

# LEANOhio

**Transforming the Public Sector**

**Green Belt**

**Welcome and Introduction**

SIMPLER. FASTER. BETTER. LESS COSTLY.

# Introductions

- Name
- Agency
- Role
- Project
- Favorite trip/vacation/place you have been

# LEANOhio

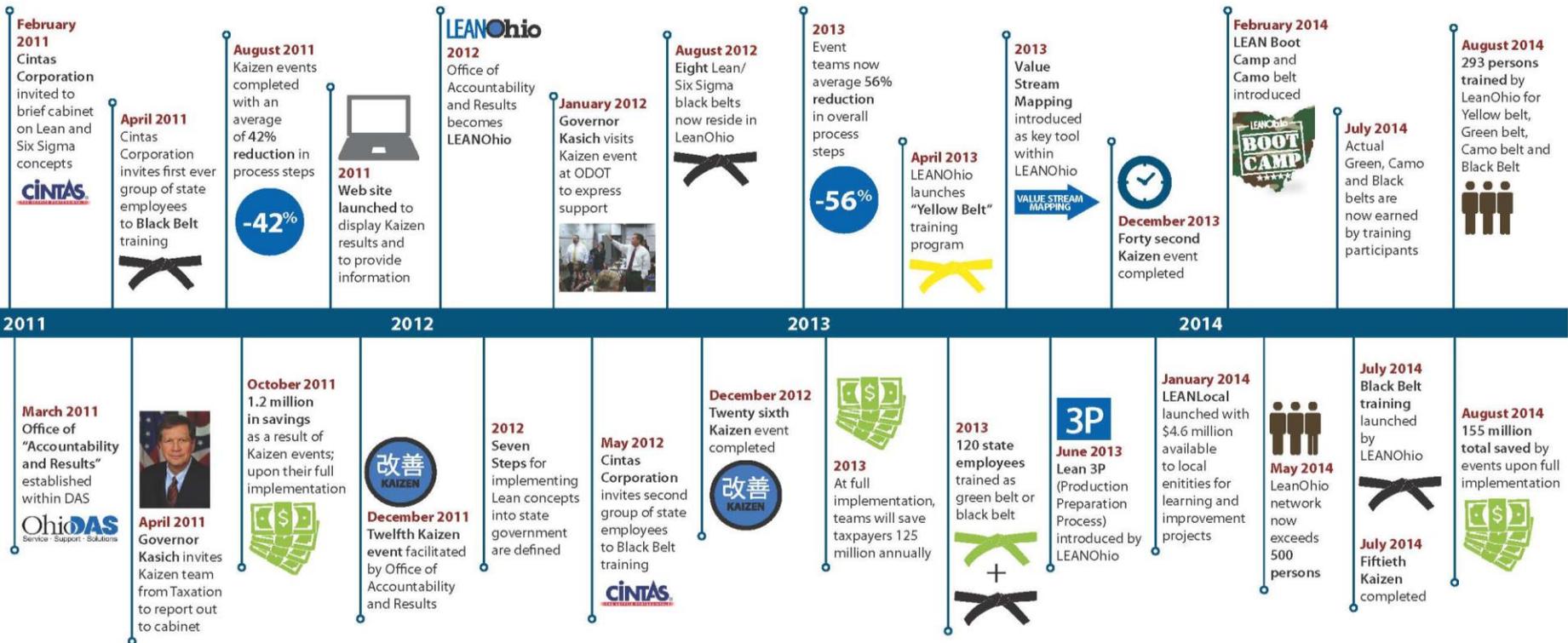
**Transforming the Public Sector**

**Green Belt**

**Six Sigma Body On Knowledge**

SIMPLER. FASTER. BETTER. LESS COSTLY.

# LEANOhio Timeline



**LEAN**Ohio

SIMPLER • FASTER • BETTER • LESS COSTLY

5

*Making state government in Ohio  
simpler, faster, better, and less  
costly.*

SIMPLER. FASTER. BETTER. LESS COSTLY.

**LEAN**Ohio

# Six Sigma

# Lean Six Sigma Methodologies

## Lean

Process Efficiency & Speed

- Used for improving process efficiency & reducing cycle time.

## Kaizen Events

Quick Process Improvements

- Used for getting quick process improvement, 5 days, good for recurring issues.

## DMAIC

Variation & Defect Reduction

- Used for improving quality, reducing variation, and eliminating defects.

