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Lean and Six Sigma Overview

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

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Agenda

- What is Six Sigma
- What is Lean
- What is Lean Six Sigma
- What is a Kaizen
- What are Kaizen Events
- Green Belt Training Structure
- Lean Six Sigma Roles

Six Sigma

- Six Sigma is the Best of the Best
- Six Sigma:
 - Minimizing variation
 - Identifying and removing the causes of defects



Three Levels of Six Sigma

- Metric
- Methodology
- Management system

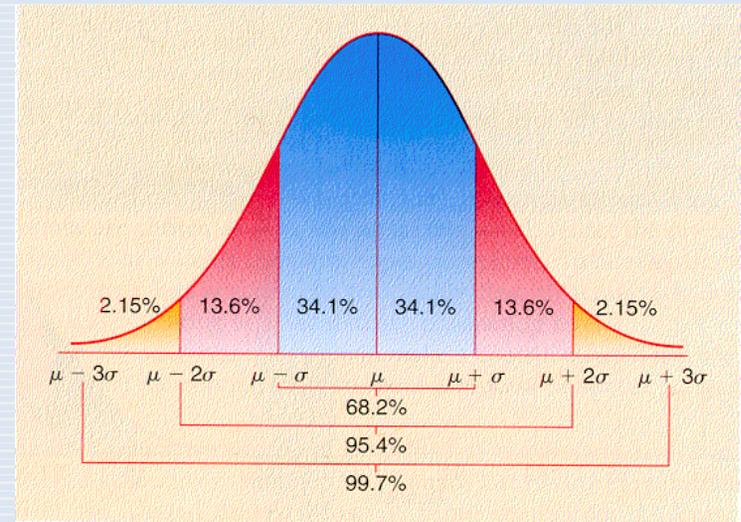
Six Sigma as a Metric

- Scale of quality Six Sigma equates to 3.4 defects per one million opportunities.

σ	DPMO
2	308,537
3	66,807
4	6,210
5	233
6	3.4

Six Sigma as a Metric

- A Six Sigma process is one in which 99.99966% of the products are statistically expected to be free of defects



Six Sigma Methodology

- Focused on Customer
- Data Analysis
- Minimize Variation
- Continuous Improvement
- DMAIC

DMAIC

DMAIC	
Define	Define the problem, clearly and related to customer
Measure	Measure what you care about, know your measure is good
Analyze	Look for root causes; generate a prioritized list of Xs
Improve	Installing the optimal solution and transitioning to process owner
Control	Ensure the problem doesn't come back – Sustain the Gain

Six Sigma Approach

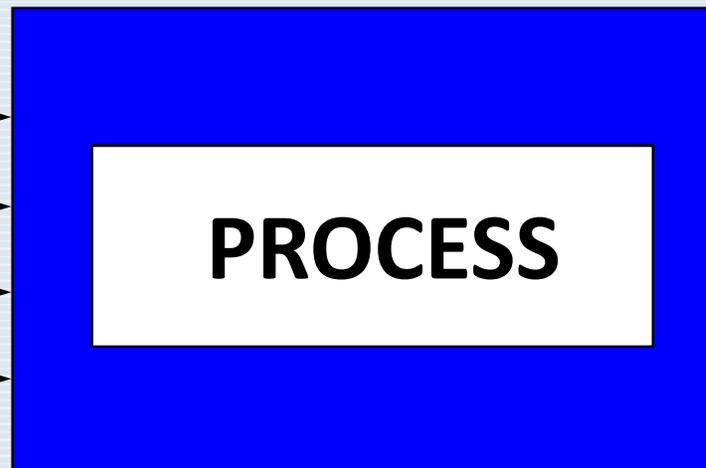
The Framework for Six Sigma

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

The Six Sigma Approach

**Inputs
(X's or Factors)**

X_1 →
 X_2 →
 X_3 →
 X_4 →



**Outputs
(Results)**

Y_1
 Y_2
 Y_3

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

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Six Sigma Management System

- Culture of the organization
- Improvement tools
- Support system for the tools

Lean: Two Pillars

Two Pillars of Lean

- Pursuit of Continuous Improvement
- Philosophy of Respect for People
- Continuous improvement
- Flowing the product at the pull of the customer
- Reducing lead times
- Building people then building products

Lean believes in building people then building products

Foundation of Lean

Lean:

- Eliminating Waste
- Continuous improvement
- Flowing the product at the pull of the customer
- Reducing lead times
- Building people then building products

Lean shines a spotlight on waste (muda)

Seven Key Principals of Lean

- Specify value in the eyes of the customer
- Identify the value stream for each product
- Make value flow without interruptions
- Reduce defect in products and deficiencies in processes
- Let customer pull value
- Pursue perfection – Six Sigma levels
- Drive out variation (short and long term)

Steps of Lean

- **Define:** Defining Value – Value must be determined by the customer
- **Identify the Value Stream:** The sequence of activities contributing value. Identify non-value added activities and examine to determine if they are necessary.
- **Enhance Value Flow:** Flow is the moving of the product uninterrupted through the system to the customer.
- **Maximize Customer Flow:** Create the product upon customer requests
- **Optimize the Process:** efforts to remove waste and improve flow never cease.

