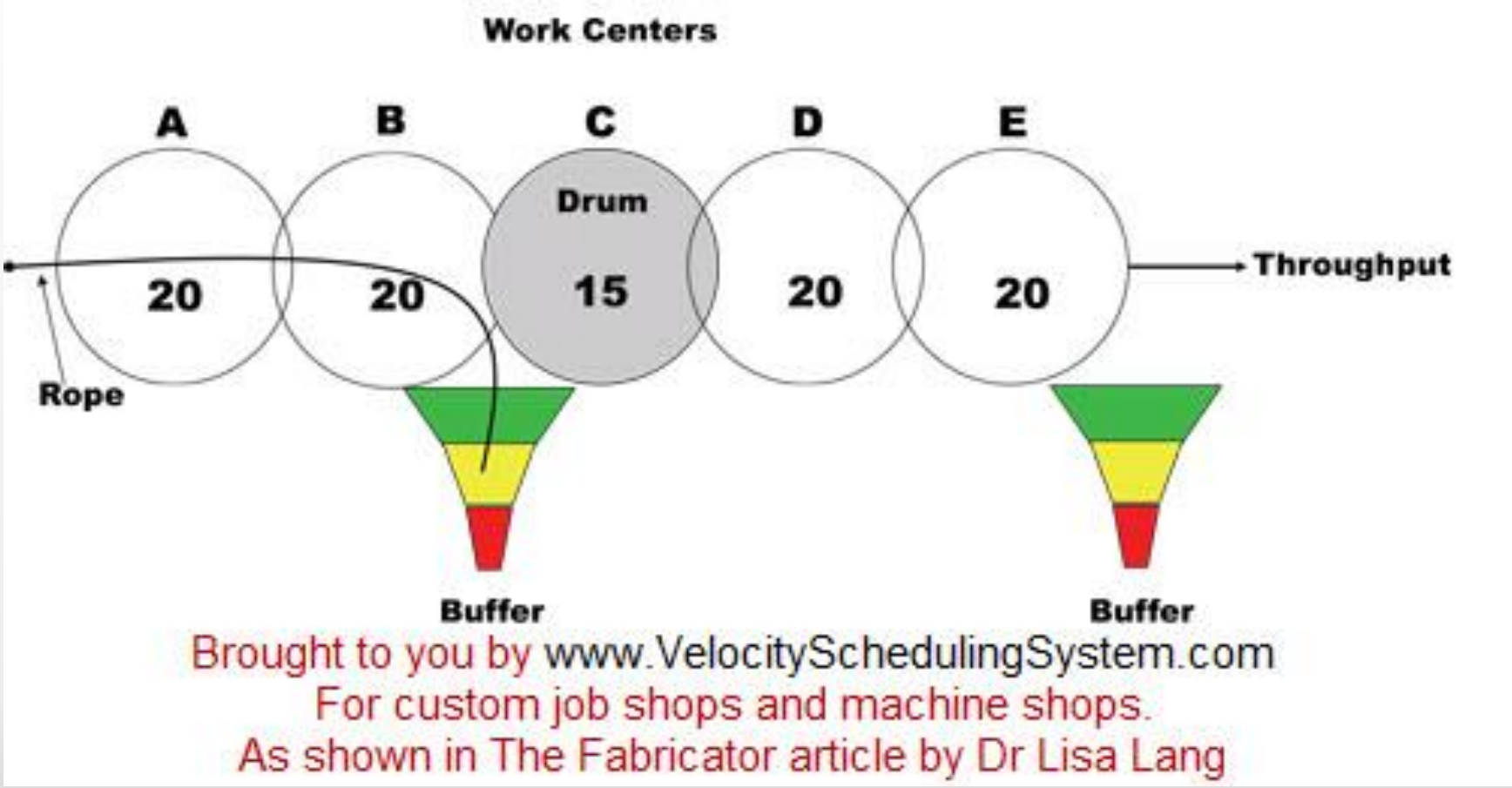
- SPC Control Charting
- Measurement data demonstrates process performance over time