## Lean Routine

Sub-processes

- Used on smaller sub-processes - routine processes.

## 3P

Production Preparation  
Process

- Used for developing new products or processes; or to radically change in process.

## Value Stream Mapping

- Used in strategic planning to map the entire value stream all product families.

# Six Sigma Overview

Six Sigma is a set of tools and strategies for process improvement that seeks to improve the quality of process outputs by:

- identifying and removing the causes of defects (errors)
- and **minimizing variation** in processes

# Six Sigma Definition

## Six Sigma is the Best of the Best

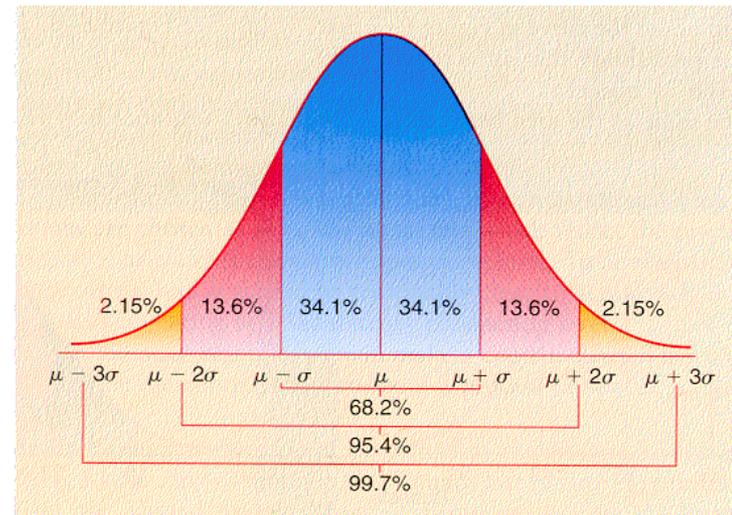
- Six Sigma: by controlling and reducing variation – leads to reduction in errors and a dramatic impact to organization
- Six Sigma is an initiative that includes emphasize on the:
  - Culture of the organization
  - Improvement tools
  - Support system for the tools

# Three Levels of Six Sigma

- Metric: Six Sigma Levels
- Methodology: DMAIC
- Management system

# Six Sigma as a Metric

- As a scale of quality Six Sigma equates to 3.4 defects per one million opportunities
- A Six Sigma process is one in which 99.99966% of the products manufactured are statistically expected to be free of defects



# Six Sigma Levels

Sigma Level	DPMO	% Defective	% Yield
1	691,462	69%	31%
2	308,538	31%	69%
3	66,807	6.7%	93.3%
4	6,210	0.62%	99.38%
5	233	0.023%	99.977%
6	3.4	0.00034%	99.99966%

Today's organizations fall here

**DPMO** = Defects per million opportunities

# What does it mean to have defects?

Sigma 5 is really a good process,  
it is 99.97% effective,  
however...

**Two bad landings at most airports every day**

**99% Good**



**One bad landing at most airports every 5 years**

**99.99966% Six Sigma**



**15 minutes of  
unsafe  
drinking water  
every day**

**99% Good**



**1 minute of  
unsafe drinking  
water every 7  
months**

**99.99966% Six Sigma**



**200,000 wrong  
prescriptions  
given to patients  
each year**

**68 wrong  
prescriptions  
given to patients  
each year**

**99% Good**

**99.99966% Six Sigma**



# Six Sigma as a Methodology

- Improvement methodology focused on:
  - customer requirements
  - data analysis to minimize variation
  - continuous improvement focused on core processes
  - DMAIC model

# DMAIC

## Define

1. Identify CTQ

2. Develop PAF

3. Visualize the Process

**Purpose:** To identify and prioritize the business improvement opportunity, define critical customer requirements, document the processes and build effective teams

**Deliverables:** Project Approval Form; Project Team – TRAIL; CT Flow Down (CTs); SIPOC; Process map (current process) ; Project benefits; Project plan major milestones; Data Collection Plan; Data Integrity Audit (if applicable)

## Measure

4. Understand Metrics

5. Validate measurement System

6. Determine Process Performance

**Purpose:** To determine what to measure, manage the measurement data collection, develop and validate measurement systems and determine process performance

**Deliverables:** TRAIL Chart – updated; Detailed Process Map; Cause & Effect Matrix; FMEA; Decision Tree; Operational Definitions; MSA Evaluation; Data Collection Plan; Capability Study with Control Charts; Project Status

## Analyze

7. ID potential Sources of Variation

8. Characterize the X's

9. Determine Significant X's

**Purpose:** To determine the root causes, estimate population parameters with confidence intervals and to construct hypothesis about the data and test them to determine significance.

