

# **Value Enhancement *Strategies***

*Presents*

**Managements' Role in  
Reducing Process Variation:  
*from*  
Concept of Variation to  
Six Sigma Performance**

***April 25, 2009***

## ➔ Value Enhancement Strategies, LLC. *(7 years)*

- ❑ Organizational Development
- ❑ Team Development
- ❑ Lean Six Sigma

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

- ❑ General Manager
- ❑ Corporate Director Quality & Improvement Initiatives:
  - TQM, CTR, SQI, Lean, Six Sigma & ISO9000
- ❑ Plant Manager
- ❑ QA Manager, Production Manager, Assembler

## ➔ Education, Certifications

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

## ➔ American Society for Quality

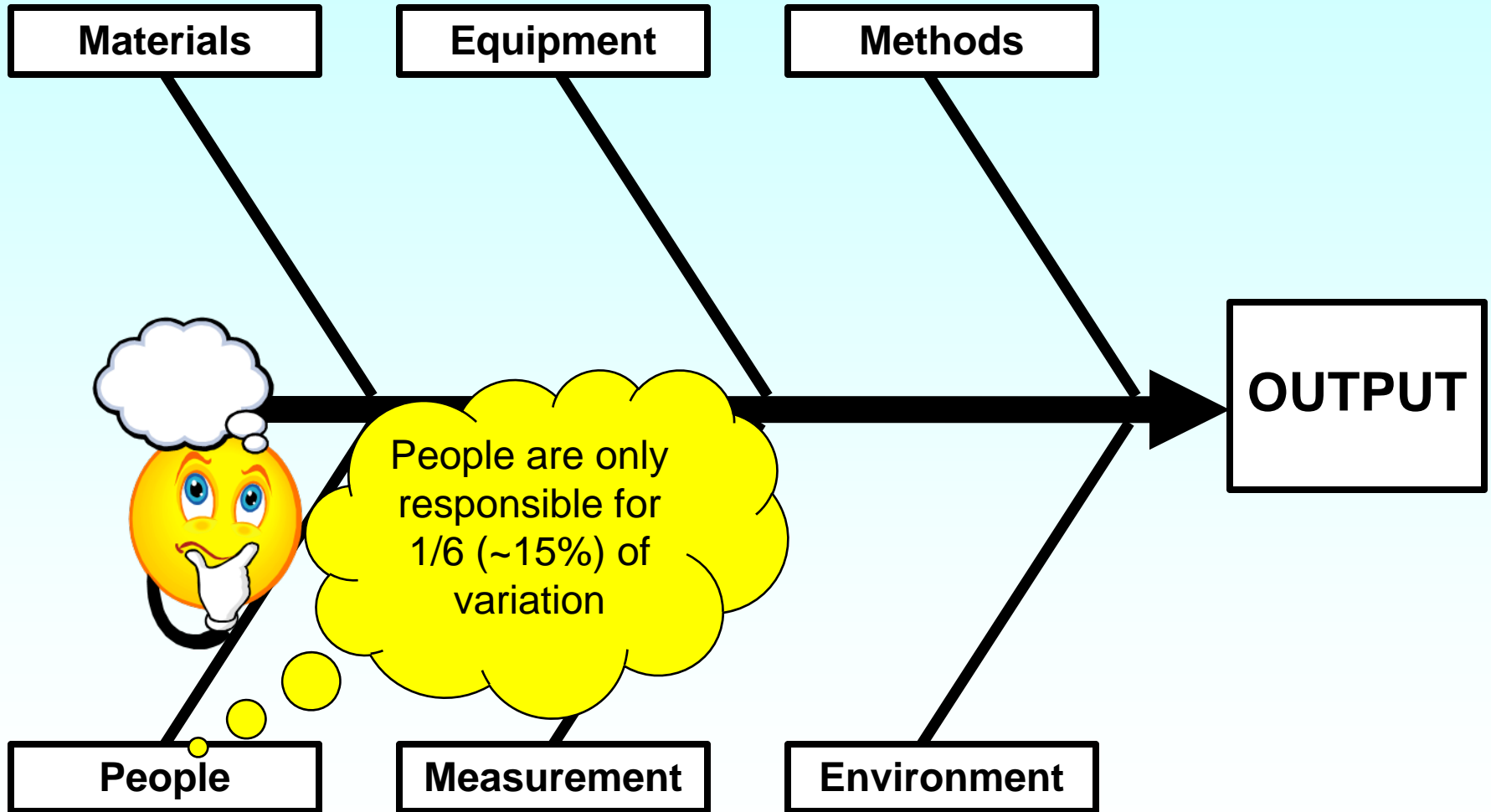
- ❑ Senior Member (joined 1983)
- ❑ Co-founder Section 1528 in Ocala, FL
- ❑ Southwest Florida Section Chair (2005-2008)
- ❑ CMQ/OE, CSSBB, CQE, CQA
- ❑ [www.asq1530.org](http://www.asq1530.org)

# Concept of Variation

# Basic Premise of Continuous Improvement

- ➔ Everything with an output is a process
- ➔ Processes consist of numerous inputs
- ➔ Each input contains variation
- ➔ Outputs contain variation
- ➔ Must monitor & minimize variation
- ➔ Statistical Process Control is used to understand input & output variation
- ➔ Allows for improved decision making

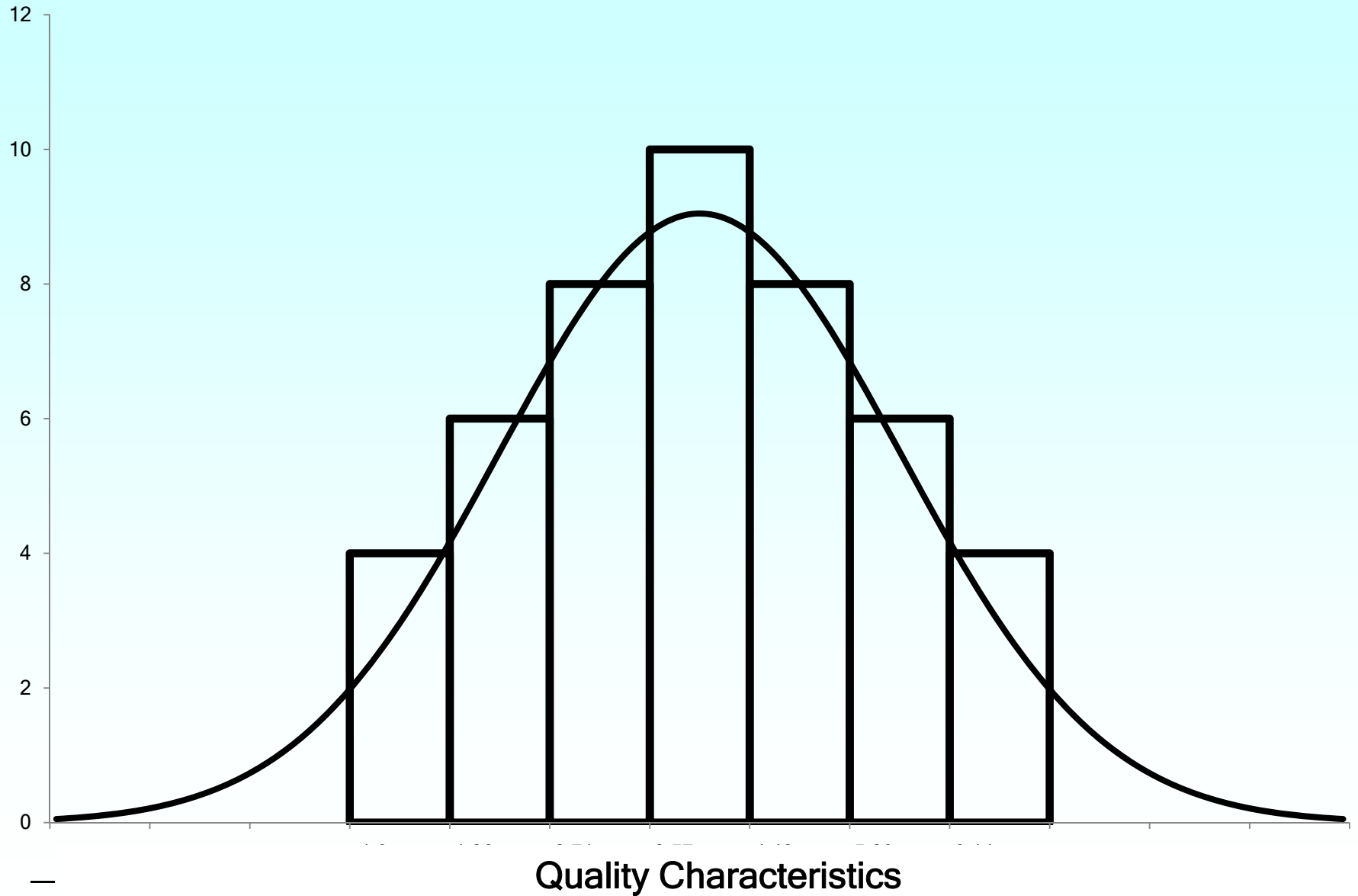
# Processes Consist Of...



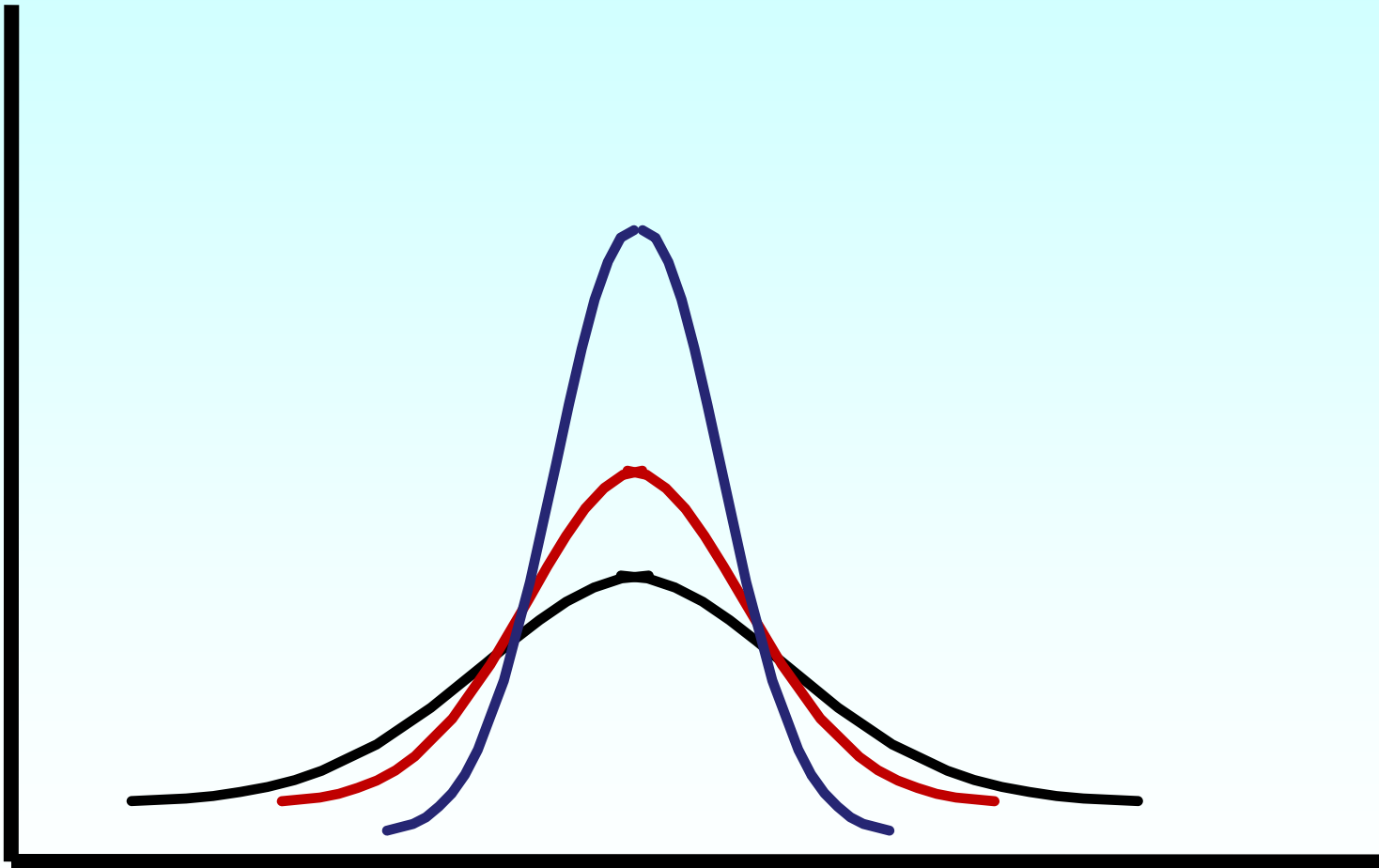
# Control of Quality = Control of Variation