# TOC – Managing the Constraint



# TOC DBR, Drum Buffer Rope



# Side By Side Comparison

| Theory | Lean | Six Sigma | TOC |
|---|---|---|---|
| **Objective** | Reduce Waste | Reduce Variation | Manage Constraints |
| **Process** | LEAN 5 Step & PDCA | DMAIC 5 Step | TOC 5 steps |
| **Focus** | Reduce Lead Time, Lot Size, Defects, Costs | Problem Solving & PDCA, Data Measurement | System Constraints - optimizing throughput |
| **Primary Effect** | Flow Improved & Waste Reduces | Variation Reduced | Increased Throughput matching demand |
| **Characteristics** | Principles & Tools – New Way of Thinking | Statistical Problem Solving Tool | Mgmt Theory Leans on LEAN |
| **Criticisms** | Difficult to emulate Toyota | Inappropriate use of Six Sigma in many cases | Borrows concepts from other operations theories |

# First, Lean and 6 Sigma

- Applied as designed these might be described as this;
- **Doing things Right** (6 Sigma) vs **Doing the Right Things** (LEAN).
- LEAN **requires** incredible amounts of **discipline to implement** and maintain.
- Six Sigma is far **more difficult to learn** and apply **correctly**.
- Many practitioners do process improvement using LEAN techniques but call it Six Sigma = Confusing!
  - Value Stream Mapping
  - Kaizen
- Let's organize our tools so we will better apply them!
- Our "toolbox" will have all our tools, called LEAN Six Sigma.

# Adding TOC to the Mix

- Constraint Management is to borrow many of the LEAN concepts, but focusing primarily on the constraint to maximize throughput – which improves flow.
- TOC is essentially a repackaging of many other practices where we focus on LEAN and Six Sigma to optimize THROUGHPUT, sometime also improving FLOW.

# Application

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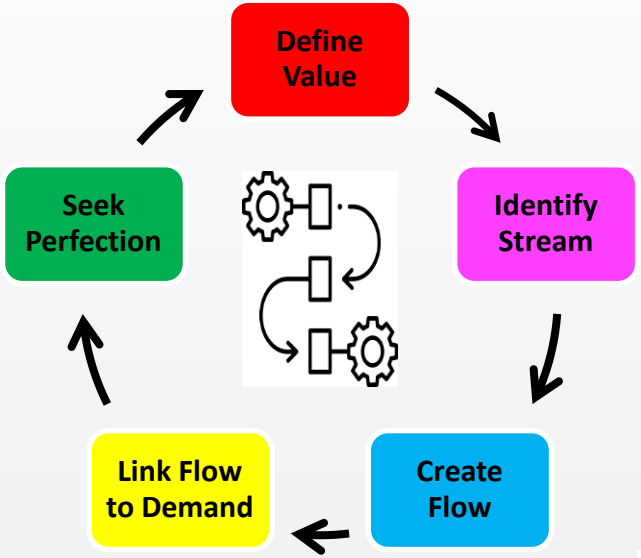
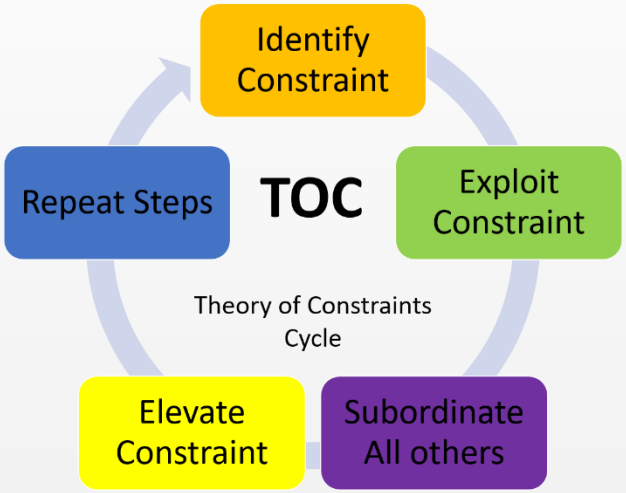
# Applying the Tight Tool - Where/When to Use Each?

