Introduction To Lean Six Sigma

Abstract

The Lean Six Sigma methodology uses data and rigorous statistical analysis to identify defects in a process or product, reduce waste and variability, and achieve high quality well managed processes. Approaches to business performance improvement have evolved and grown since the early 1900s. Today process focused Lean Thinking and statistically driven Six Sigma methodology has been widely used by many organization to improve the business performance and optimizing the bottom-line benefits. This presentation reports an overview of the Lean Six Sigma methodology and the tools used to achieve high quality processes. Participants will gain knowledge on the Lean Six Sigma methodology and see how the tools can be used to improve quality, reduce cycle time and increase throughput within for-profit and not-for-profit business models.

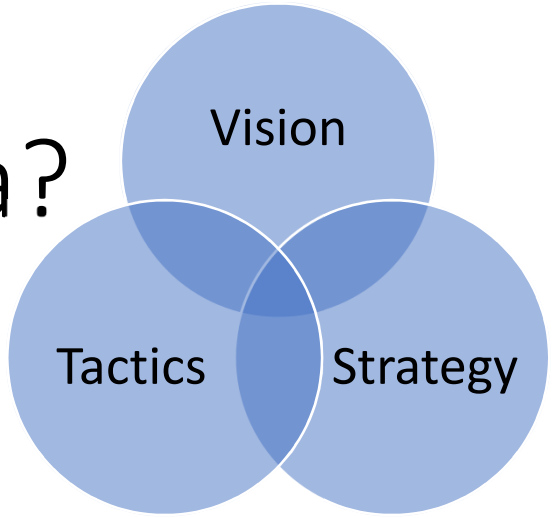
Speaker Information

- Lean Six Sigma Master Black Belt
- B.S. Manufacturing Engineering Technology, Southwestern Oklahoma State University
- MBA, University of North Alabama
- The Lean Office blog
- Worked on the production floor, in high volume maintenance, low volume/high mix process engineering, industrial engineering, site LSS Black Belt, multi-site transactional organization LSS Master Black Belt in the Telecom and Aerospace Industries.

Agenda

- What is Lean Six Sigma
  - History
  - Systems Thinking
  - Voice of the Customer
- Tools & Thinking
  - Gauge R&R
  - Attribute Agreement
  - True Root Cause & Corrective Action
  - Cost of Quality
- Lean Culture
- How to Measure and Improve
- Questions?

What is Lean Six Sigma?



Tools & Tactics

- Process Mapping
- Value/Non-Value Analysis
- 8-Wastes
- 5S
- Single Minute Exchange of Dies
- SPC
- F-Test
- Levene's Test
- Design of Experiments
- DMAIC
- Design for Six Sigma

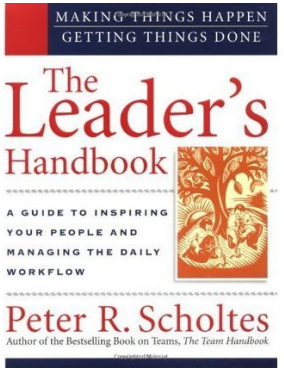
Thinking & Strategy

- Customer Alignment
- Lean Enterprise
- Shingo Model
- Continuous Improvement
- Respect for People
- Hoshin Kanri
- Just In Time
- Kano Analysis

What is Lean Six Sigma?

- History of Lean Six Sigma
  - Fredrick Taylor – Scientific Management
  - Sakichi Toyoda – G Type Power Loom
  - Henry Ford – Automobile Production
  - Walter Shewhart – Statistical Process Control
  - World War II – Bomber per Day
  - W. Edwards Deming – 14 Management Points
  - Joseph Juran – Managing for Quality
  - Toyota enters U.S. automobile market
  - Bill Smith & Mikel Harry – Six Sigma & DMAIC
  - Spreads to GE, Allied Signal, Honeywell
  - Healthcare, Finance & Banking, Aerospace
  - Government

What is Lean Six Sigma?