Lean

The true value of continuous improvement is creating an atmosphere of continuous learning and a place that embraces change.

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Lean Six Sigma

Process improvements requires aspects of both Lean and Six Sigma approaches. Both are:

- Customer focused
- Quality focused
- Require strong management support
- Data Driven Decisions
- Proven Continuous Improvement Methods

Lean and Six Sigma

Lean	Six Sigma
Two Pillars: Continuous Improvement & Respect	DMAIC Methodology
Reduce Time and Waste	Reduce Defects and Variation
Shorter Cycle Time and reduce bottlenecks with an emphasize of flow and pull.	Six Sigma Goal: 3.4 Defects per million opportunities
Process Mapping, 5S and 7 Waste	Data driven and Root Cause Analysis

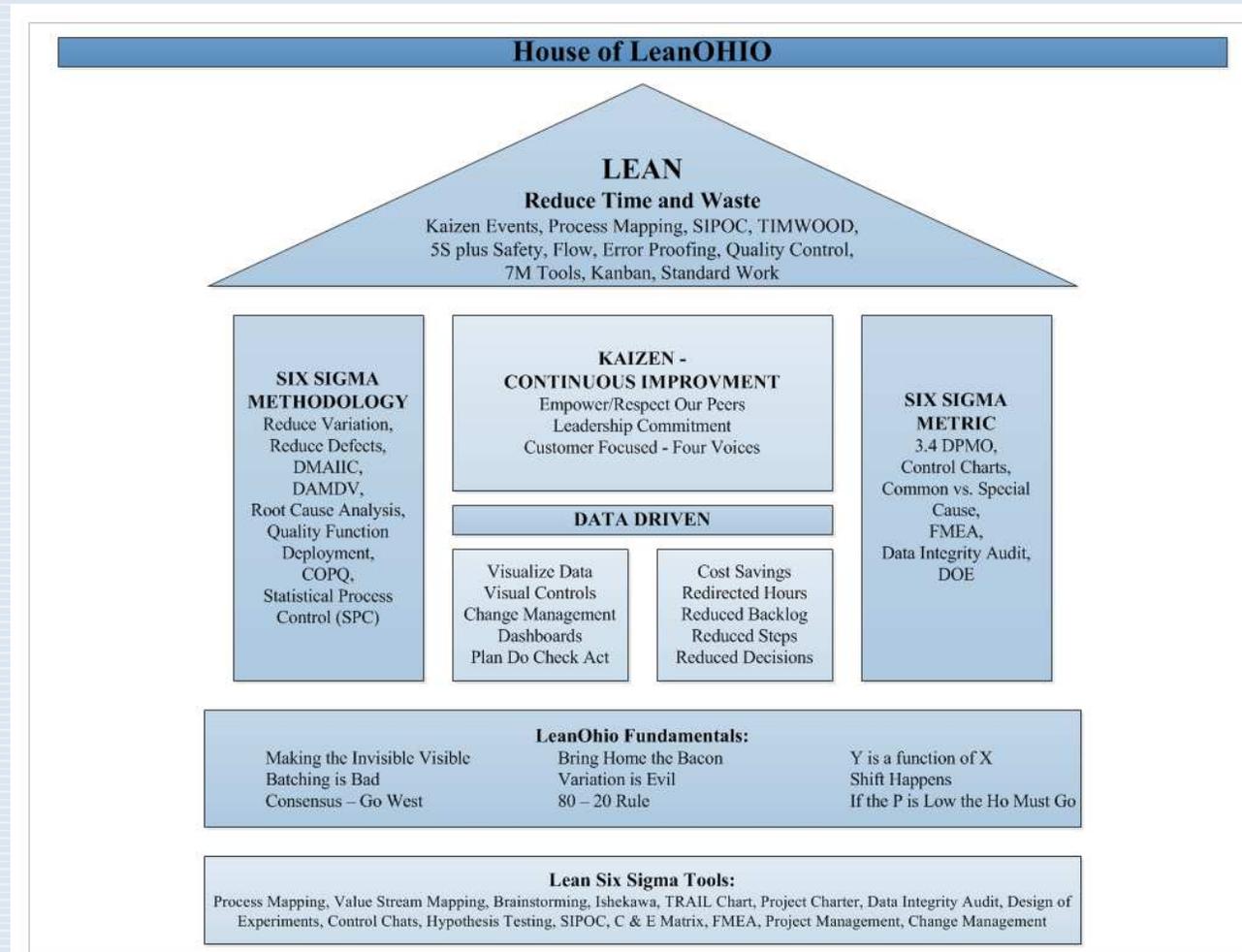
The lines between Lean and Six Sigma have become blurred.