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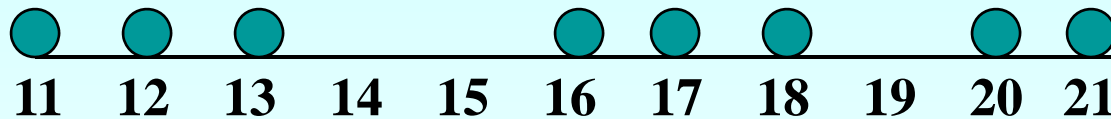


# Infinite Normal Distributions Exist



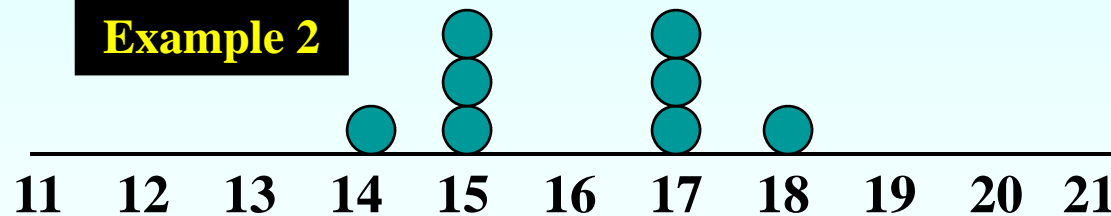
# Impact of Process Dispersion

**Example 1**



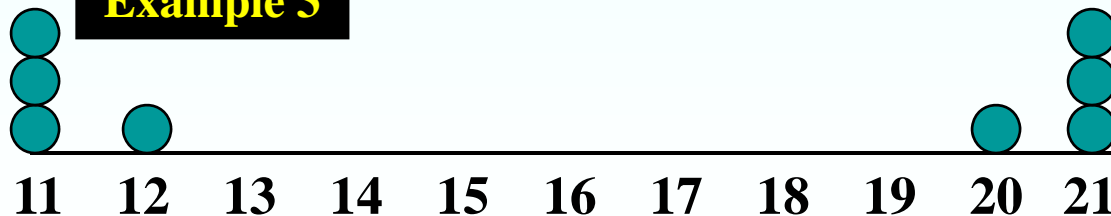
Mean = 16.0  
Std. Dev. = 3.70

**Example 2**



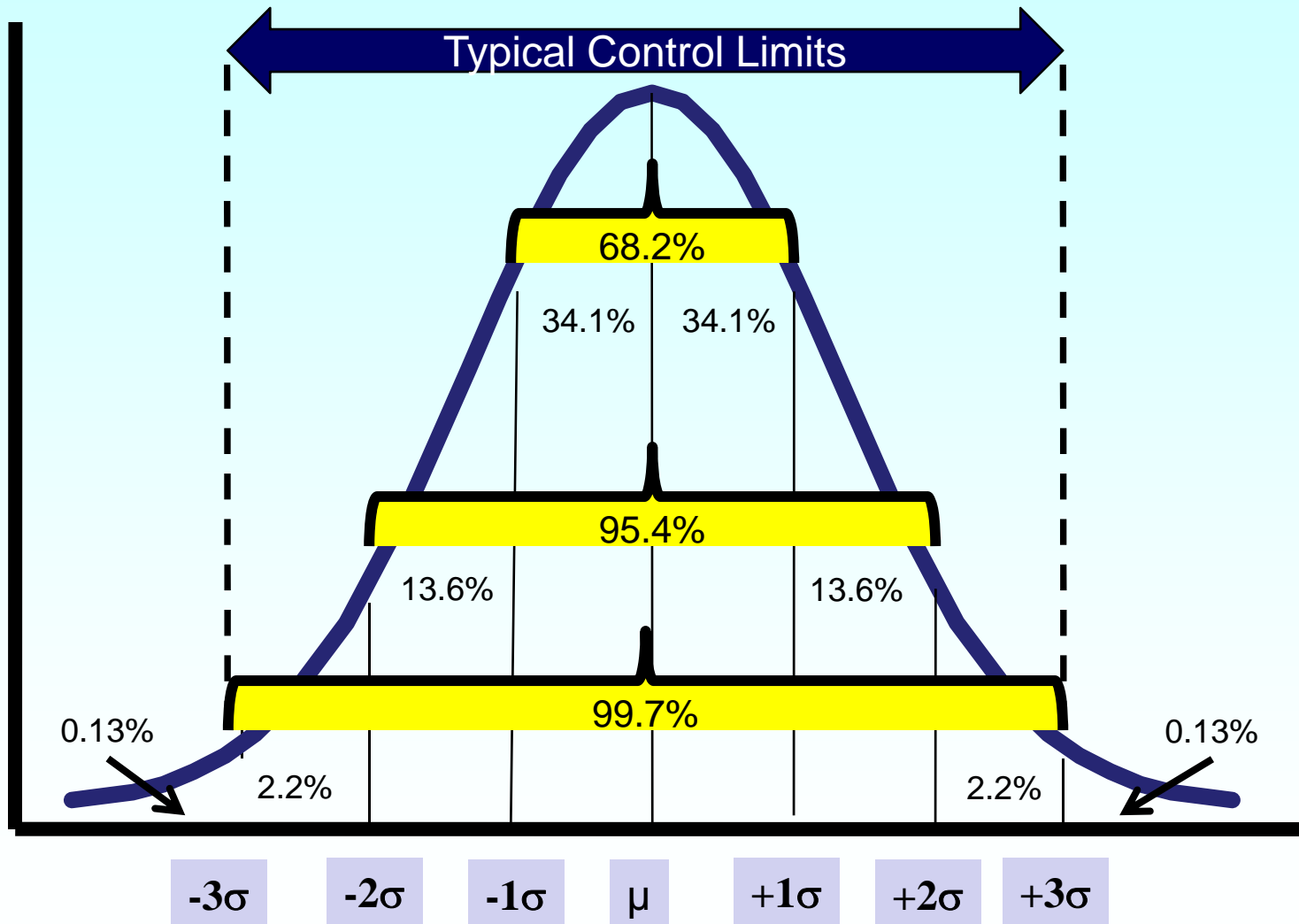
Mean = 16.0  
Std. Dev. = 1.41

**Example 3**

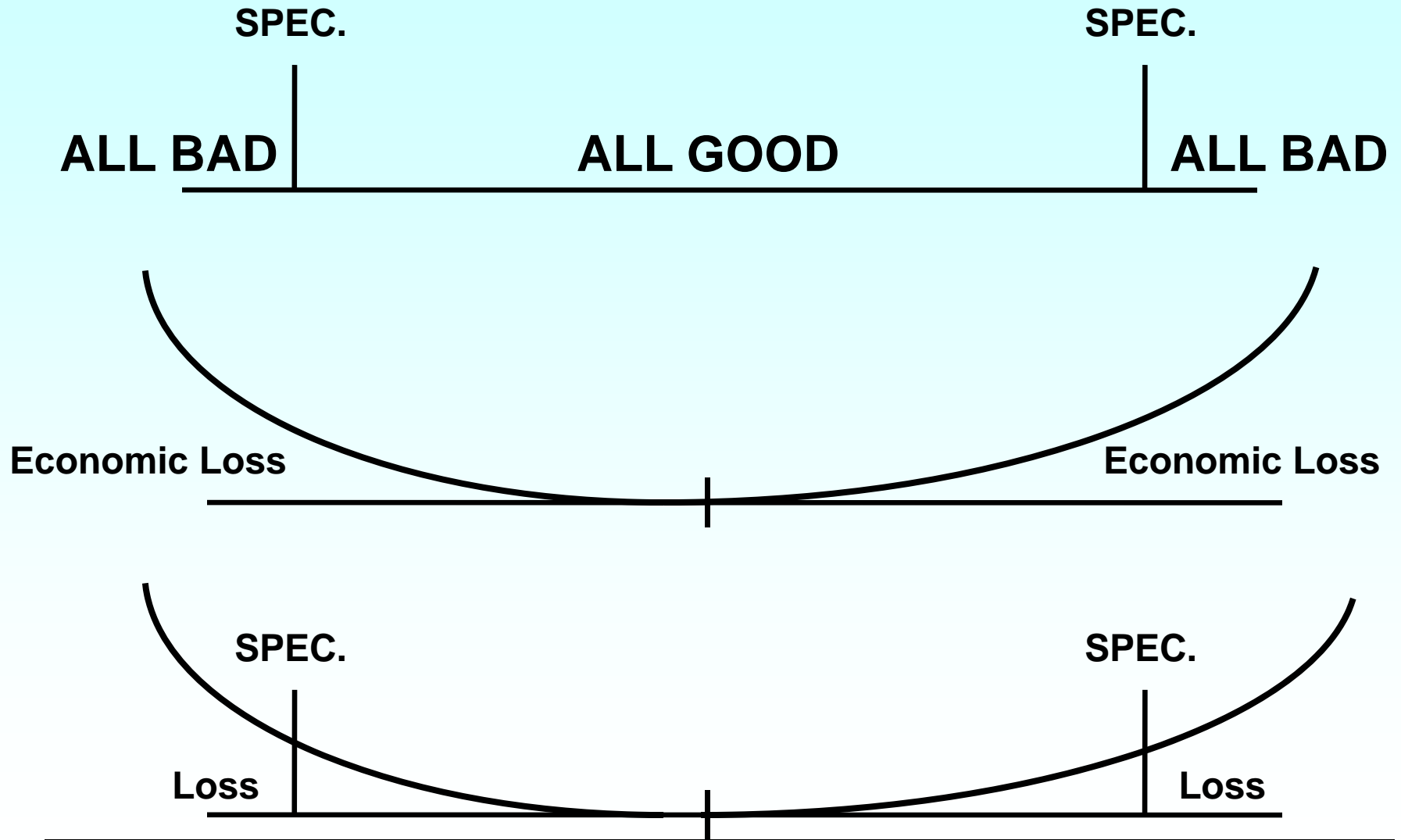


Mean = 16.0  
Std. Dev. = 5.10