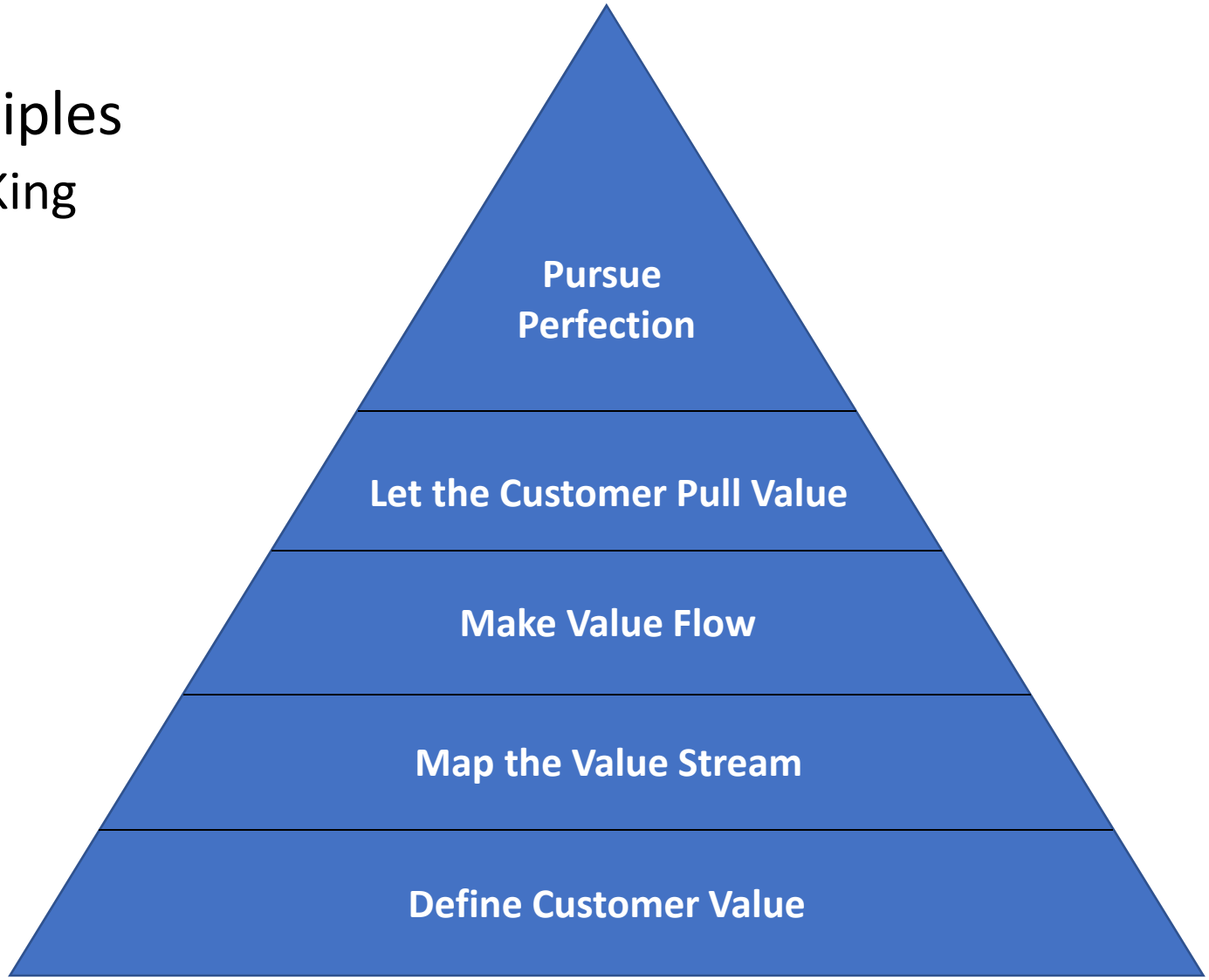


- Systems Thinking is the general reflex or habit of conceiving of reality in terms of interdependencies, interactions, and sequences.
  - *System* refers to the interactions and interdependencies on a large scale.
  - *Processes* are the components of a system that have their own purpose and function, but does cannot accomplish the purpose of a system.
  - *Methods* are the components of the process that have their own purpose and function, but the value of the method is seen through the interactions with other methods.
  - Steps are the components of the method. One event in a sequence that interacts with other steps.

Peter R. Scholtes, The Leaders Handbook

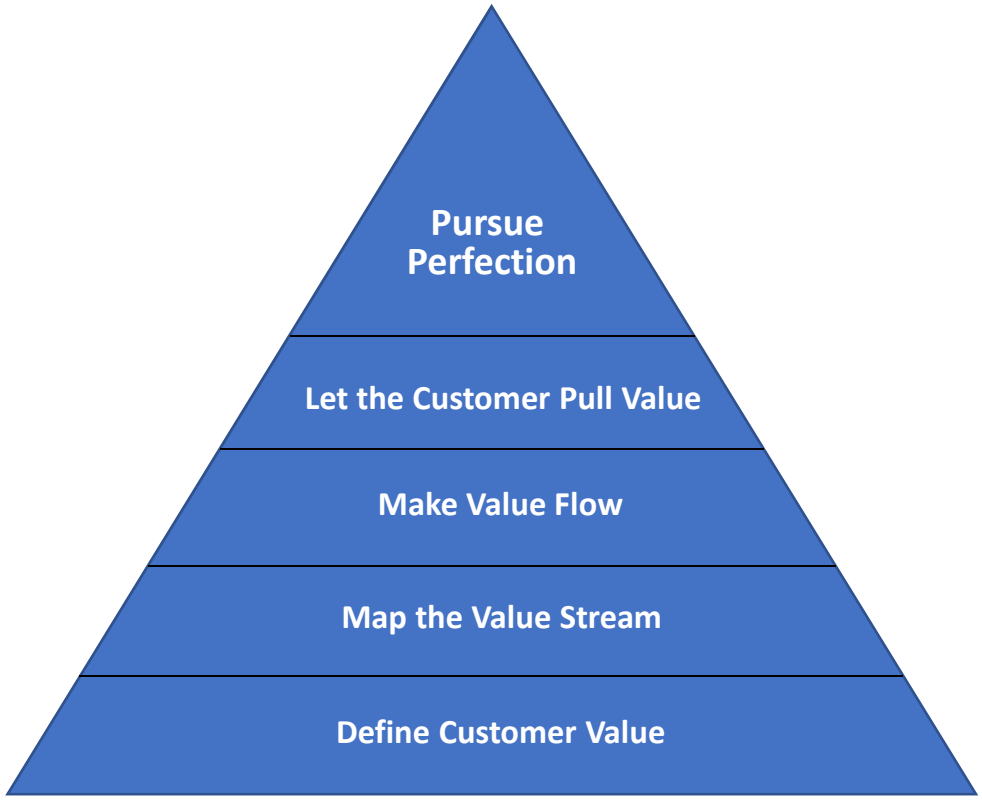
What is Lean Six Sigma?

