



*Presents*

**Lean vs. Six Sigma**  
*Complementary or Contradictory?*

*To*



**Southwest Florida  
Section**

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## Steve Engelman

### ➔ **Engelman Consulting & Training, LLC.** *(6 years)*

- ❑ Organizational Development / Cultural Change
- ❑ Team Development
- ❑ Continuous Improvement
- ❑ Lean & Six Sigma

### ➔ **Dayco Products, Inc.** *(24 years)*

- ❑ Held numerous plant and corporate-level positions
  - ❑ General Manager of seven plant Business Unit
  - ❑ Corporate Director:  
TQM, CTR, SQI, Lean, Six Sigma & ISO9000 Initiatives
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## ➔ Education

- ❑ MBA - Xavier University, Cincinnati, OH
- ❑ BLA - Xavier University, Cincinnati, OH
- ❑ Qualified Administrator: Myers-Briggs Type Indicator

## ➔ American Society for Quality

- ❑ Member since 1983
  - ❑ Senior Member since 1994
  - ❑ Co-founder of Ocala Section 1528
  - ❑ Southwest Florida Section Chair(2005-2007, etc.)
  - ❑ CMQ/OE, CSSBB, CQE, CQA
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# Process Thinking

- ➔ Everything we do is a process
  - ➔ All processes have inputs, conversion activities, and outputs
  - ➔ Basic premise of improvement is accepting all processes inherently have waste and variation
  - ➔ Lean attacks waste in processes, Six Sigma attacks variation.
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# Customer Perspective of Value

$$\text{Value} = \frac{\text{Quality} \uparrow \times \text{Service} \uparrow \times \text{Innovation} \uparrow}{\text{Cost} \downarrow \times \text{Time} \downarrow}$$

*Customer perception of value constantly changes*

➔ Pioneered by Toyota (*TPS*)

➔ Traceable to 1930s

➔ Based on observations of:

- ❑ Ford Motor
- ❑ U.S. grocery stores

➔ Popularized by Womack, Jones, Roos

- ❑ *The Machine That Changed The World*
  - ❑ *Lean Thinking*
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# LEAN

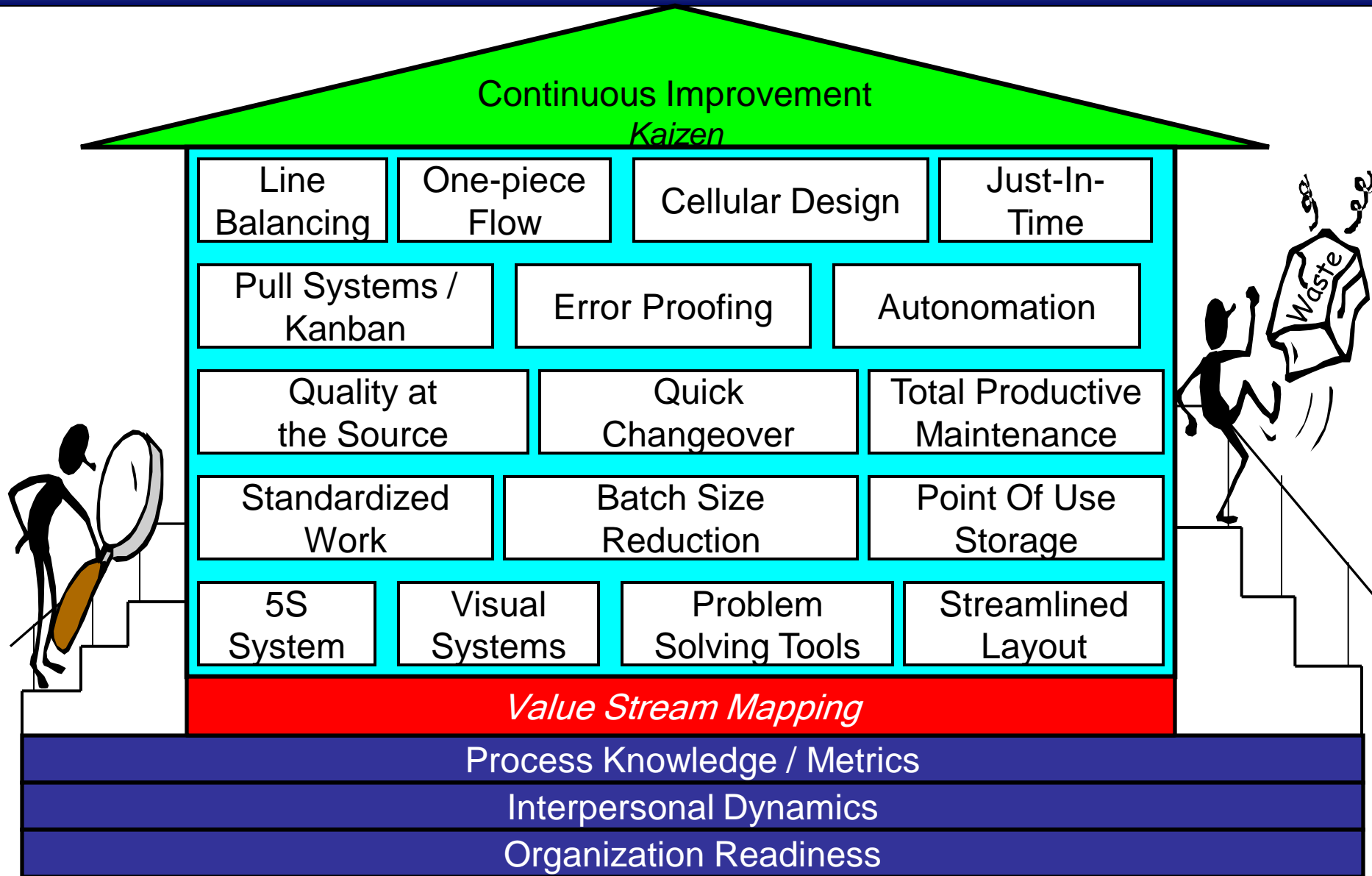
**Enhancing customer value through  
the relentless elimination of waste**