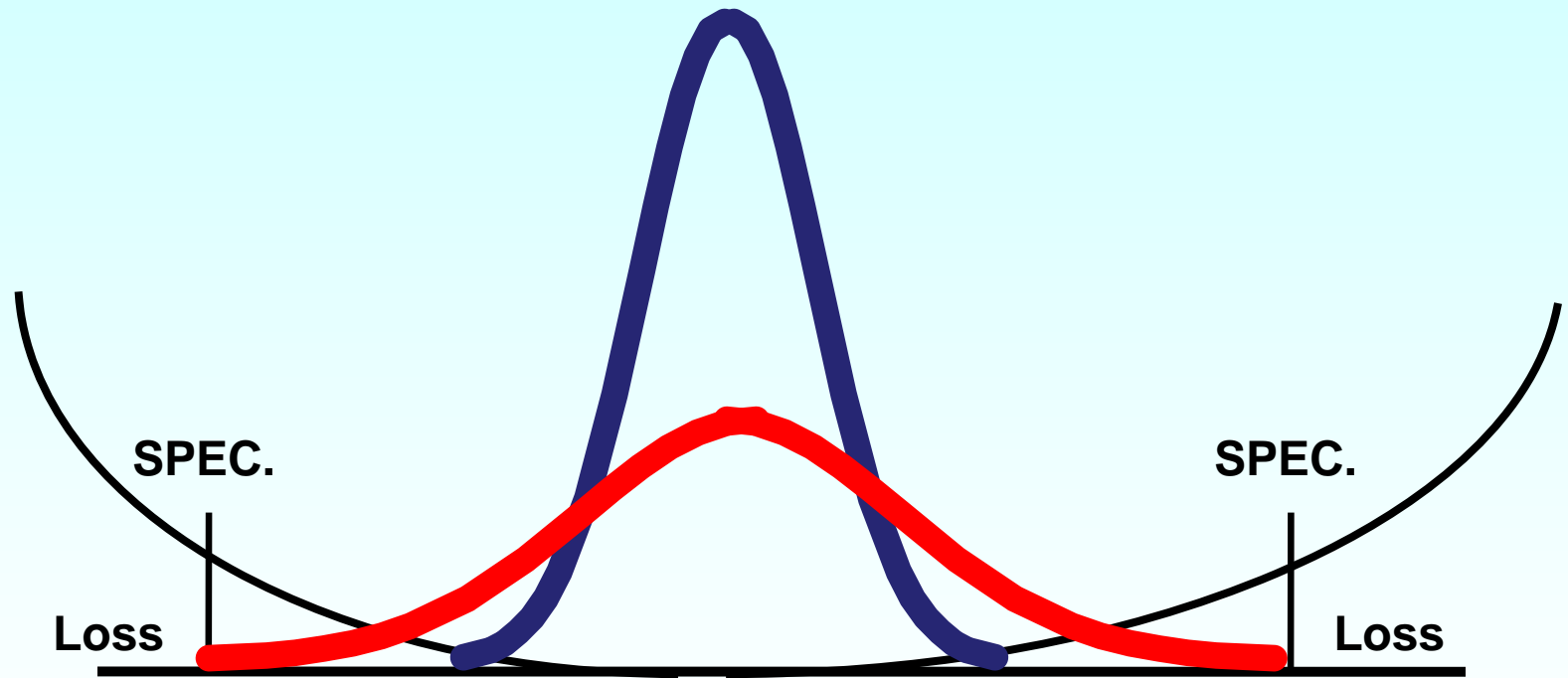
# Empirical Rule



# Economic Loss Function



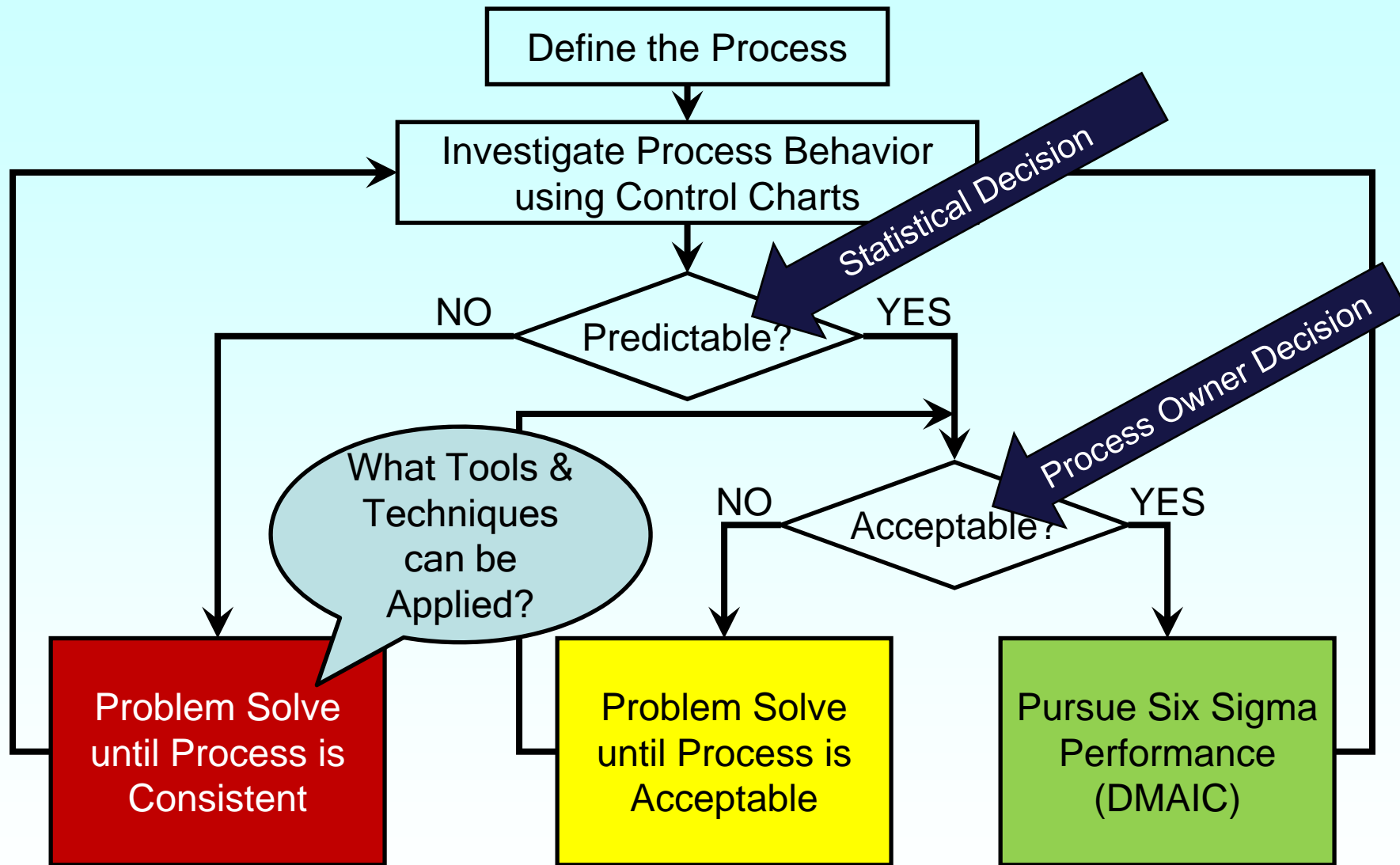
# Reducing Variation Reduces Loss



# Process Management

- 1) To produce products or services that are consistently the same over time
- 2) To produce products or services that meet or exceed customer expectations
- 3) To do this at the most economical cost

# Process Management



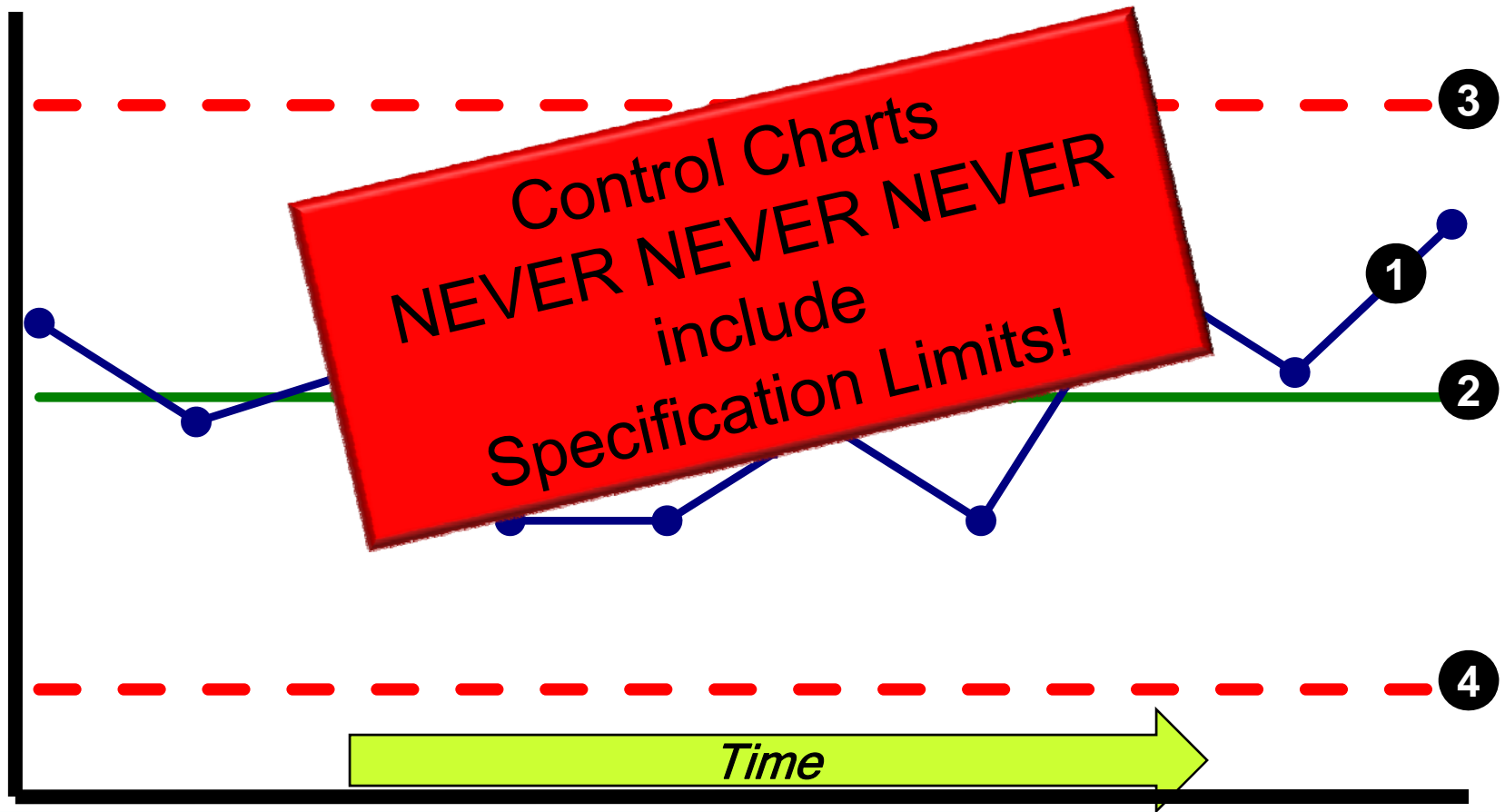
Statistical techniques include the...