- Lean Principles
  - Flow is King



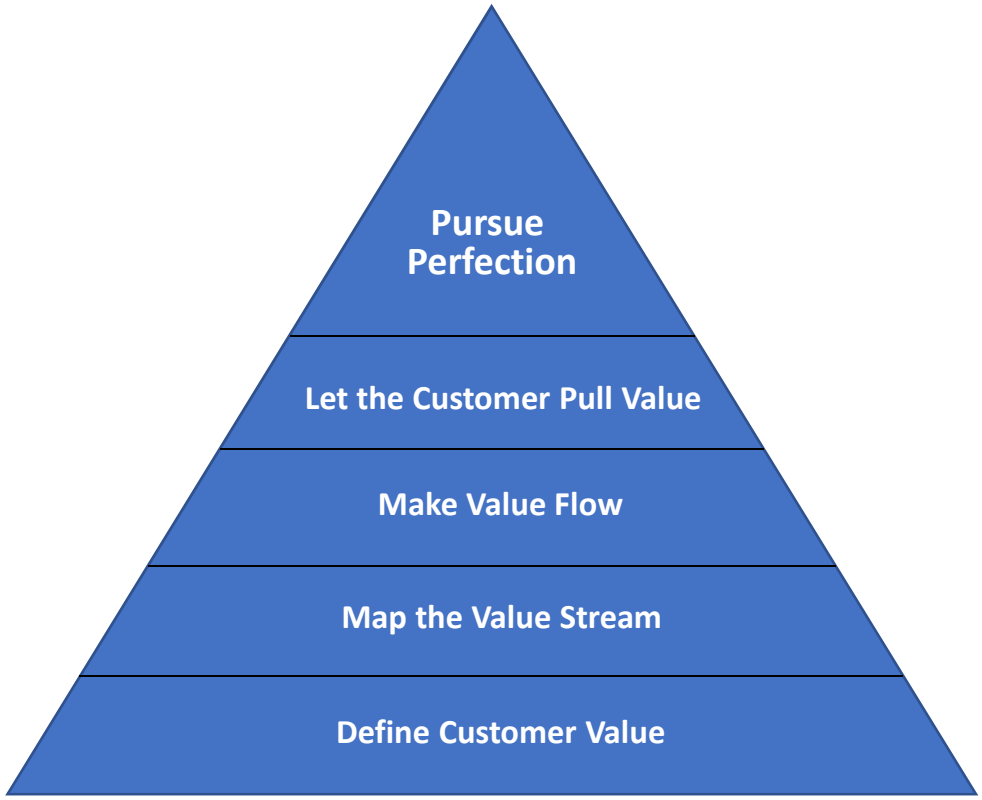
What is Lean Six Sigma?

- Define Customer Value
  - Voice of the Customer
    - Requirements
    - Wants
    - Desires
  - Voice of the Business
    - Regulations
    - Policy
  - Voice of the Process
    - Performance