**Deliverables:** Data Collection Plan- updated; Hypothesis Testing; Decision Tree; MSA Analysis; Capability Analysis- updated; Executive Summary- updated; TRAIL- updated; Analysis Summary; Control Charts- updated

## Improve

10. Establish level for X's

11. Develop Solutions

12. Pilot and Implement

**Purpose:** To develop and quantify potential solutions, improve/optimize the process, evaluate and select final solution and implement the pilot.

**Deliverables:** DOE; Lean Analysis; Simulation; Optimal settings for X's; Executive Summary- updated; TRAIL- updated; Implementation plan; Control Charts- updated; Capability Analysis- updated

## Control

13. Evaluate Process Performance

14. Develop Control Plan

15. Transition to Project Owner

**Purpose:** Implement final solution, maintain process improvements, ensure new process problems are identified & quickly corrected, disseminate lessons learned. Identify areas for replication & standardization.

**Deliverables:** Control Plan; Transition Plan; Capability Analysis- updated; Executive Summary- updated; TRAIL- updated; Control Charts- updated

# Six Sigma Mantras

- Zero Mantra: Bring Home the Bacon
- First Mantra:  $Y$  is a Function of  $X$

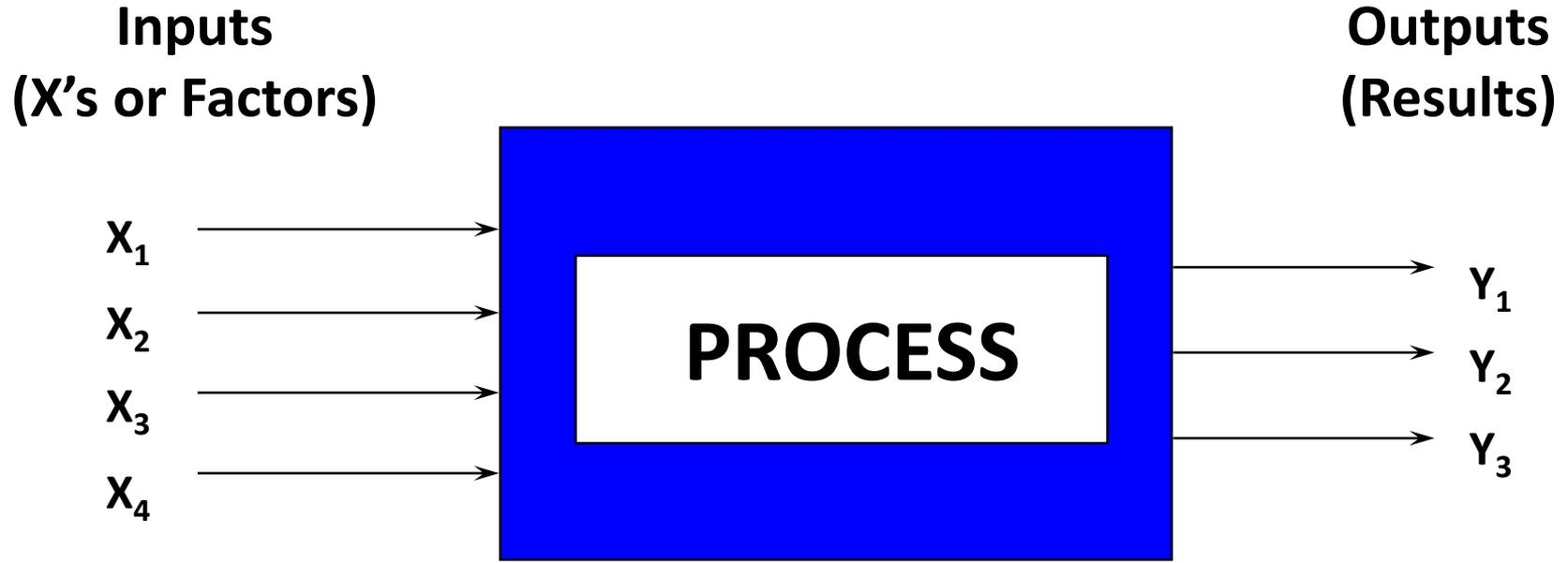


# The Six Sigma Approach

## *The Framework for Six Sigma*

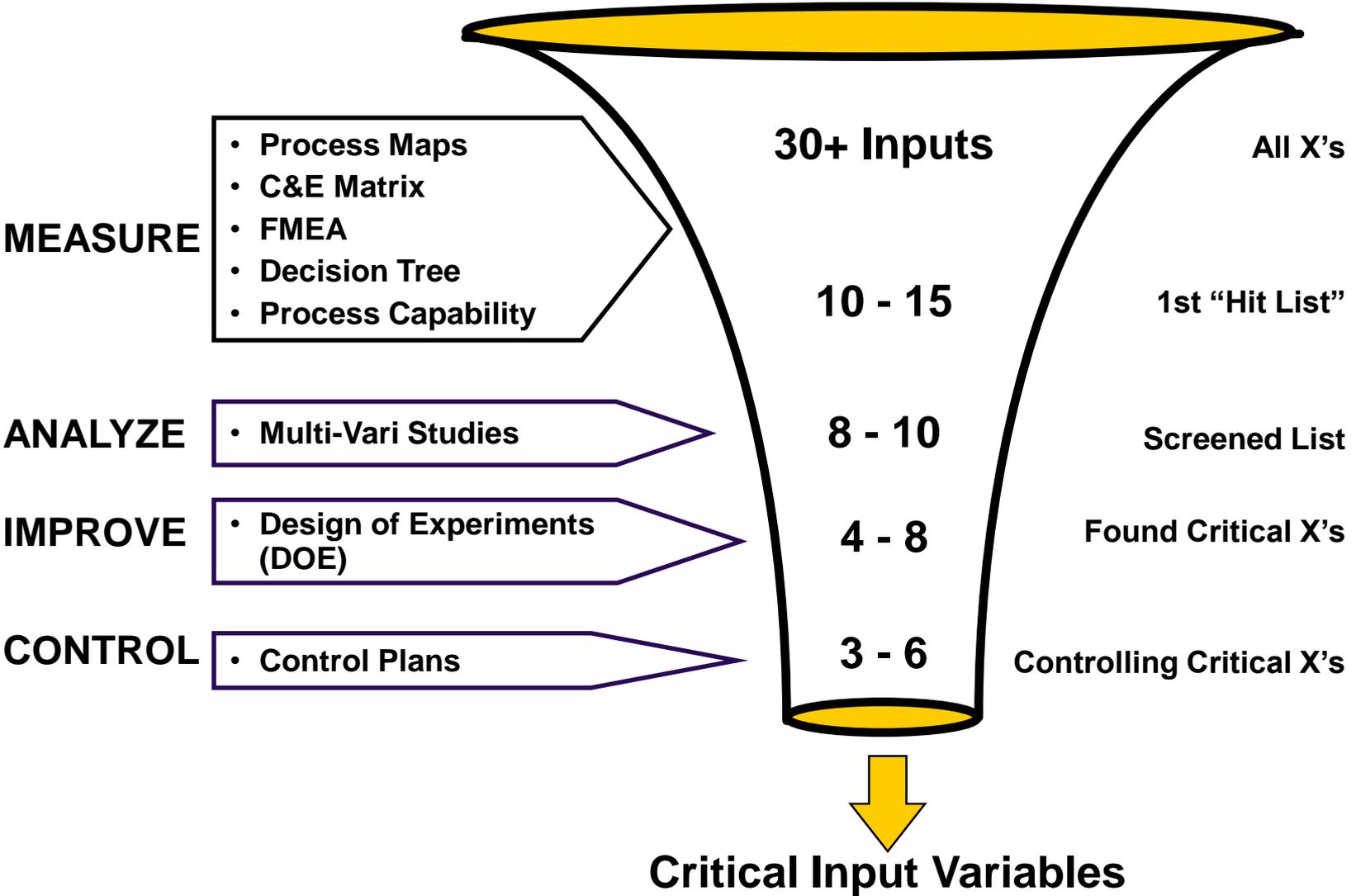
$$Y = f(X_1, X_2, X_3 \dots)$$

# The Six Sigma Approach



*Find and control the critical X's to control the Y's*

# The Funneling Effect



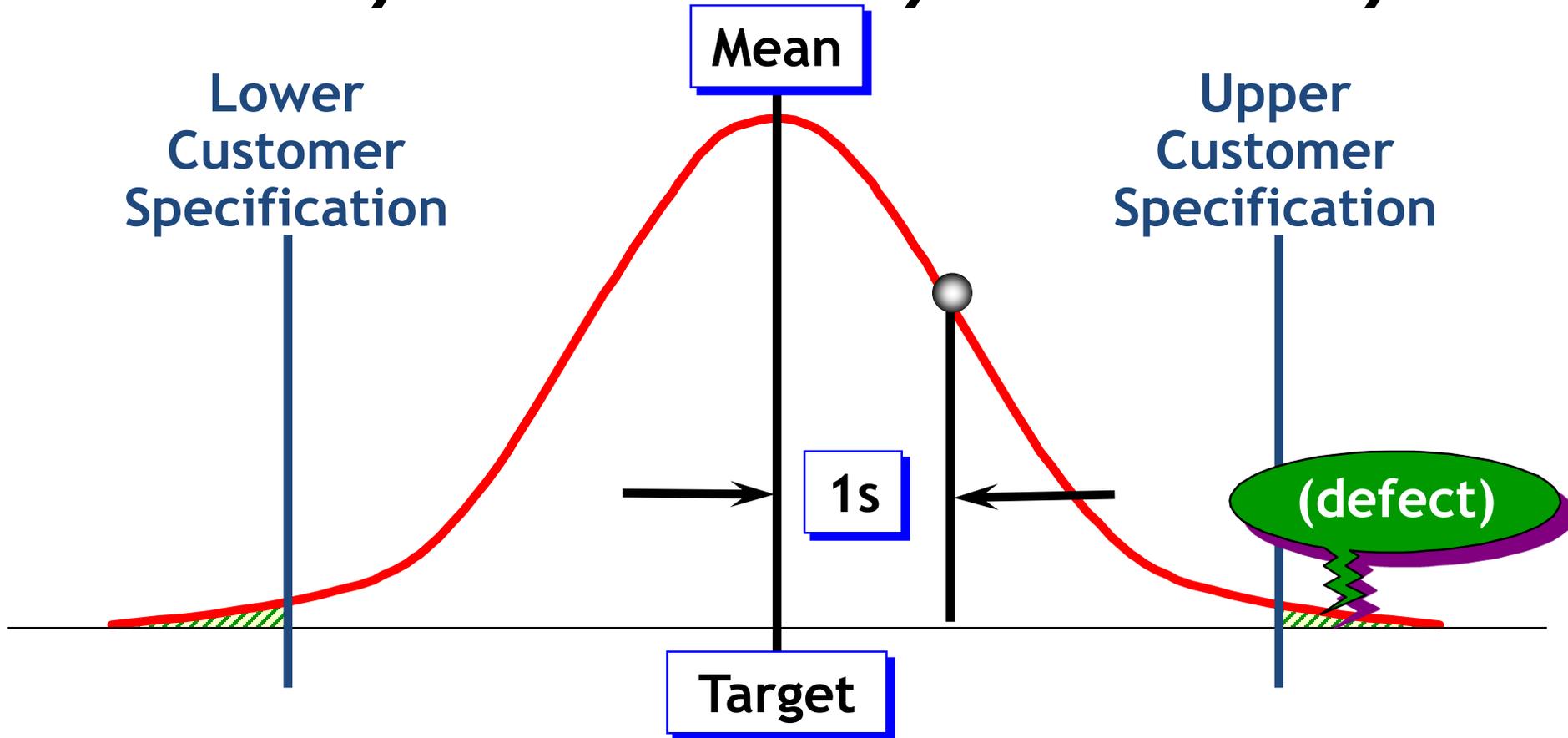
# Six Sigma Mantras

- Zero Mantra: Bring Home the Bacon
- First Mantra:  $Y$  is a Function of  $X$
- Second Mantra: Variation is Evil