- ➔ Collection
- ➔ Analysis
- ➔ Interpretation
- ➔ Presentation

...of Data

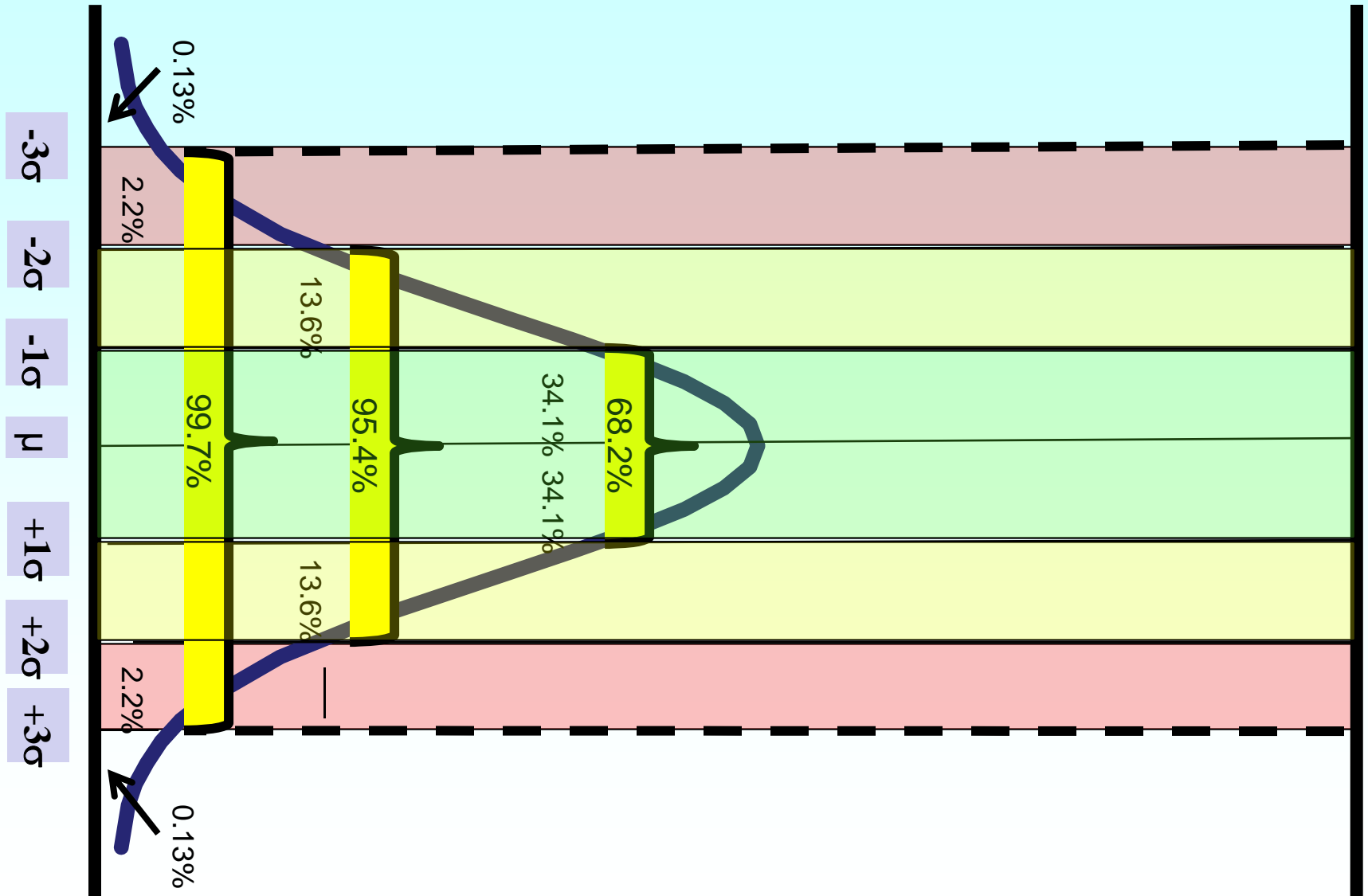
# Control Charts

*All Control Charts have 4 Key Components*



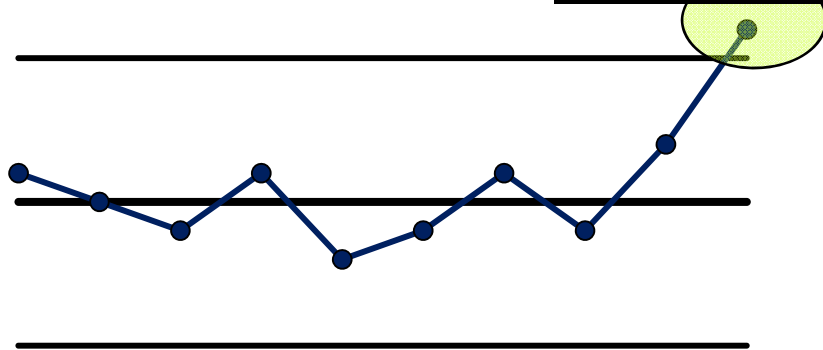
- ① Data points    ② Centerline    ③ Upper Control Limit    ④ Lower Control Limit

# Correlating Process Distribution to Control Charts

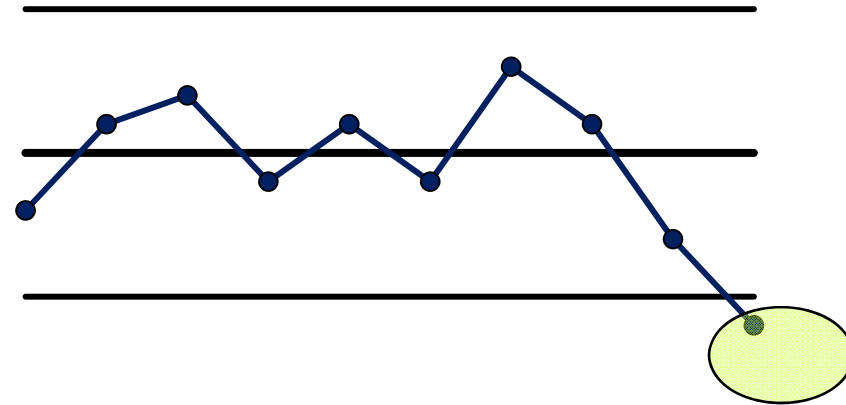


# Are Your Control Charts Predictable?

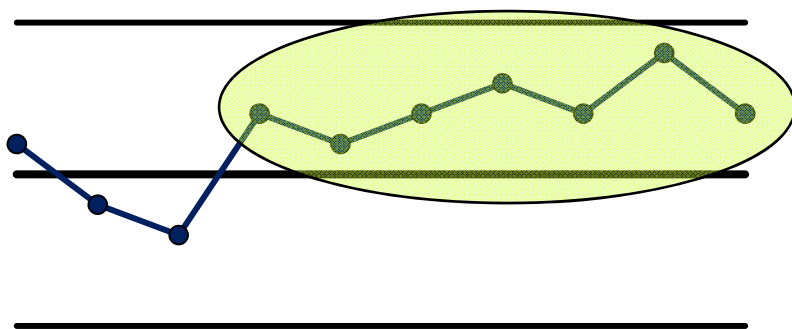
## 1) Point on or outside control limits



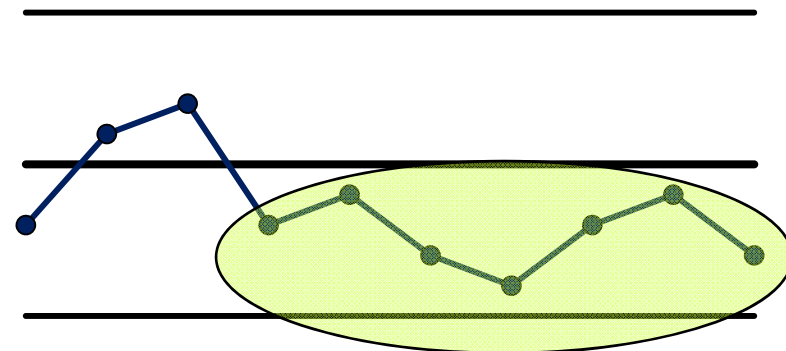
UCL  
C/L  
LCL



## 2) SHIFTS: Seven consecutive points above or below center line

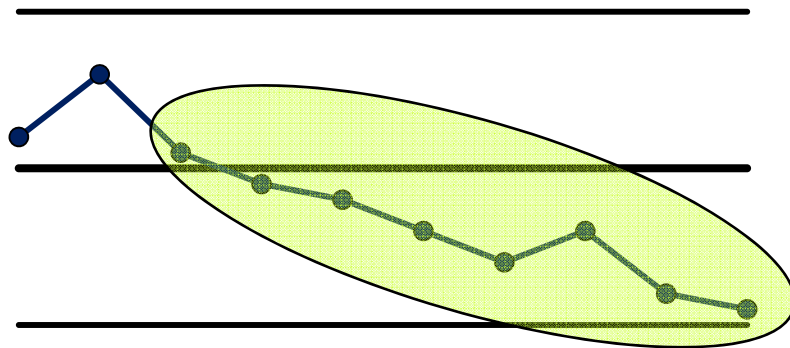


UCL  
C/L  
LCL



# Are Your Control Charts Predictable? (cont.)

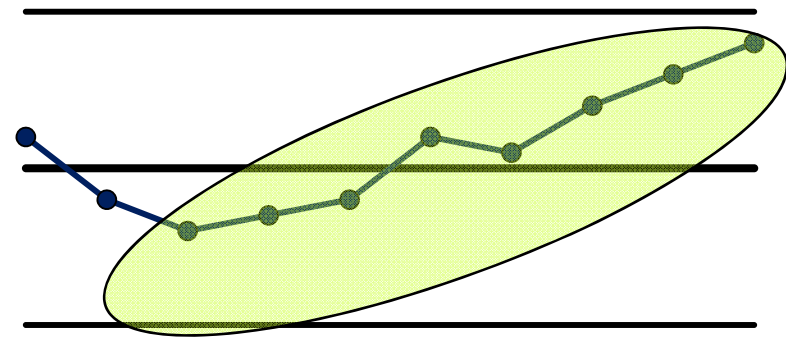
## 3) TRENDS: 7+ Consecutive Points with Obvious Directional Movement