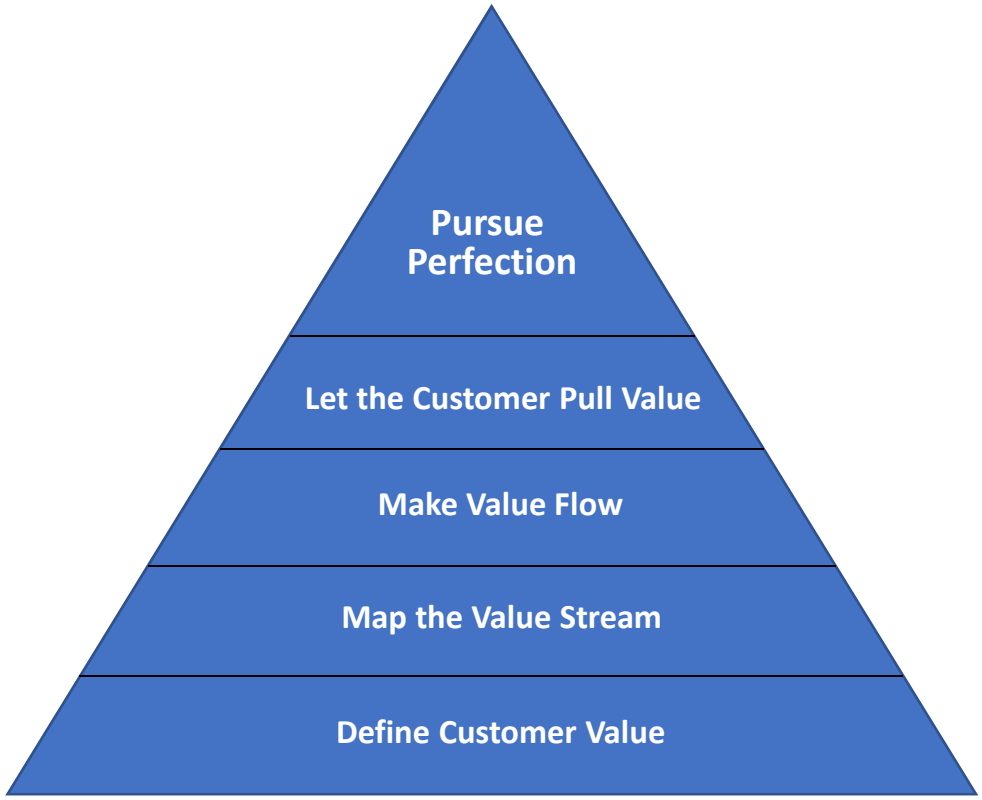
What is Lean Six Sigma?

- Map the Value Stream
  - Product Flow
  - Information Flow
  - Material Flow
  - People Flow
  - Tool Flow
  - Metrics



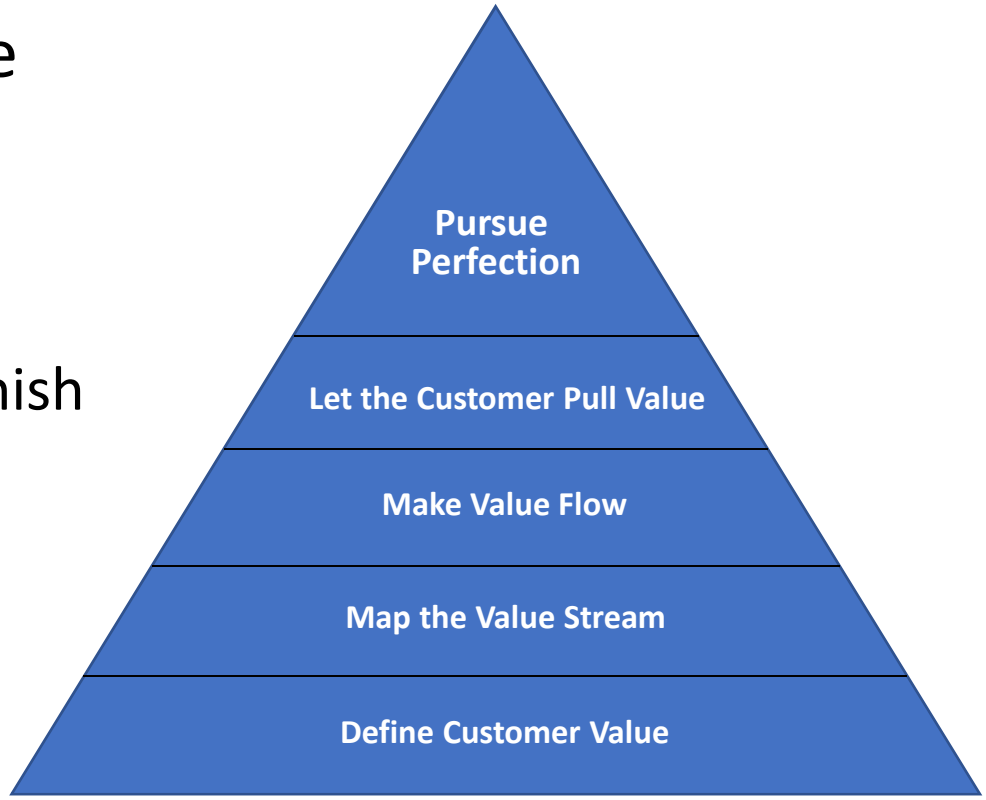
What is Lean Six Sigma?