Start with Lean

- The lines between Lean and Six Sigma have become blurred.
- The most successful users have begun with the lean approach
- When process problems remain – the more technical Six Sigma statistical tools may be applied.

Start with Lean

House of LeanOhio



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Lean Six Sigma Roles

Sponsors/Leadership	Stakeholders
Champion	Mentor
Project Champion	Kaizen Event Facilitator(s)
Master Black Belt	Kaizen Event Formatter
Black Belt	Kaizen Team Leader
Green Belt	Kaizen Sponsor
Lean Certified	Fresh Perspective
Process Owner	

Greenbelt vs. Blackbelt

Greenbelt

- Part-time work on projects
- Typically smaller less data heavy project
- Trained in the use of lean tools and foundation statistics
- Knowledge about project area
- Manages project and team

Two weeks of in-class work over 2-3 months

Vs.

Blackbelt

- Ideally Full-time work on project
- Trained in-depth in the use of lean tools and advanced statistics
- Knowledge about project area
- Provides support to ESC and Green Belts
- Provides analytical support throughout project
- Provides training and coaching for Green Belts

Five Weeks of in-class work over 5-6 months

Green Belt Class Structure

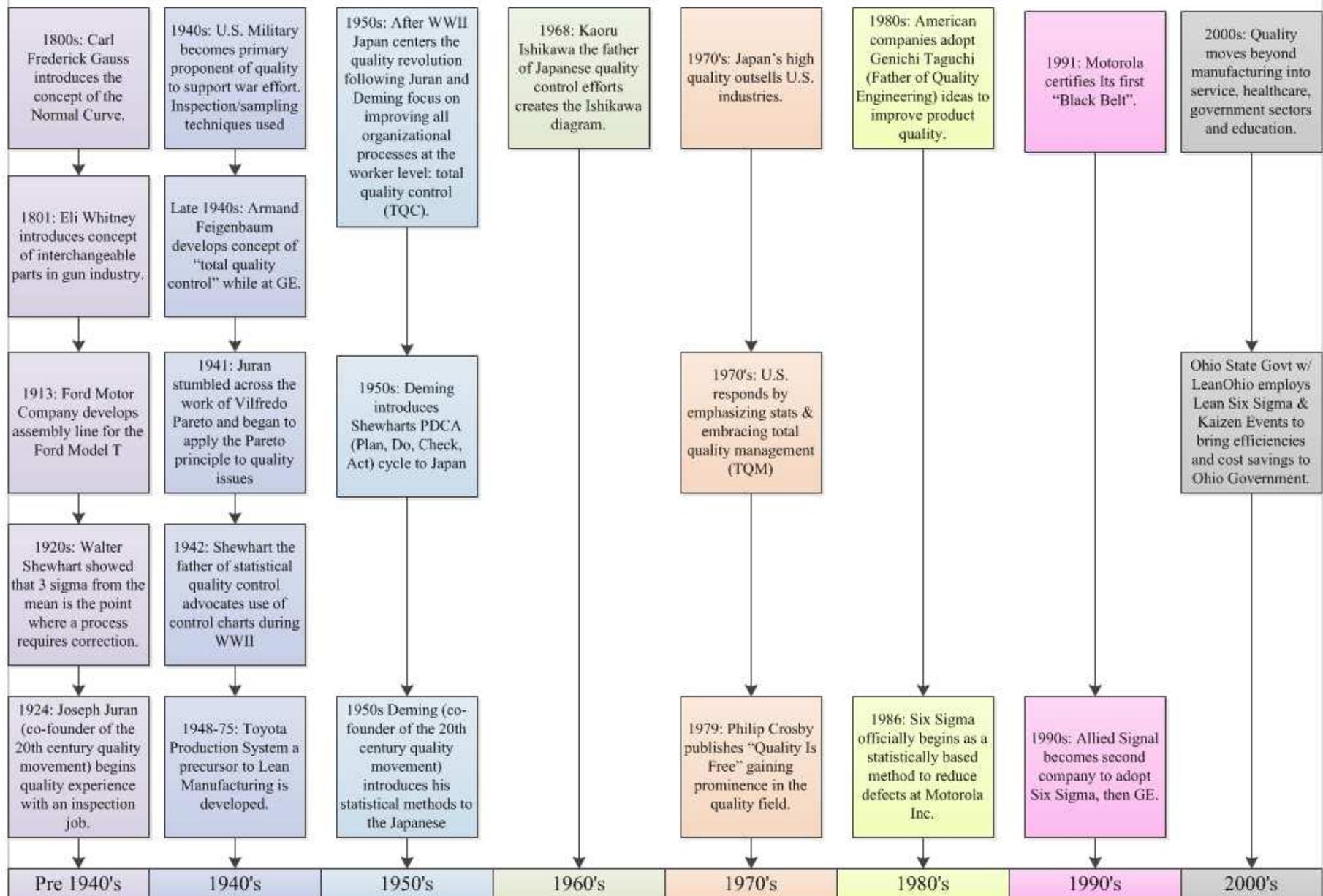
- Week One: Lean Focus
 - Follow a Kaizen Event Flow
- Week Two: Six Sigma Focus
 - Follow a DMAIC Flow