# Six Sigma as a Concept

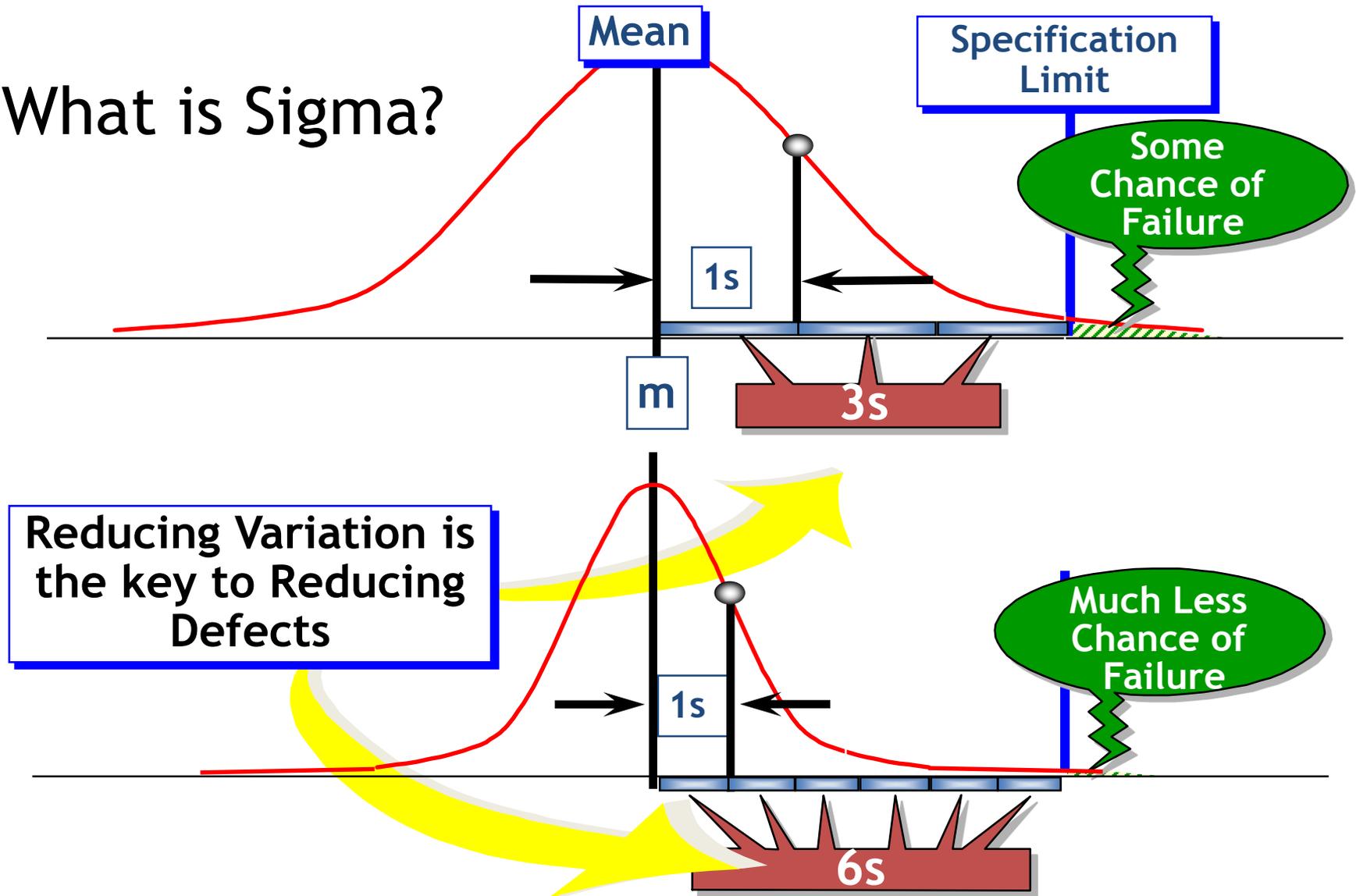
***Every Business Activity Has Variability...***