- Make Value Flow
  - Improve Quality
  - Improve Capacity
  - Improve Policy
  - Improve Management
  - Improve Skills
  - Improve Visuals
  - Improve Organization
  - Improve Suppliers
  - Improve Maintenance



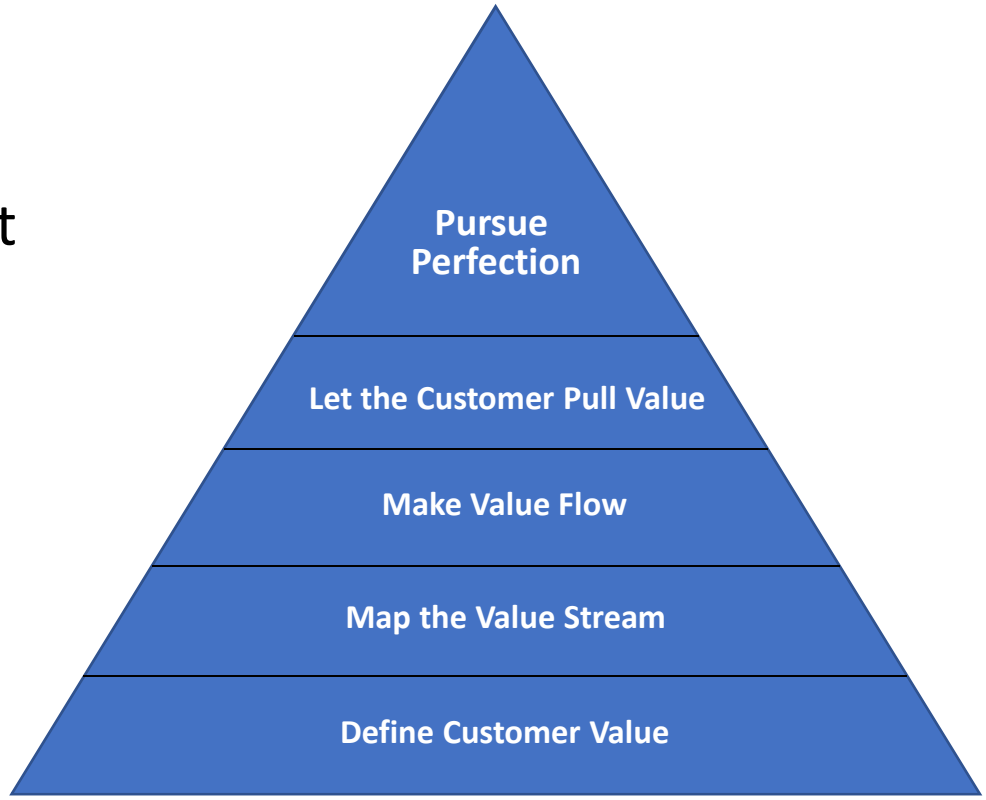
What is Lean Six Sigma?

- Let Customer Pull Value
  - Customer Signal
  - Post-Sale Service
  - Just-In-Time
  - Time To Reliably Replenish

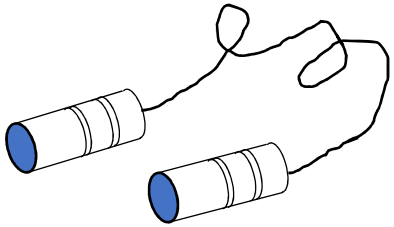


What is Lean Six Sigma?

- Pursue Perfection
  - Visual Controls
  - Customer Demand Shift



Voice of the Customer

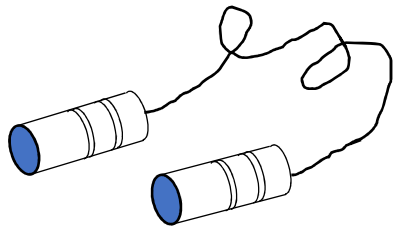


- What is a Customer?
  - An individual or organization that buys or receives your goods or services (target market)
  - External or Internal in relation to the enterprise or flow of the product
- Examples

  - Individual purchases a Gibson Les Paul
  - Individual purchases services from Huntsville Hospital
  - Company purchases spare parts
  - Company purchases market analysis
  - Production Team receives raw material for processing

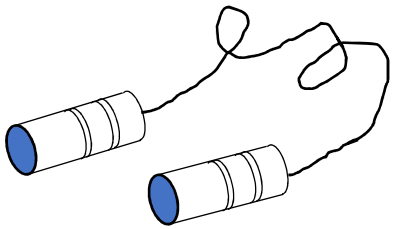
  - Supply Chain Team receives data for analysis