| LEAN | 6 Sigma | TOC |
|---|---|---|
| Process Takes Too Long | Making Defects | Capacity Imbalance |
| Has Too Many Steps | Process Not Reliable | Starting/Stopping |
| Late Delivery – Process | Late Delivery – Quality | Late Delivery – Output |
| Value Add = Low % of LT | Process Not Consistent | Output Qty Variable |
| Too Much Inventory Cost | Product Cost Too High | Resource Intensive |
| Lead Time Too Long | Forecast Accuracy | Capacity Planning |
| Cycle Time > Takt Time | | |

# Which Tool to Apply?



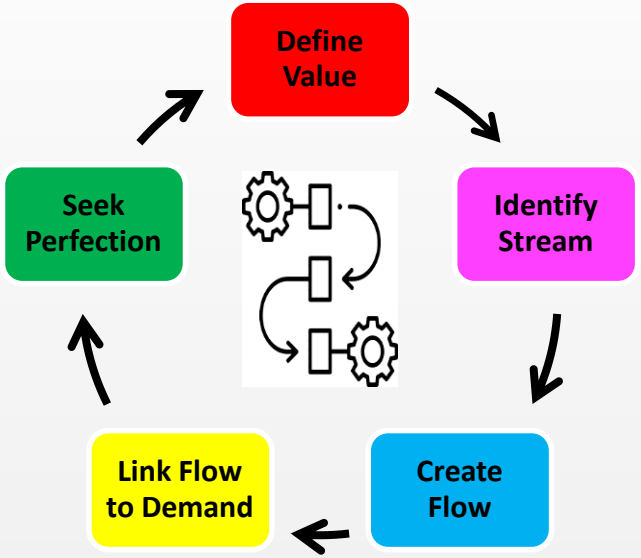

# Case Study #1 – Long LT, High Invty

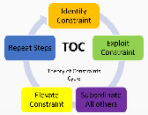
- Long processing time, too much inventory across all stages
- Stage 1 mfg in metal fab production
- Load truck at first location to deliver to paint shop in different city
- Paint and Cure
- Load product on truck to deliver back to metal fab – fabric assy
- Final fabric assy and packaging

- One process spread over 2 facilities, extra load/unload and lost time at both, with truck load of inventory

- **Better, Use LEAN to redesign process flow, one location where all steps are close together and set up flow process, to customer**