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## Seven Hidden Wastes

1. Overproduction
  2. Inventory
  3. Defects
  4. Waiting
  5. Unnecessary Transport
  6. Excess Motion
  7. Overprocessing
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# Lean Foundations



# Value Stream Mapping Defined

*A simple, preferably hand-drawn, diagram using standardized symbols highlighting material and information flows and time-impacting process measures*

➡ Captures information flow from customer to supplier *(typically flows right-to-left)*

➡ Captures material flow from supplier to customer *(typically flows left-to-right)*

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# Value Stream Map Analysis

➔ At each step, is the task:

- 1) Creating Value?
- 2) Capable?
- 3) Available when Needed?
- 4) Adequate Capacity?
- 5) Flexible?

➔ Does the Value Stream:

- 1) Flow smoothly?
  - 2) Pull?
  - 3) Have level-loaded capacity?
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# Six Sigma History

➔ Developed by Motorola

➔ 1980s

➔ Based on application of classical statistical tools and techniques

➔ Popularized by General Electric

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# SIX SIGMA

**Enhancing customer value through  
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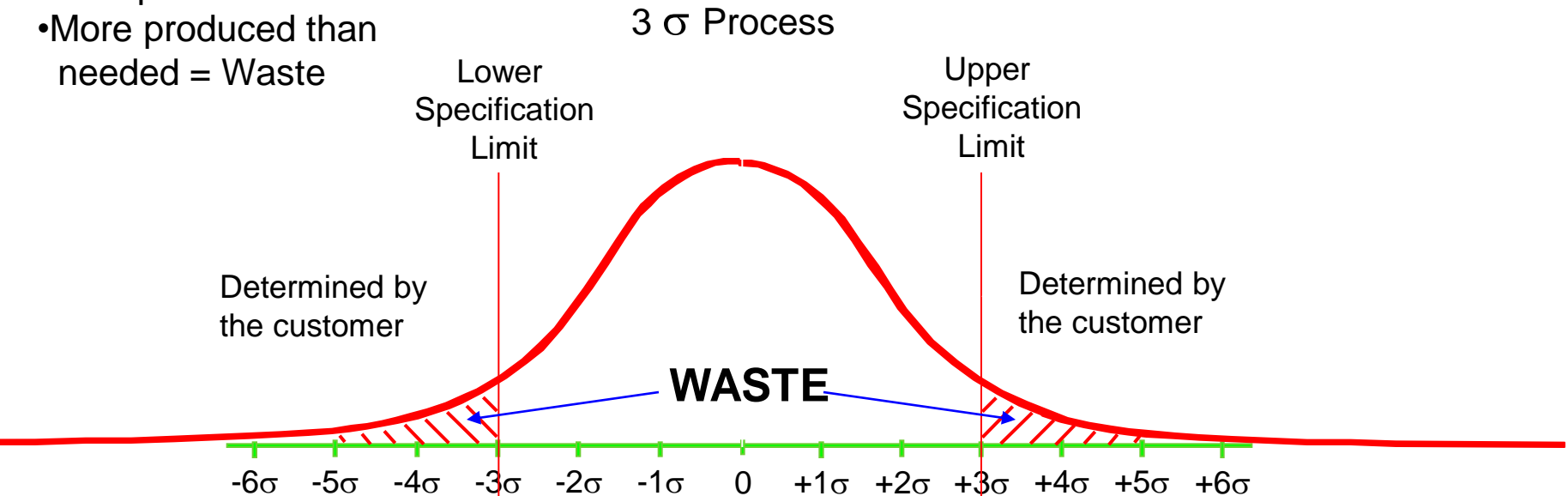
# A Look at Process Variation