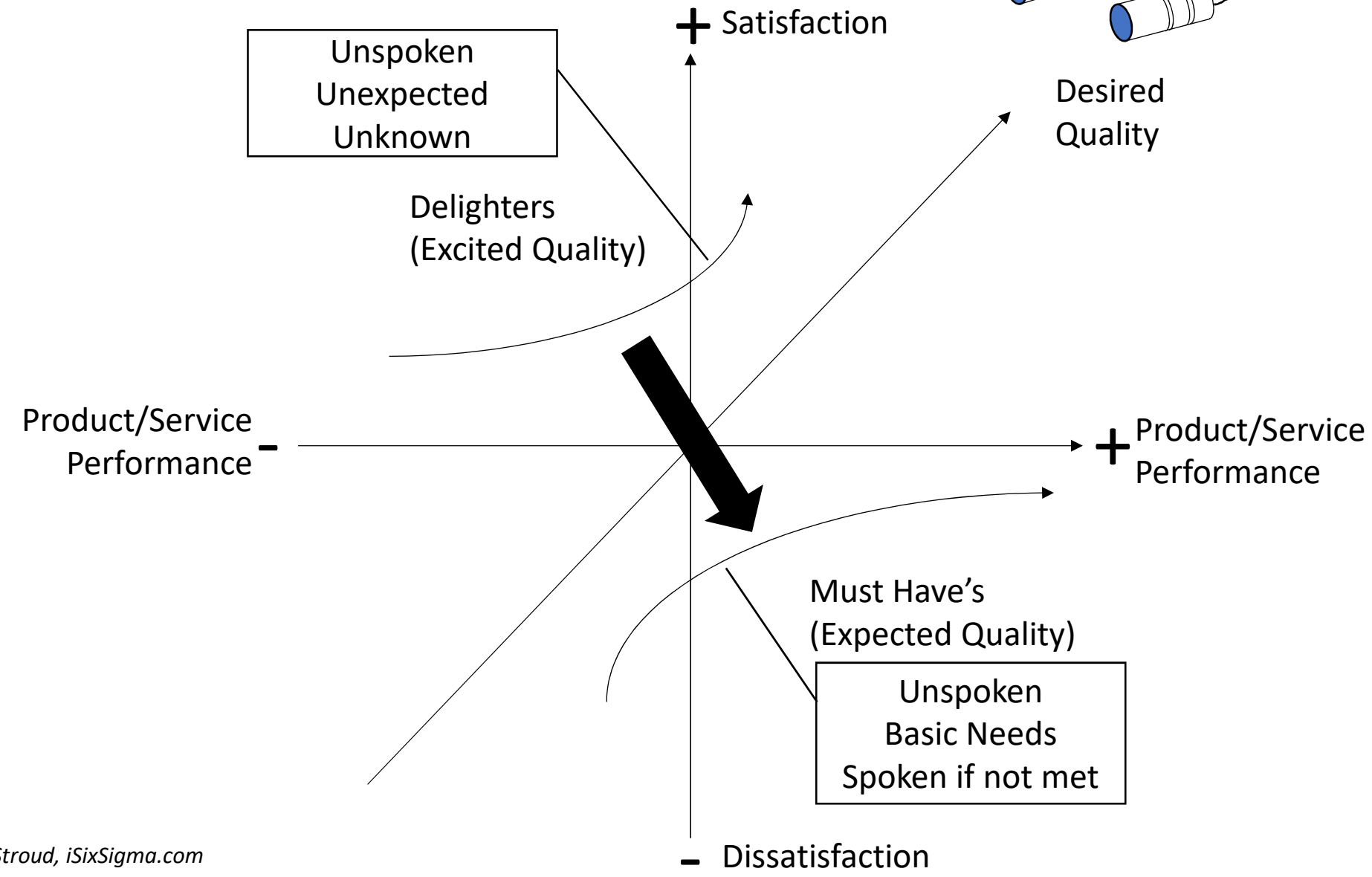
Voice of the Customer



- Can you identify your External and/or Internal Customers?
- External or Internal Customer have requirements or expectations about the goods or services?
  - Specifications, price, features, reliability, ease of use, availability, etc, etc, etc
- What is “Quality”?
  - Ability to meet characteristic or attribute
  - Alignment between Expectations and the “Product”
- Do you know your Customer’s requirements or expectations?

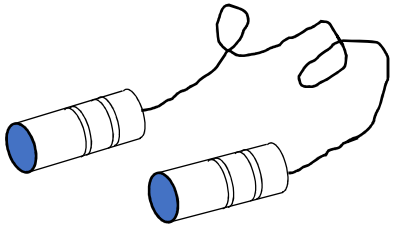
Voice of the Customer





Stroud, iSixSigma.com

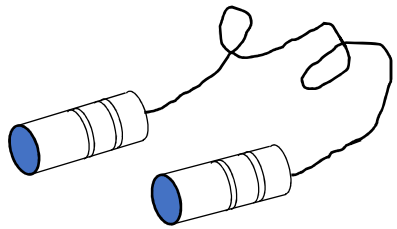
Voice of the Customer



- Identifying Desired Quality
  - Customer Satisfaction Surveys
  - Transition Reports
  - Focus Groups
  - Perception Surveys
- Identifying Must Have Quality
  - Complaint System
  - Non-Conformance System
  - Lost Customer Surveys
  - Attrition Analysis
- Identifying Delighter Quality
  - “Invent the Future” Focus Groups
  - Customer Loyalty Programs
  - Advisory Groups
  - User Groups