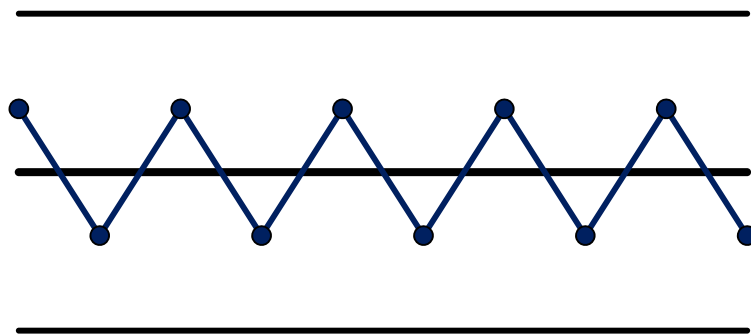
UCL

C/L

LCL



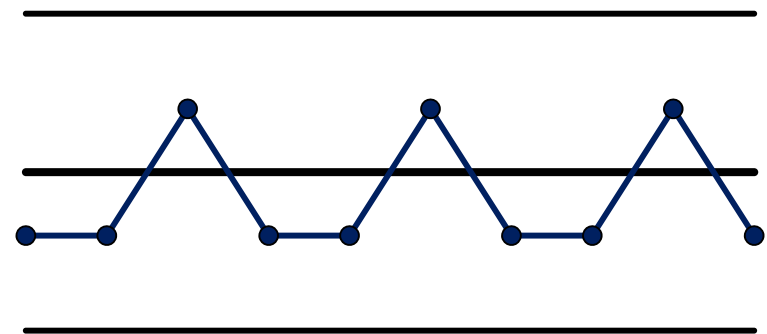
## 4) PATTERNS: Non-random data points



UCL

C/L

LCL



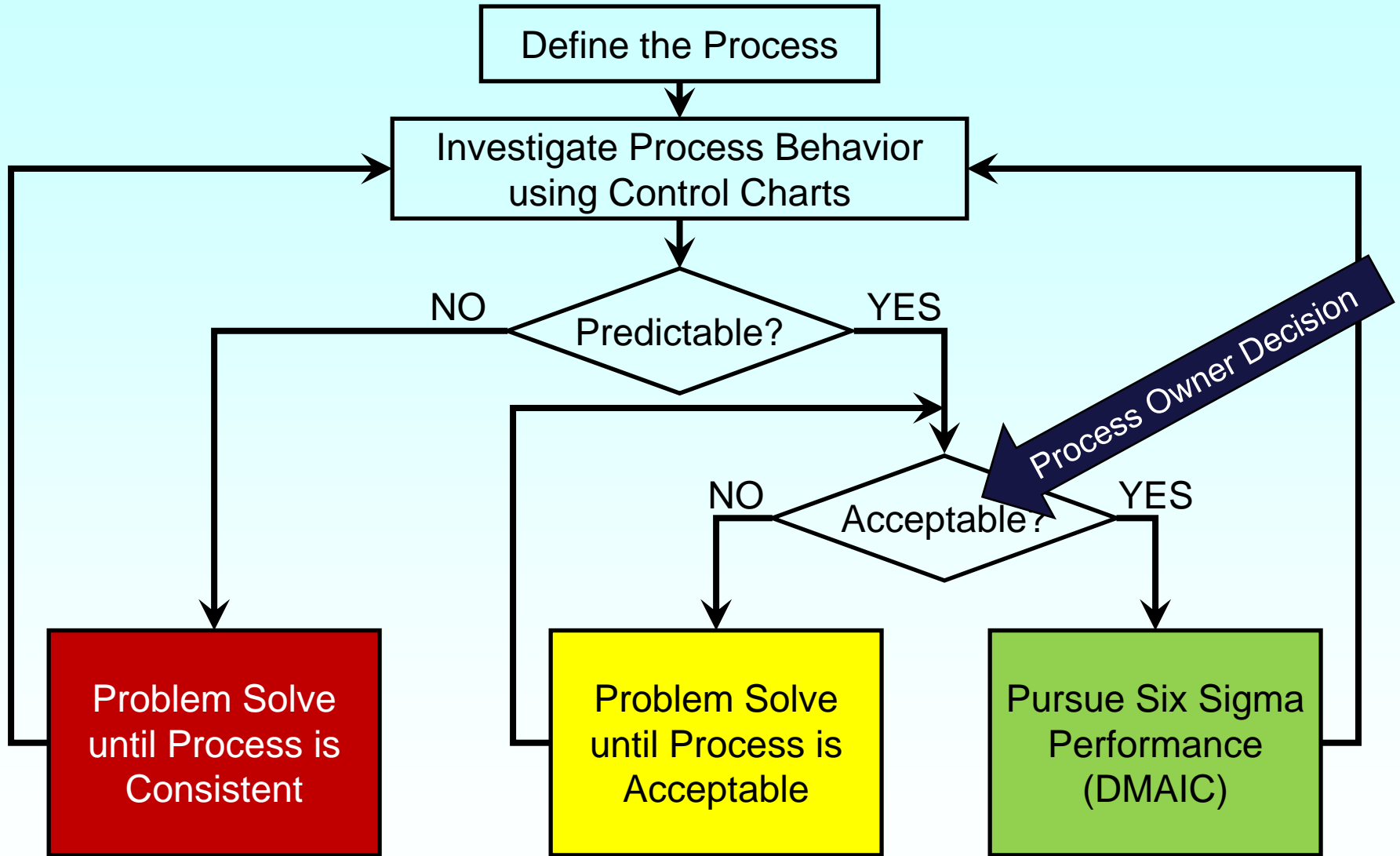
## The “No Green Bead” Company

*Start-up company with goal of manufacturing no green beads*

- ➔ Equipment: Rectangular wood box
- ➔ Material: Multi-colored beads
- ➔ People: Operators manufacturing colored beads
- ➔ Method: Manufacture 100 beads using bead box
- ➔ Measurement: Inspector counts # green beads
- ➔ Environment: Training room conditions

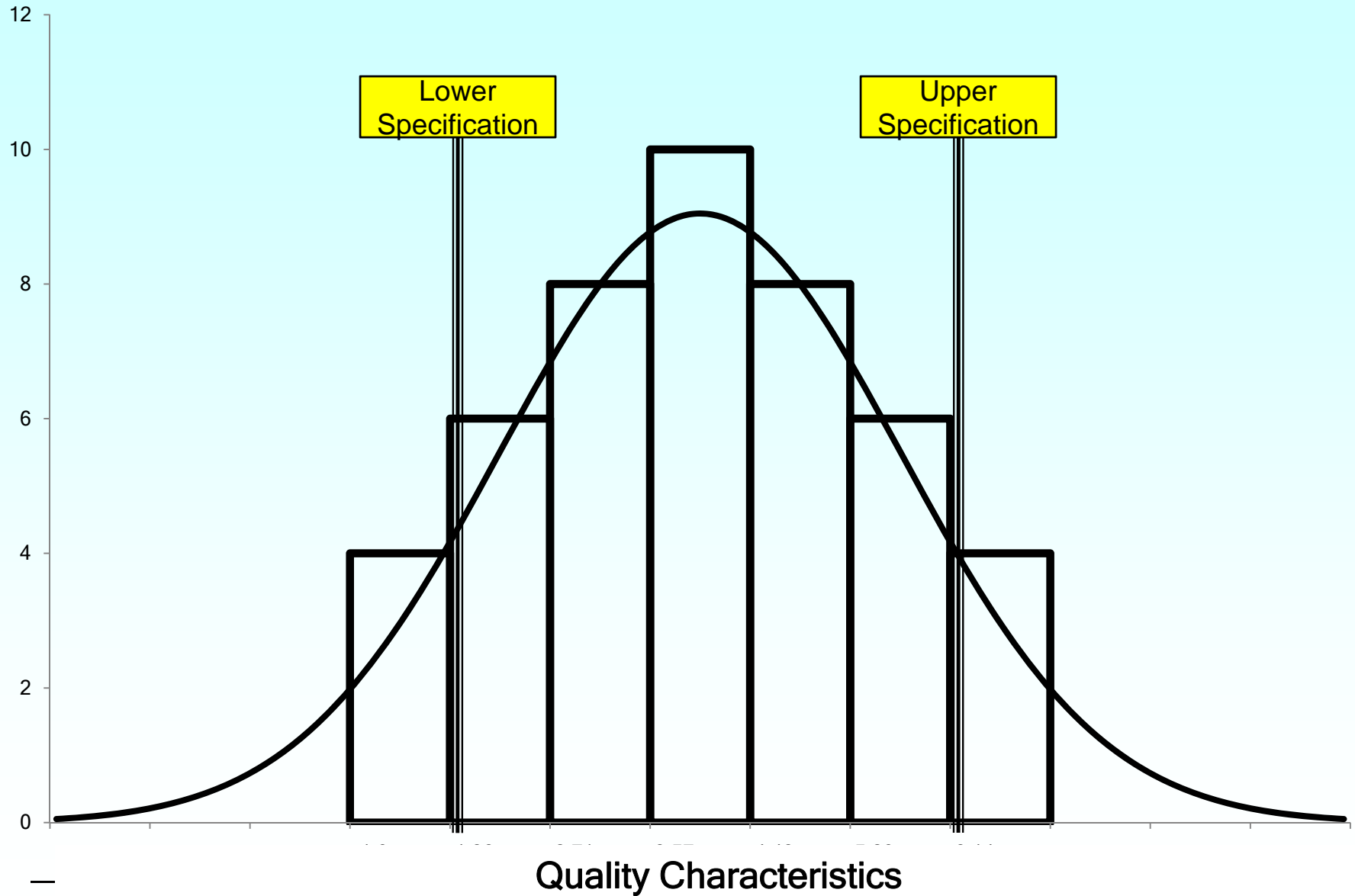
# Process Capability

# Process Management

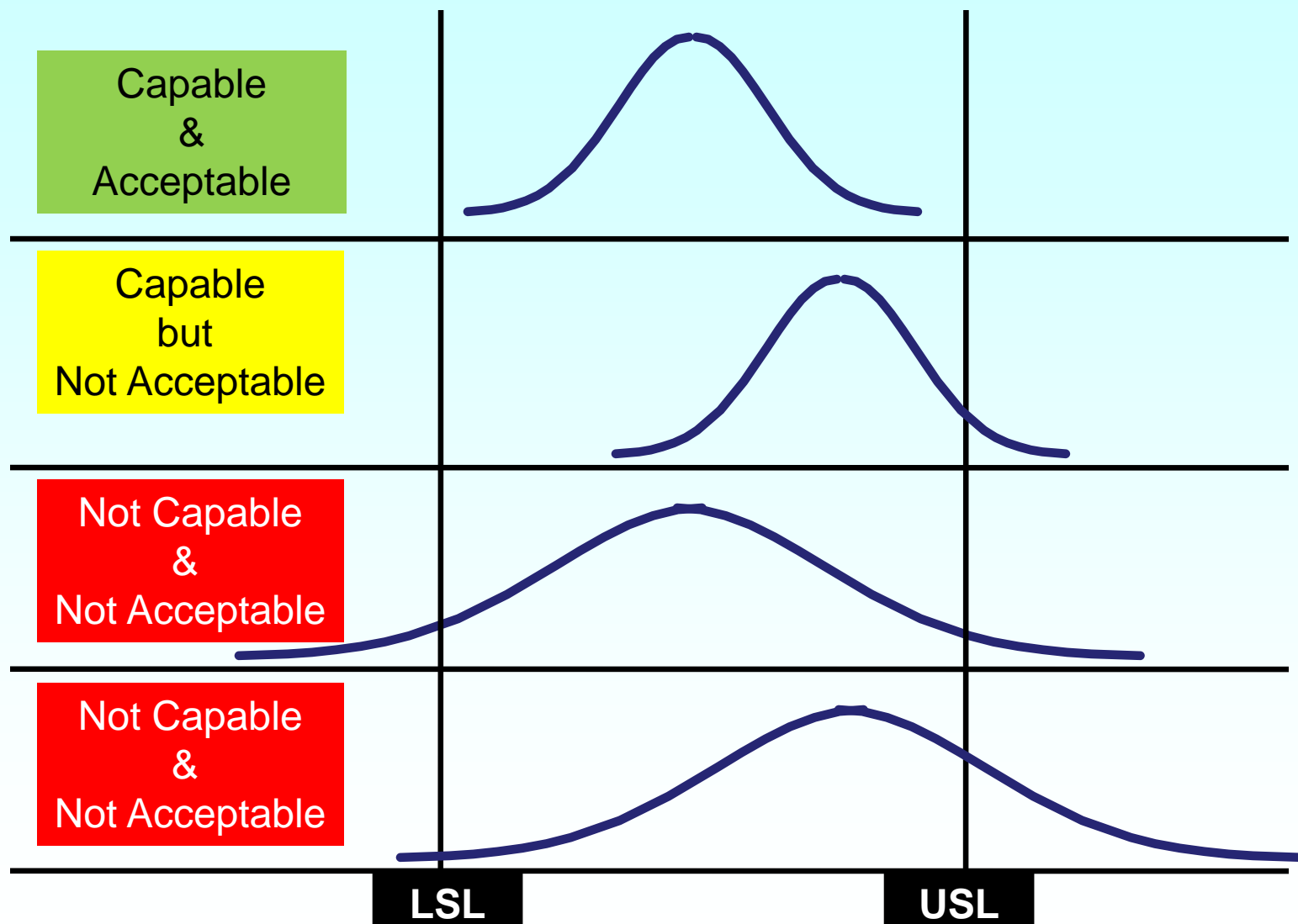


- ➔ Compares natural variability of a consistent process to internal/external customer specifications
- ➔ Determines the ability of a process to be centered between specifications with room to spare
- ➔ Uses information from control charts and histograms
- ➔ Control charts only identify consistency over time
  - ▣ Do not identify if process is conforming to requirements
- ➔ Less variation = Higher capability