***Reducing variability is the essence of Six Sigma***

# Six Sigma as a Concept

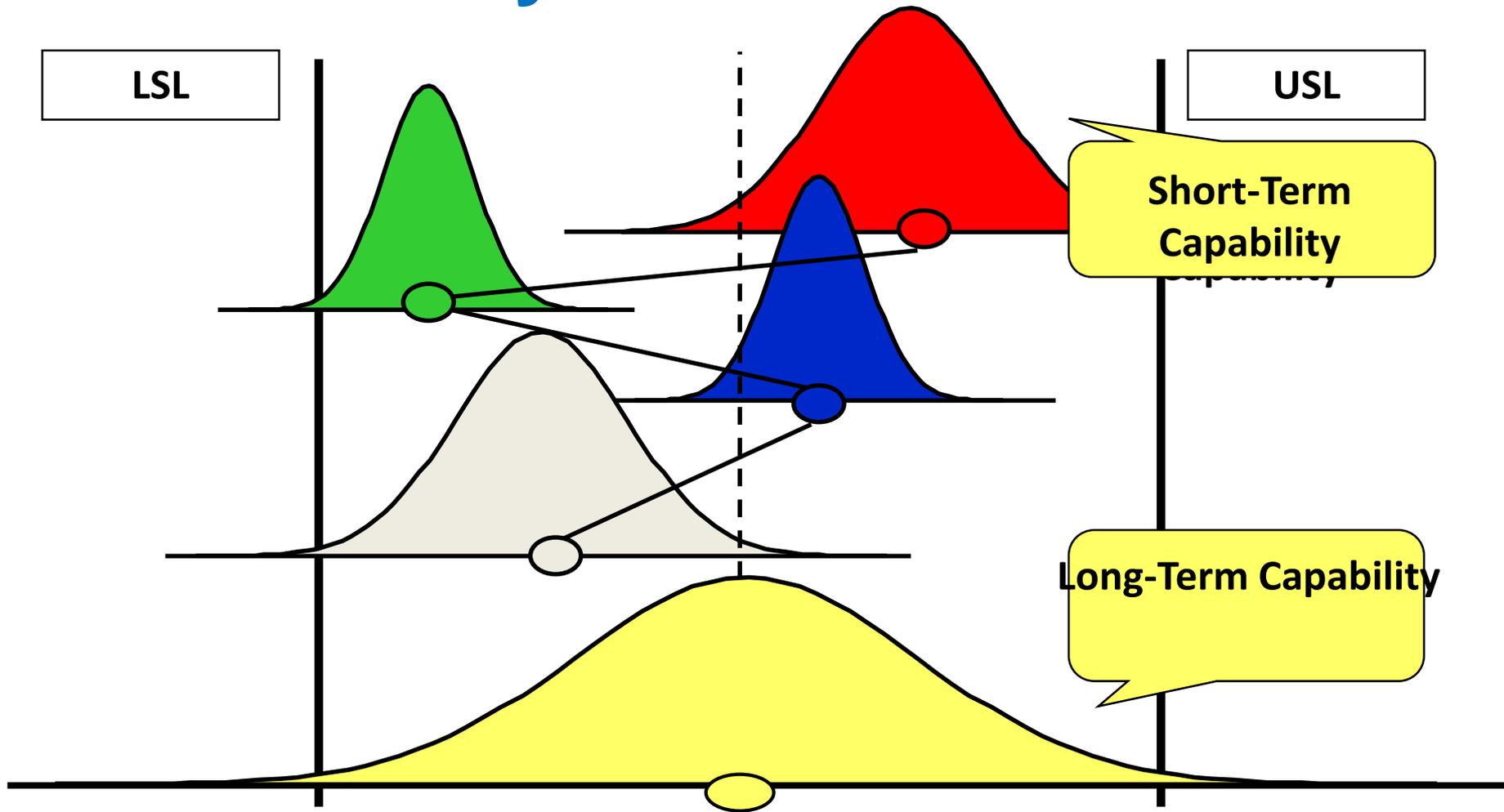
What is Sigma?



# Six Sigma Mantras

- Zero Mantra: Bring Home the Bacon
- First Mantra:  $Y$  is a Function of  $X$
- Second Mantra: Variation is Evil
- Third Mantra: Shift Happens!

# The Dynamic Process



# Week One Review

- Project Charter
- Operational Definitions
- SIPOC
- Process Mapping
- Baseline Data

# Statistical Process Control (SPC)

- Statistical process control (SPC) is a philosophy focusing on optimizing continuous improvement by using statistical tools for analyzing data, making inferences about process behavior, and then making decisions
- SPC leaves the variations from common causes to chance, and instead focuses on identifying and eliminating special causes
- SPC relies on evidence rather than intuition

# Statistical Process Control (SPC)

## SPC Tools: Basic Quality Tools:

- Flow charts
- Run charts
- Pareto charts and analysis
- Fishbone diagrams
- Histograms
- Scatter diagrams

**These tools will be covered this week!**

## SPC Methods

- Control charts
- Process-capability analysis

## Advanced Statistical Analysis Methods

- Regression
- Hypothesis testing
- Design of experiments
- Analysis of variance

**Questions?**

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