# Which Tool to Apply?

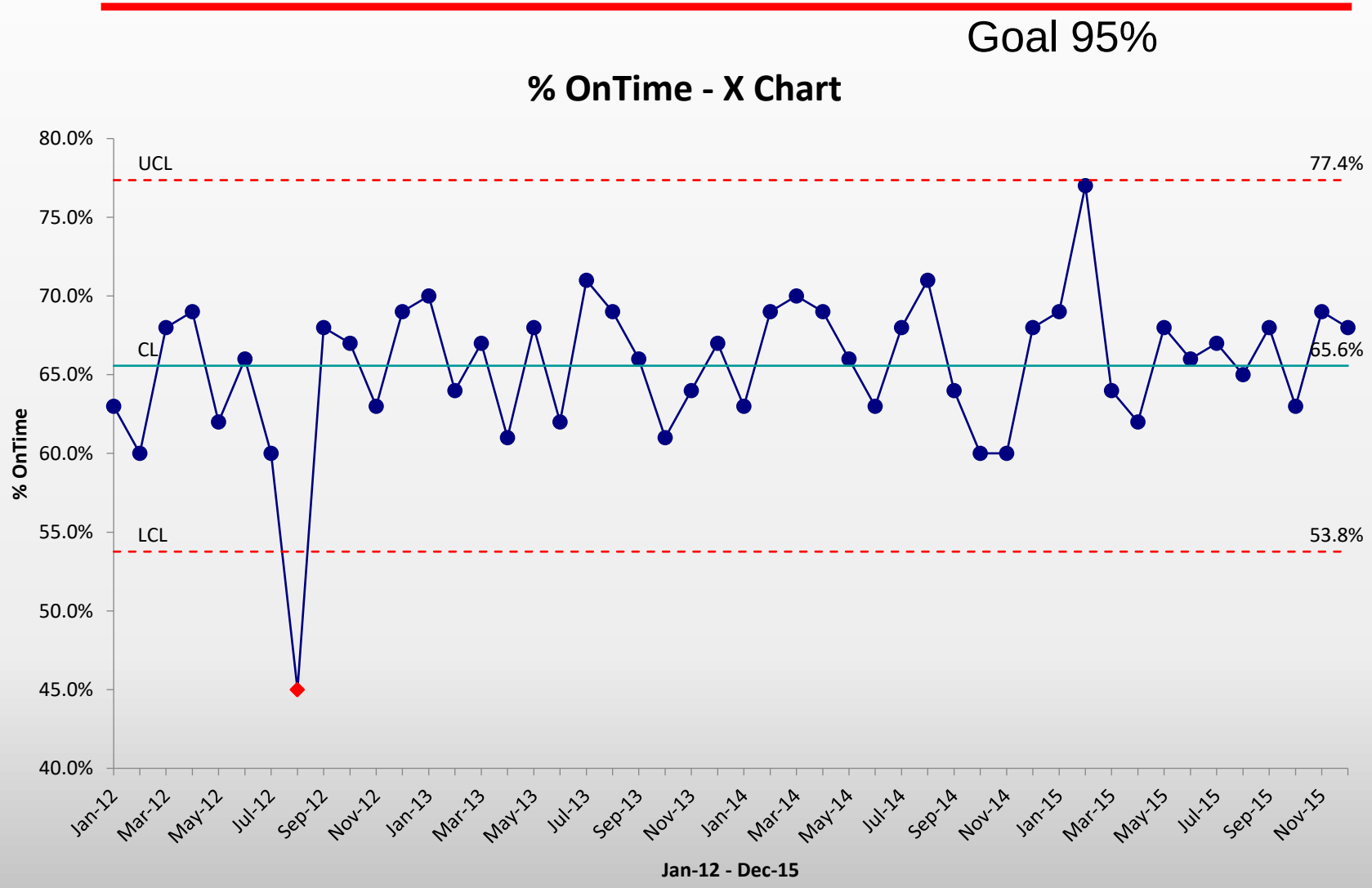


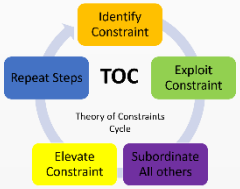

# Case Study #2 – Process Capability

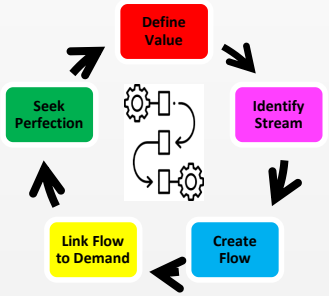
- Poor On-Time Delivery performance, 65% for several years.
- Began tracking delivery data.
- Captured root causes to classify and measure source of delays.
- Began measuring sources of problems per root cause analysis.
- Calculate system performance and process capability, set goal.
- Prioritized elements to improve, project teams to seek corrective actions, changes.
- Some 6 Sigma teams due to type of problems from quality issues, some LEAN teams to redesign process workflows, some TOC to reconfigure constrained resources.

# SPC Chart for OTD



# Which Tool to Apply?




# Case Study #3 – Focus on Wrong Element

- Time to approve new customers for CC application – 63 Days
- 6 Sigma produced several hundred pages of data collected on how to process a Credit Card application, improving from 2 hou
- 6 Sig n revie
- LEAN ents. Mos
- New days.