# Control of Quality = Control of Variation



# Process Capability Overview

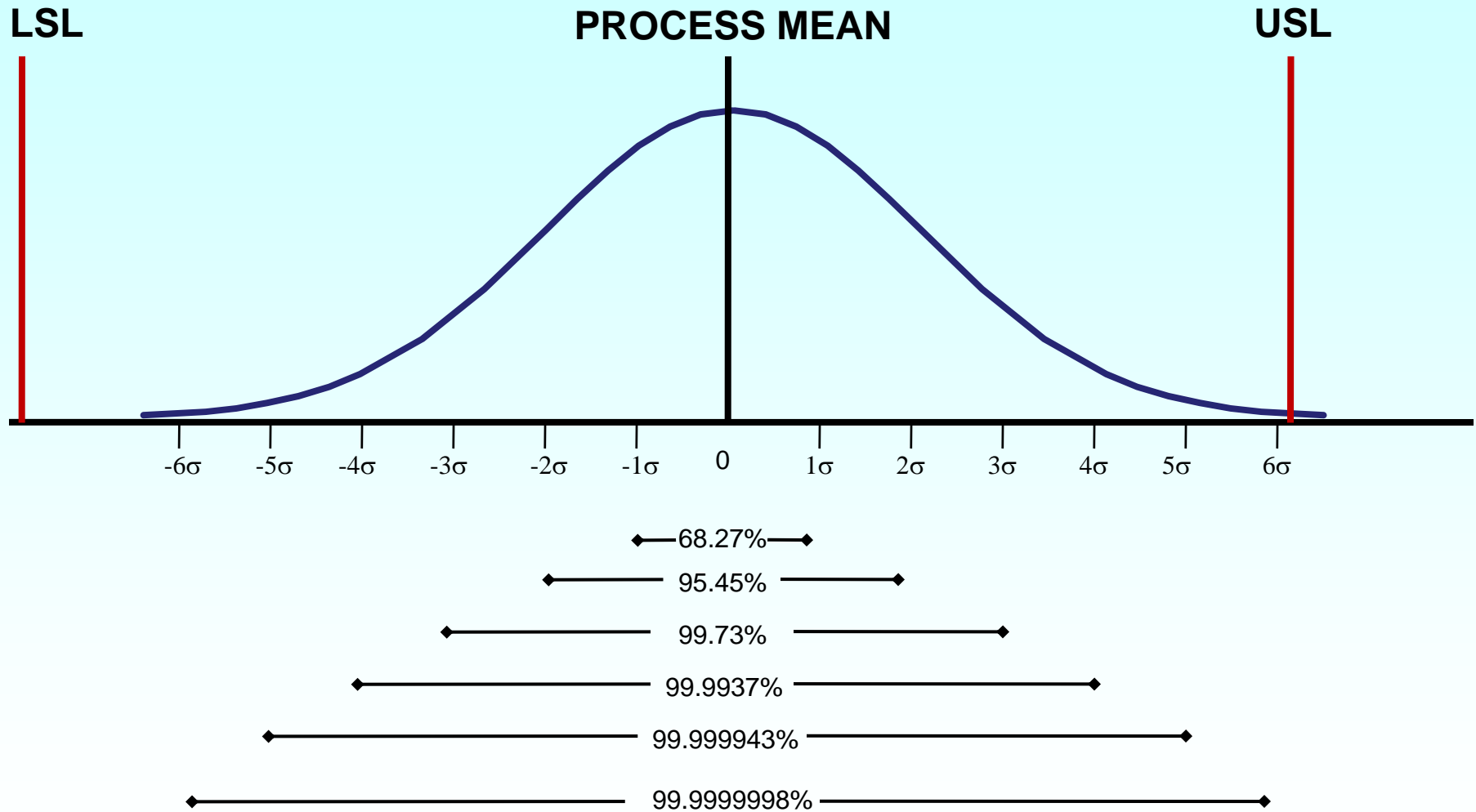


# Six Sigma

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

*Number of standard deviations  
(ideally six)  
between the center  
of the process  
and the  
closest specification limit*

# Predictability of the Normal Curve



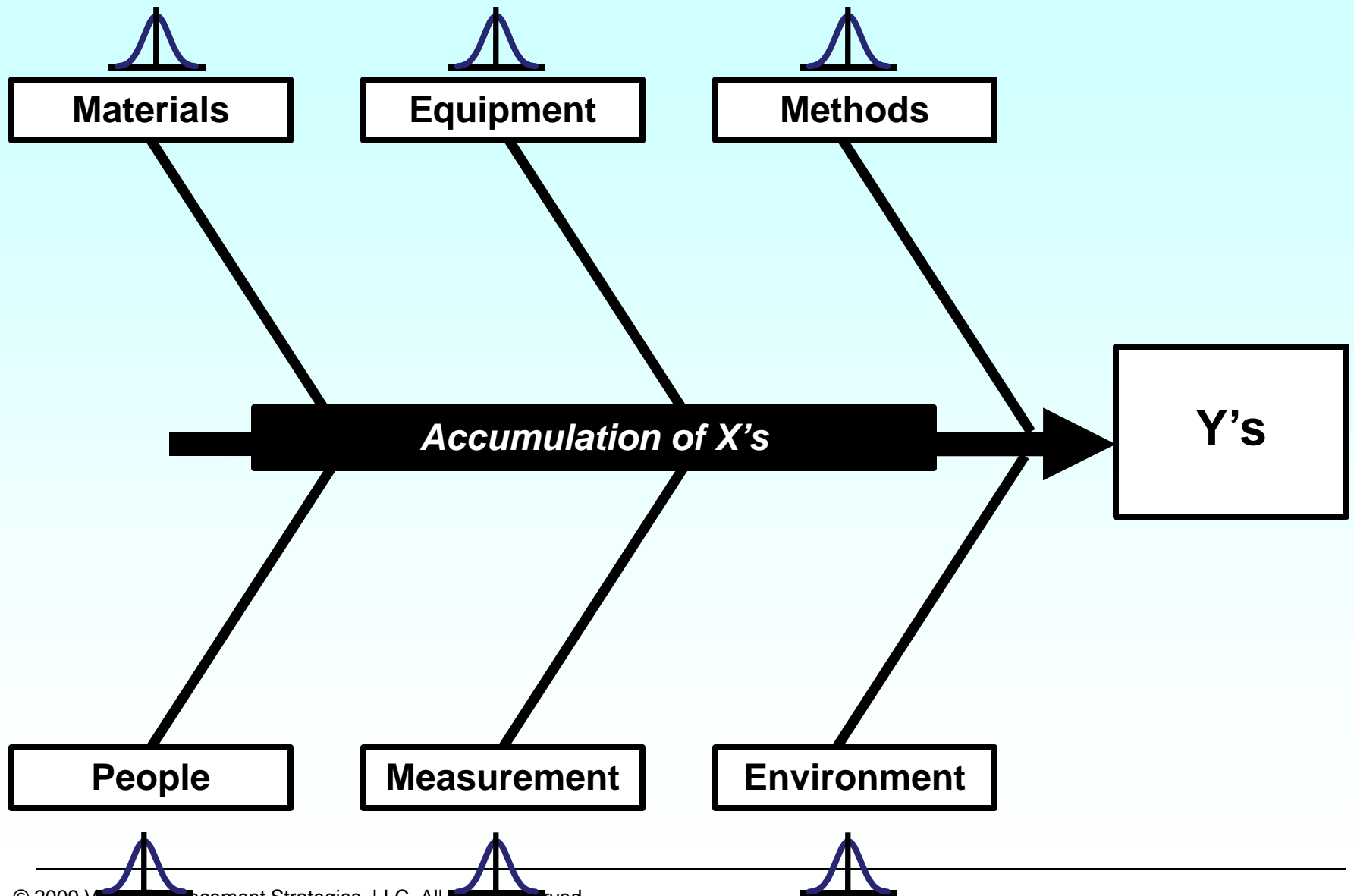
# What Do Sigma Levels Equate To?

Sigma Level	Defects Per Million Opportunities	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%

$$Y = f(x)$$

- ⇒ “Y” is the measurable output of the process
- ⇒ “Y” is dependent on the various inputs
- ⇒ “x” represents the various independent input variables
- ⇒ Allows for predicting future outputs from known inputs

# Processes Consist Of...



# $Y = f(X)$ Example

The Flavor of a Cup of Coffee is a function of:

Brew temperature, Water quality, Water quantity,  
Coffee type, Coffee quantity, Filter type...