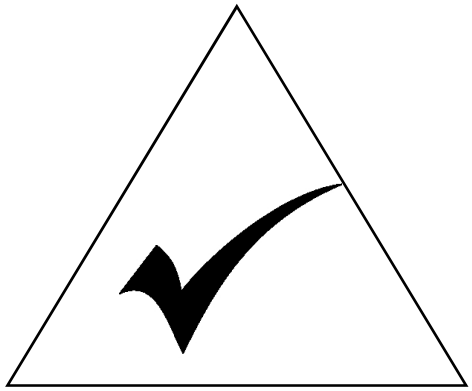
Stroud, iSixSigma.com

Voice of the Customer



- Basic Customer Expectations (Typical Must Haves)
  - Complete
  - Correct
  - On-Time

- How well are we performing to Customer Expectations?
  - Current State



LSS Tools – Gauge R&R

- Measurement System Analysis is a method to determine if variation is from the process or from the gauge.
- Accuracy – The measurement system's ability to measure correctly.
- Stability – Change over time using a measurement system to measure to a standard.
- Repeatability – The measurement system's variability is consistent.
- Reproducibility – The measurement system's ability to product consistent results.

LSS Tools – Gauge R&R

- What is Acceptable amount of Variation?
  - Acceptable – Less Than 10%
  - Marginal – Between 30% and 10%
  - Unacceptable – Greater Than 30%
  - *Your Requirements or Quality Policy May Differ*
- Why Gauge R&R?
  - Type I Errors – the incorrect rejection of an acceptable condition. This may create unneeded rework ($$$$$$$).
  - Type II Errors – incorrectly retaining an unacceptable condition. This may become an escape to the customer.
  - *Remember the Kano Model?*

LSS Tools – Attribute Agreement

- Attribute Measurement System Analysis is a method to determine if variation is from the process or from the evaluator.
- Repeatability – The evaluator's variability is consistent.
- Reproducibility – The measurement system's ability to product consistent results.
- Accuracy – The evaluator's ability to correctly categorize.

LSS Tools – Attribute Agreement

- What is the Overall Effectiveness?
  - Overall % Agreement = count of correct responses/total responses
  - Kappa – used to measure the agreement of the appraiser with the reference value
    - Range from -1 to 1

https://www.spcforexcel.com/knowledge/measurement-systems-analysis/attribute-gage-rr-studies-part-2

LSS Tools – Attribute Agreement

- What is the Acceptable Overall Agreement?
  - Acceptable – Greater than 90%
  - Marginally Acceptable – 80% to 90%
  - Unacceptable – Less than 80%

- A general rule of thumb is that values of kappa greater than 0.75 indicate good to excellent agreement (with a maximum kappa = 1); values less than 0.40 indicate poor agreement.

- *Your Requirements or Quality Policy May Differ*

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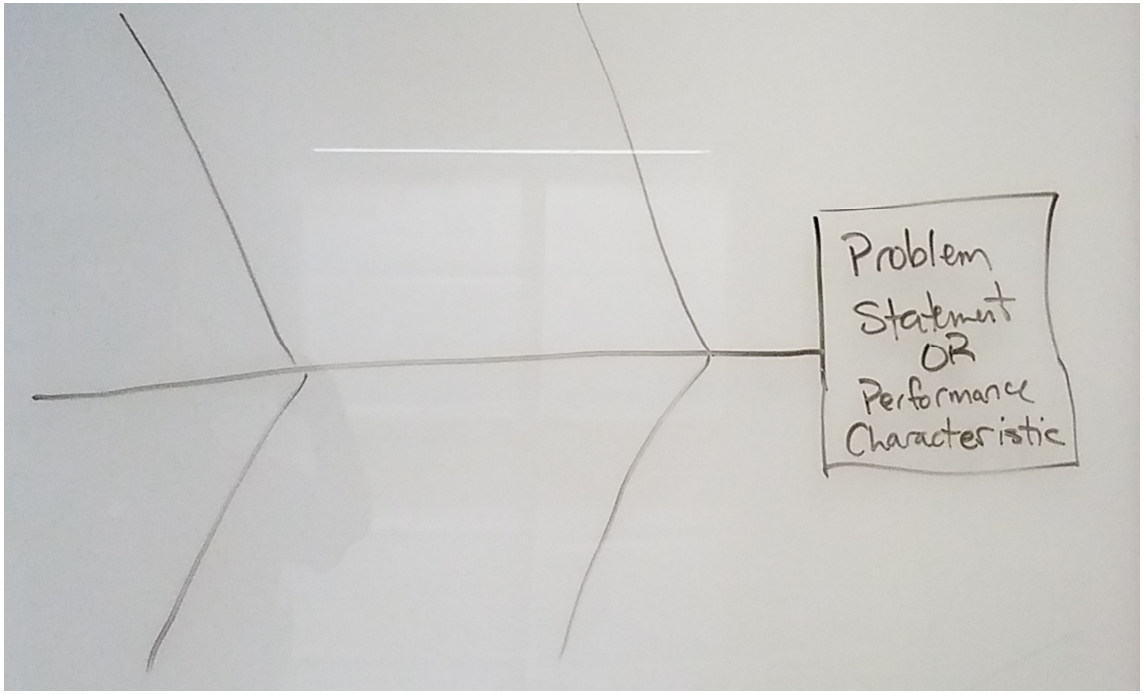
LSS Tools – Root Cause & Corrective Action