## 3 $\sigma$ Process Centered

- Process is WIDER than the specifications
- More produced than needed = Waste

**+/- 3  $\sigma$  Processes=66,807 DPMO**

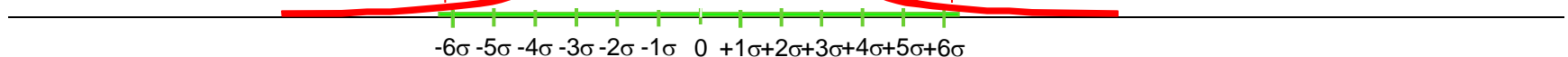
**+/- 6  $\sigma$  Processes=3.4 DPMO**



## **6 $\sigma$ Process**

## 6 $\sigma$ Process Centered

- Process FITS within the specifications
- Producing to customer requirements = Minimal Waste

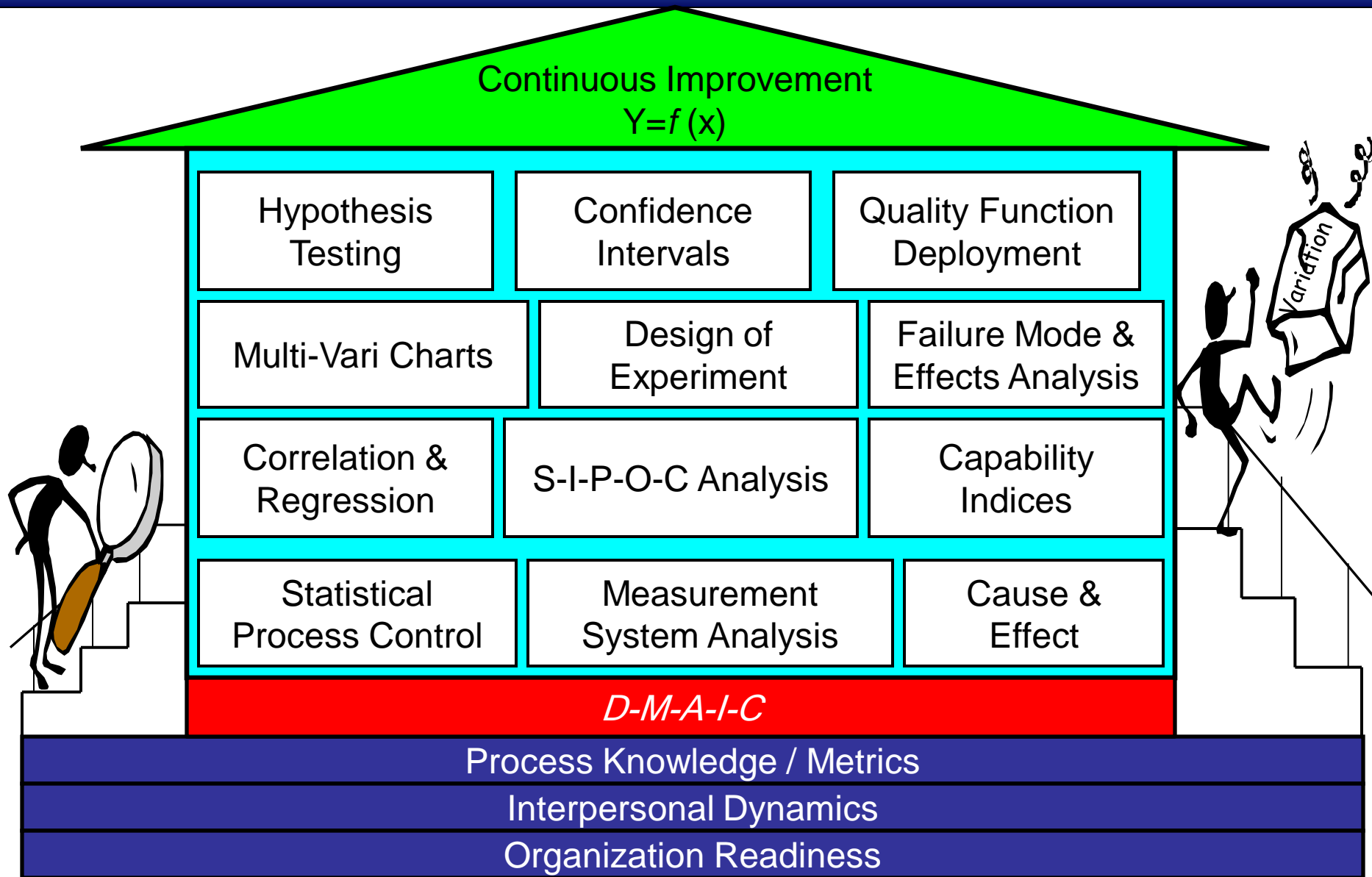


# What Does Sigma Equate To?

Sigma Level	DPMO	Yield
6	3.4	99.99966%
5	233	99.9770%
4	6,210	99.379%
3	66,807	93.32%
2	308,538	69.2%
1	691,462	31%

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# Six Sigma Foundations



## ➔ Define

- ❑ Scope of improvement project & problem statement

## ➔ Measure

- ❑ Understand process flow & collect relevant data

## ➔ Analyze

- ❑ Identify root causes and confirm using data

## ➔ Improve

- ❑ Develop and implement potential solutions. Evaluate results

## ➔ Control

- ❑ Maintain the gains & change the system
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# Relationship of Lean & Six Sigma

*Reducing process variation* 

*Reducing Non Value Adding Steps* 

	Sigma Level			
# of Process Steps	+/- 3 Sigma	+/- 4 Sigma	+/- 5 Sigma	+/- 6 Sigma
1	93.32%	99.379%	99.977%	99.99966%
5	70.8%	96.933%	99.885%	99.9983%