# Structured Improvement Process

## ➔ Define

- ❑ Scope of improvement project & problem statement

## ➔ Measure

- ❑ Understand process flow & collect relevant data

## ➔ Analyze

- ❑ Identify root causes and confirm using data

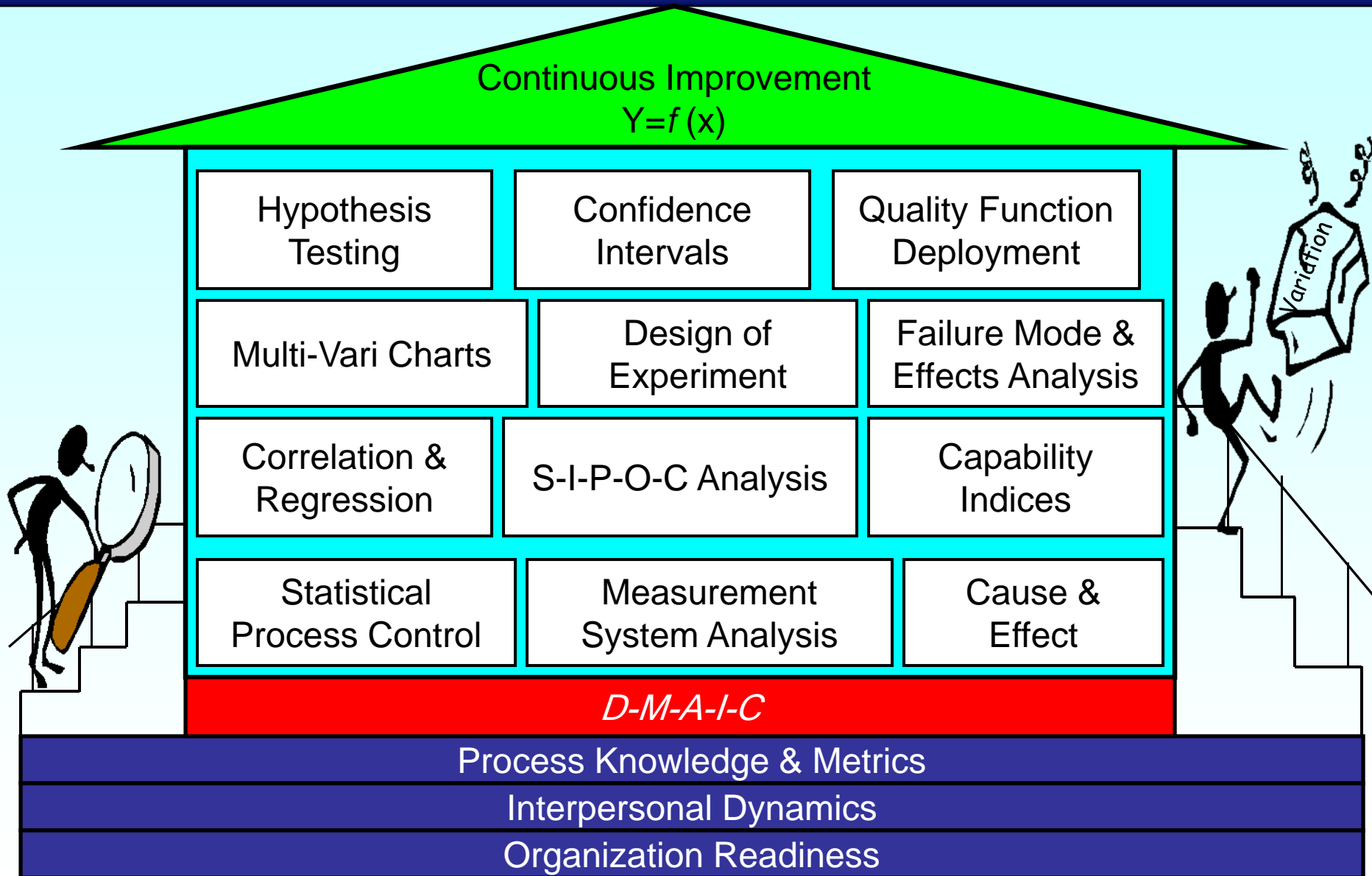
## ➔ Improve

- ❑ Develop and implement potential solutions. Evaluate results

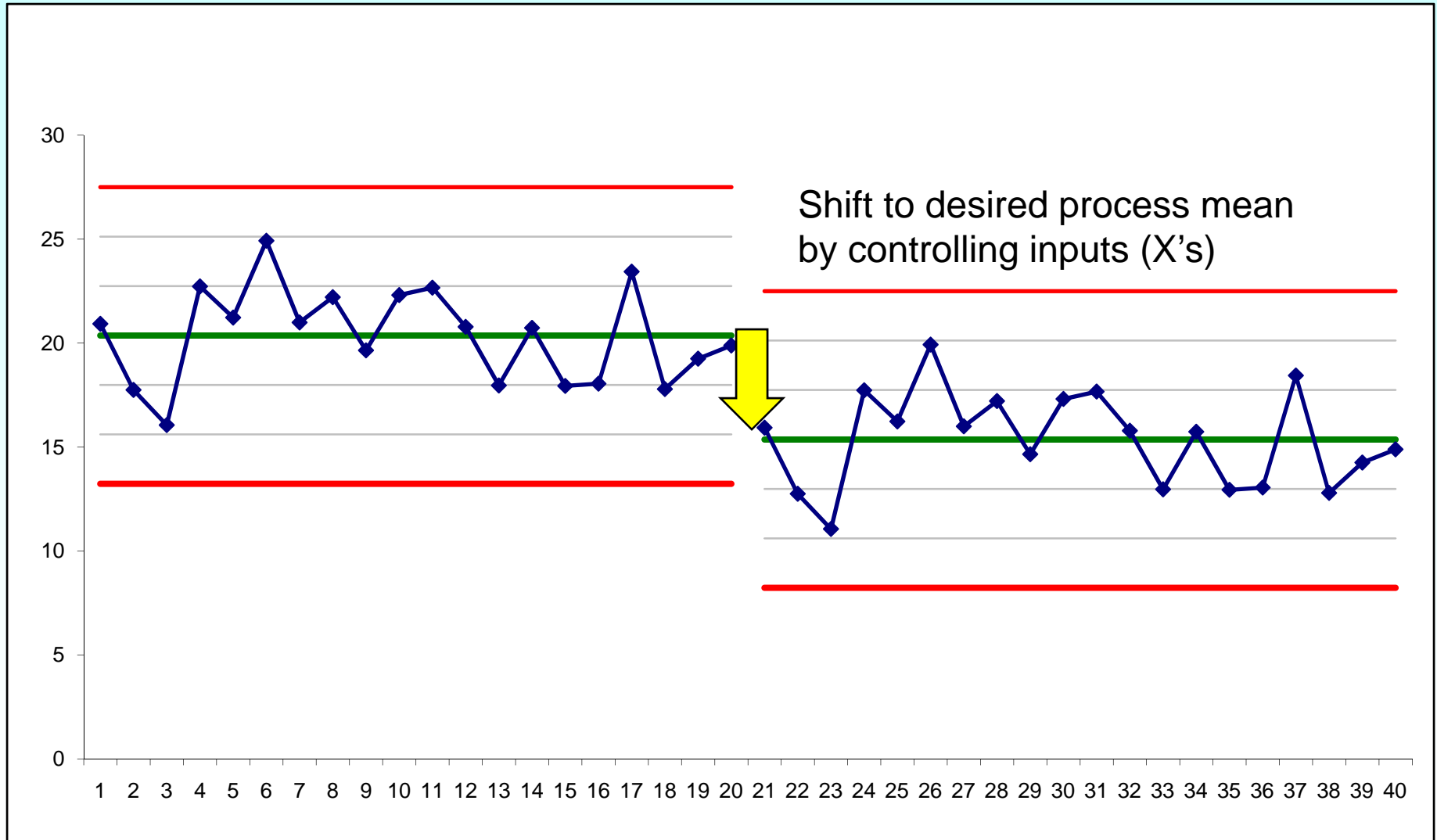
## ➔ Control

- ❑ Maintain the gains & change the system

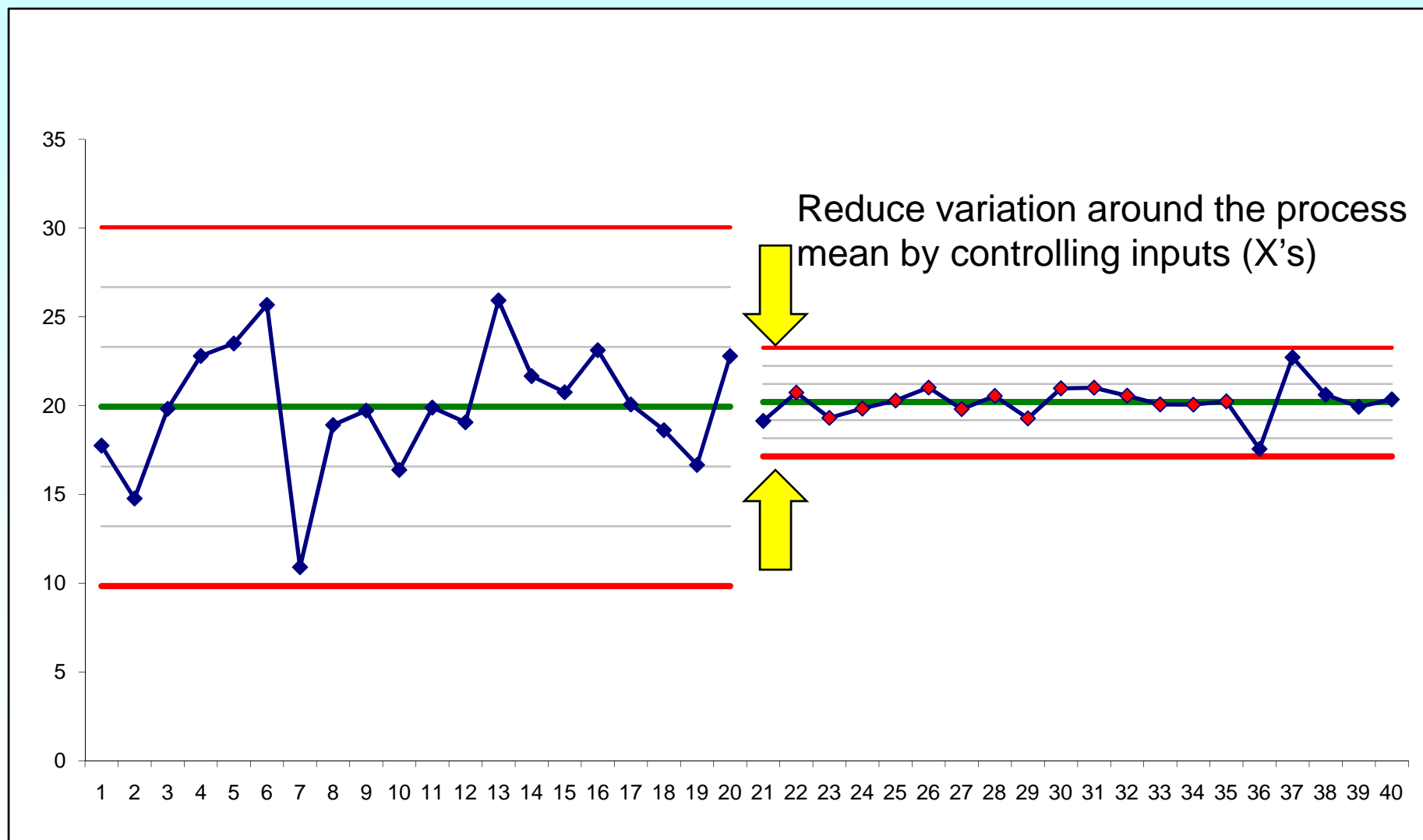
# Six Sigma Foundations



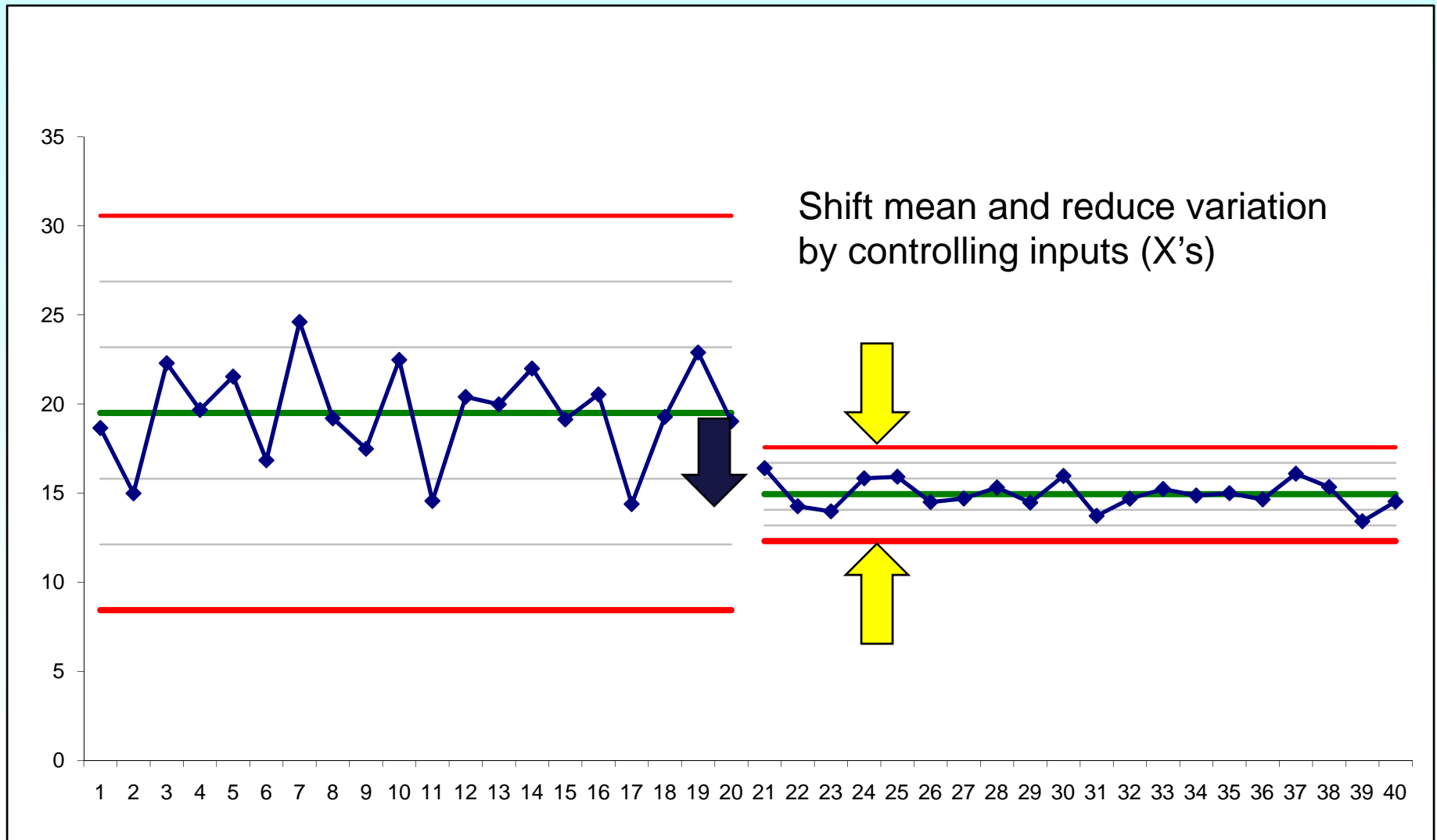
# Realizing Improvement: Targeting Process Mean