- Starts with problem statement and findings from the performance of the current state.
  - Safety, Quality, Cost, Delivery
- Brainstorm for potential causes with smart people



LSS Tools – Root Cause & Corrective Action

- Evaluate potential causes
  - Risk – Severity, Occurrence, Detection (RPN from FMEA)
  - Design of Experiments
- Drill down through mostly likely potential causes
  - 5-Whys
  - Fault Tree Analysis
  - Process Analysis
  - Analyze the Interactions
- Test your ideas
  - Simulate
  - Evaluate

LSS Tools – Cost of Quality

- Prevention Costs
  - Quality Planning
  - Training
  - Quality System Maintenance
- Appraisal Costs
  - Verification
  - Auditing
  - Supplier Rating & Development
- Internal Failure Costs
  - Waste
  - Scrap
  - Rework
  - Failure Analysis
- External Failure Costs
  - Repairs & Servicing
  - Warranty Claims
  - Complaints
  - Returns

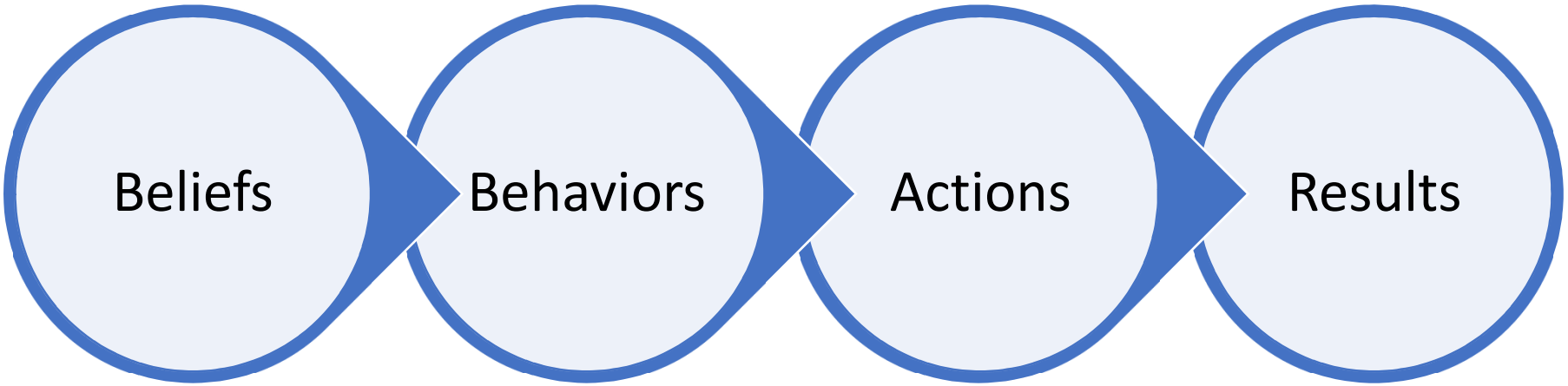
Total Cost is the Sum of all Costs

Lean Culture

- A culture that is based on continuous improvement and lean principles.
  - Specify value by product
  - Identify all the steps in the value stream for each product family
  - Make the value flow smoothly toward the customer
  - Customers pull value
  - Repeat until perfect
- It is critical for sustainability; and to change it, you have to change your management system.

Lean Culture

- Shingo Model
  - Culture cannot be changed by implementing a continuous improvement program. Improvement events do not change the Culture or the Organization.



Lean Culture

- Shingo Model Cultural Enablers
  - Guiding Principals
    - Lead with Humility
    - Respect Every Individual
  - Supporting Principals
    - Nurture Long-Term Relationships
    - Empower and Involve Everyone
    - Develop People
    - Assure a Safe Environment

How to Measure and Improve

- Flow Is King!!
- Andon (Pop the Flare)
- Signal used to focus the Smart People on immediate impacting issue in the work area.
- Kaizen (Incremental Change, Evolutionary)
- Use the Smart People focused on the small problem to determine root cause and implement the fix.
- Kaikaku (Radical Change, Revolutionary)
- Use the Smart People focused on the large problem to determine root cause and implement the fix.

How to Measure and Improve

- Hoshin Kanri (Management Direction)
  - What is the Vision? Where are you going?
  - Communicate the vision!
  - Implement Leader Standard Work
- 5S (Organize)
  - Obeya (War Room)
  - Workplace organization/Point of Use
  - Quick Changeover
  - Balance the Work
  - Use Visual Controls with Defined Responses
  - Poka-Yoke
  - Why, Why, Why????

Questions?

I welcome any questions, comments, or feedback

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