10	50.1%	93.961%	99.770%	99.9966%
50	3.2%	73.237%	98.856%	99.9830%
100	0.1%	53.637%	97.726%	99.9660%
500	0.0%	4.439%	89.135%	99.8301%
1000	0.0%	0.197%	79.451%	99.6606%

$0.708 = .9332^5 = .9332 \times .9332 \times .9332 \times .9332 \times .9332$

## ➔ Focus

- ❑ Creating Value
- ❑ Minimizing Waste

## ➔ Approach

- ❑ Value Stream Mapping

## ➔ Tools

- ❑ Focused on Creating Flow

## ➔ Skills Required

- ❑ Understanding Creation of Value
  - ❑ Creative Thinking
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## ➔ Focus

- ❑ Creating Value
- ❑ Minimizing Variation

## ➔ Approach

- ❑ DMAIC

## ➔ Tools

- ❑ Classical Statistical

## ➔ Skills Required

- ❑ Highly Developed - Applying Statistical Concepts
  - ❑ Hierarchical
  - ❑ “Belt” Structure
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# Benefits of Lean and Six Sigma

## ➔ Reduces

- ❑ Inventories, cycle times, costs

## ➔ Improves

- ❑ Quality, lead times

## ➔ Increases

- ❑ Capacity, sales, productivity, profits

**Creativity Before Capital!**

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# Thank You!



Southwest Florida  
Section

Steve Engelman  
President  
Engelman Consulting & Training, LLC

(239) 482-LEAN

[Steve@LeanSixSigmaCoach.com](mailto:Steve@LeanSixSigmaCoach.com)