# Realizing Improvement: Reducing Process Variation



# Realizing Improvement: Targeting & Reducing



## ➔ Focus

- ❑ Creating Value
- ❑ Minimizing Variation

## ➔ Approach

- ❑ DMAIC

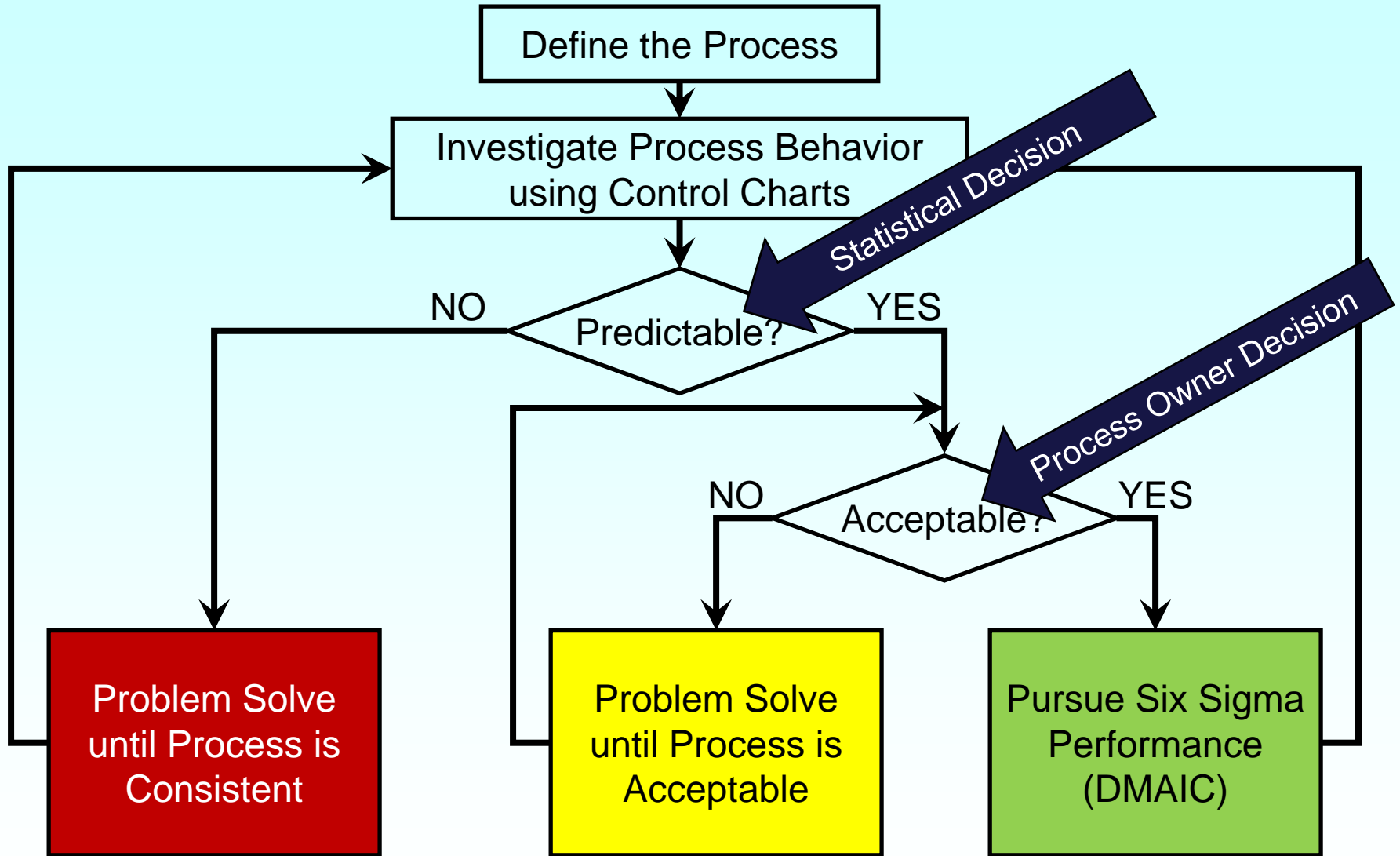
## ➔ Tools

- ❑ Classic Statistical

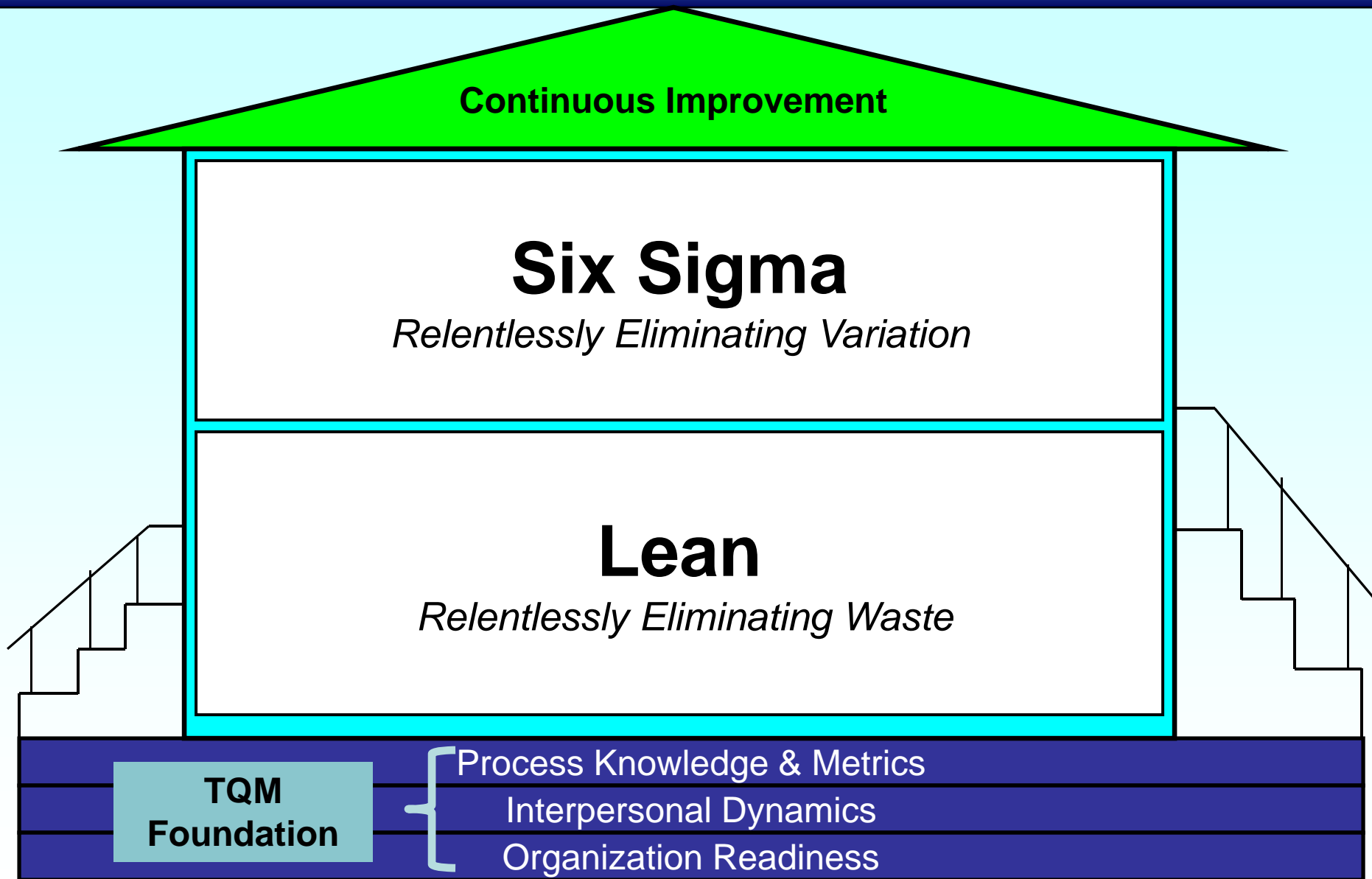
## ➔ Skills Required

- ❑ Highly Developed - Applying Statistical Concepts
- ❑ Hierarchical
- ❑ “Belt” Structure

# Process Management

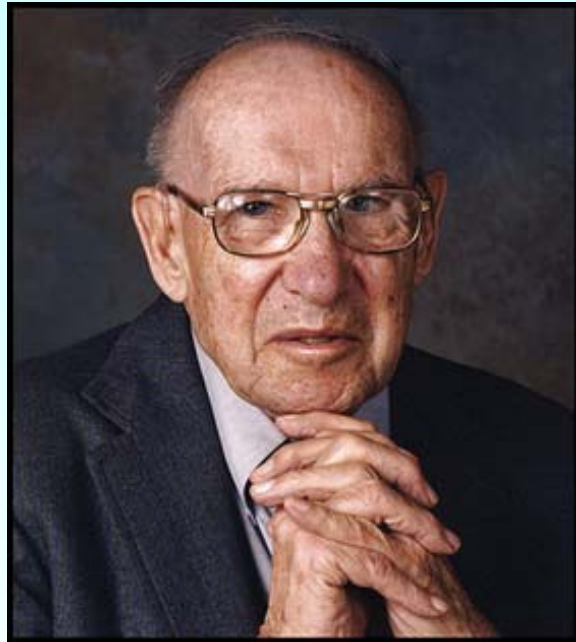


# Achieving Organizational Excellence



# Summarizing Managements' Role

- ➔ Understand the concept of variation and  $Y=f(x)$
- ➔ Reinforce understanding process stability before capability
- ➔ Clearly understand the difference between specification limits and control limits
- ➔ Drive centerline targeting and variation reduction
- ➔ Focus improvement efforts on the 85%
- ➔ Ensure proper culture & resources exist



“There is nothing so  
useless as doing  
efficiently that which  
should not be done  
at all.”

*Peter Drucker, American business philosopher and author,  
1909-2006*

# Thank You!

**Value  
Enhancement  
*Strategies***

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