History of Continuous Improvement

Six Sigma has its roots all the way back to the 1800s: Carl Frederick Gauss' concept of the normal curve.

1940's	U.S. Military becomes primary proponent of quality to help support the war effort (World War II)
1950's	Japan centers the quality revolution following Joseph M. Juran and W. Edwards Deming: total quality control (TQC).
1970's	Japan's high quality outsells U.S. industries. U.S. responds by emphasizing statistics and embracing (TQM)
1980's	Six Sigma officially begins in 1986 as a statistically based method to reduce defects at Motorola Inc. Extends to other business processes.
1990's	Motorola certifies its first "Black Belt" in 1991. Allied Signal becomes second company, then GE.
2000's	Quality moves beyond manufacturing into service, healthcare, government sectors and education.

Lean Six Sigma Timeline





Lean Body of Knowledge

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Quality Pioneers: Seven Founders of Six Sigma

- Philip Crosby (1926-2001)
- W. Edwards Deming (1900-1993)
- Armand Feigenbaum (1920-)
- Kaoru Ishikawa (1915-1989)
- Joseph M. Juran (1904-2008)
- Walter A. Shewhart (1891-1967)
- Genichi Taguchi (1924-2012)

Crosby's Tools

“Business Person of Quality”

- Basis of quality is based on DIRFT “Do it right the first time”
- Made quality meaningful and accessible to American executives.
- Promoted addressing quality problems through existing management structures rather than from statistical basis.

DIRFT: “Do It Right The First Time

W. Edwards Deming

Credited with Starting the Modern quality Improvement Movement

- Introduced statistical methods to American industry during World War II.
- Quality is whatever the customer needs and wants.
- Process-oriented approach
- Acknowledge and involve of workers' expertise
- Believed you understand variation using statistical analysis

“95% of quality problems are due to system, while only 5% are due to employees

Armand Feigenbaum

Credited with developing the concept of “total quality control” while at G E.

- Emphasizes the need for everyone to focus on serving external and internal customers
- Quality is an organization-wide process
- Total customer focus

Focus on Serving External and Internal
Customers

Kaoru Ishikawa

“Father of Japanese Quality Control Efforts”

- Made quality movement a nationwide phenomenon.
- Company-wide quality control (CWQC) to distinguish the Japanese approach from Total quality control.
- Use 7M Tools

7M Tools: Seven Management & Planning Tools

- Affinity Diagram
- Interrelationship digraph
- Tree Diagram
- Prioritization Matrices
- Matrix Diagram
- Process Decision Program (PDPC) Chart
- Activity Network Diagram

Joseph M. Juran

“Co-founder of the 20th century quality movement”

- Worked with Japanese to introduce quality concepts.
- Quality control as a management tool rather than specialist's technique.
- Cost of Quality

Cost of Quality: The further from the source
the Greater the Cost

Walter A. Shewhart

“Father of statistical quality control”

- Developed control chart techniques – common cause and special cause.
- PDCA Cycle (Shewhart Cycle or Deming Cycle)



Plan, Do, Check, Act

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Genichi Taguchi

“Father of Quality Engineering”

- Developed specific quality engineering techniques to optimize the process of engineering experimentation and product design.
- Quality should be designed into a product, not inspected into it

- Questions

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