Prod Lead Time = 63 days or 30,240 min
63 d * 8 hr * 60 min

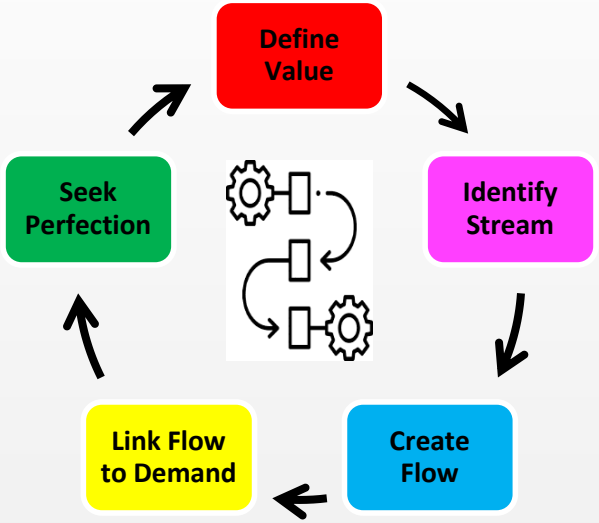
Processing Time = 60 min

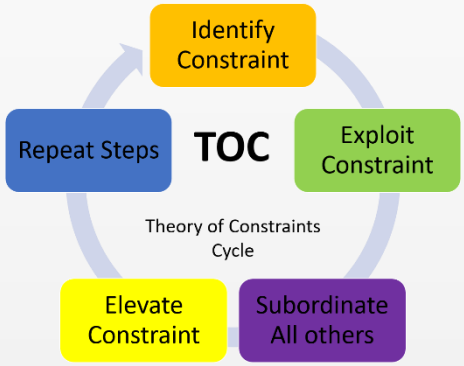
Value Add Ratio BEFORE = 60/30,240 = .0001984 Sec

Value Add Ratio AFTER = 60/60 = 1

Immediately created revenue increase of $216M from CC sales.

# Which Tool to Apply?




# Survey
# Which you would choose as the best approach

| Problem to Overcome | LEAN | 6 Sigma | TOC |
|---|---|---|---|
| Mfg **Lead Time is very long**, 12 weeks. Quality is reasonably good. | | | |
| Mfg **orders often ship late**. Raw material supply is good, quality is good. | | | |
| **Forecasting is inconsistent**, downstream planning struggles. | | | |
| New Product Dev often **misses target launch date**. | | | |
| **First Pass Yield performance has been falling** for over 30 days. Training is being considered. | | | |
| Insurance claim **processing takes too long**, 5 weeks. | | | |

# Survey – Recomendations

| Problem to Overcome | LEAN | 6 Sigma | TOC |
|---|---|---|---|
| Mfg **Lead Time is very long**, 12 weeks. Quality is reasonably good. | X | | x |
| Mfg **orders often ship late**. Raw material supply is good, quality is good. | | | X |
| Forecasting is inconsistent, downstream planning struggles. | X | | |
| New Product Dev often **misses target launch date**. | X | | |
| **First Pass Yield performance has been falling** for over 30 days. Training is being considered. | | X | |
| Insurance claim **processing takes too long**, 5 weeks. | X | | x |

How many got these same answers?

# Summary
# Lean
# Six Sigma
# TOC

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# Indications

- TOC & DBR would have you ADD inventory in certain points of a process
- LEAN would have you focus on FLOW, to eliminate the need for the buffer

- Processing insurance claims in an office would easily be a one-piece flow but a manufacturing process may often require some inventory to “Pull” from in order to support a smoother FLOW with smaller batch quantities.

- 6 Sigma is the right approach where you need measurement and process control.

# Summary

- Six Sigma and TOC on their own, both often have a myopic focus, variation and constraints, that do not allow for flexibility of LEAN for a multitude of types of business problems.
- LEAN may be more adaptable to many problem types and therefore more readily applicable to processes outside the factory where TPS (mfg JIT) tends to aim inside the factory.
- TOC tends to become useful where bottlenecks are restricting revenue and is very often important in LEAN flow.
- **LEAN-6 Sigma is what we like to call a well stocked tool box!**

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## Bob Forshay, CPIM, CIRM, CSCP, CLTD, CSCA, CSCM, CLM, CSSC, CPIA, CSCTA, TTT

Supply Chain & Operations Management Consulting, Master Instructor

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