



Seven Key Principles of Lean

1. Define value in the eyes of the customer
2. Identify the process for a service or product
3. Create continuous flow without interruptions
4. Reduce defects in services or products
5. Let customer pull what they want
6. Pursue perfection (Six Sigma)
7. Eliminate or reduce variation

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ASQ Foundations of Lean

Lean shines a spotlight on the eight wastes and seeks to eliminate or reduce these wastes by the use of, but not limited to:

- Teamwork with well-informed, cross-trained employees who participate in the decisions that impact their function
- Clean, organized, and well-marked work spaces
- Flow systems instead of batch and queue
- Pull systems instead of push systems
- Reduced lead times through more efficient processing, set-ups and scheduling

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Foundations of Lean

- Two pillars of Lean
 - Pursuit of continuous improvement
 - Philosophy of respect for people
- The true value of continuous improvement is creating an atmosphere of continuous learning and an environment that embraces change



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ASQ: 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 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.

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What is Six Sigma?

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What is Six Sigma?

- Six Sigma is a **business management strategy** originally developed by Motorola, USA in 1986
- Six Sigma seeks to improve the quality of process outputs by **identifying and removing the causes of defects (errors) and minimizing variation** in business processes
- A six sigma process is one in which 99.99966% of the outputs produced are statistically expected to be free of defects (**3.4 defects per million**)

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The pursuit of perfection

Not 99% good...

But 99.99966% good

What's the difference?

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No electricity for seven hours each month

One hour without electricity every 34 years

99 % Good



99.99966% Six Sigma



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200,000 wrong prescriptions given to patients each year

68 wrong prescriptions given to patients each year

99% Good



99.99966% Six Sigma



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Two bad landings at most airports every day

One bad landing at most airports every 5 years



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Six Sigma

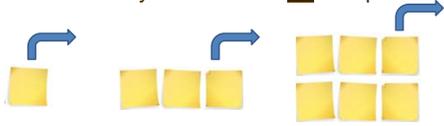
- Six Sigma is the Best of the Best
- Six Sigma:
 - Minimizing variation
 - Identifying and removing the causes of defects



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Try This!

- Team1 – write your name on **one** and pass
- Team2 – write your name on **three** and pass
- Team3 – write your name on **all** and pass



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Three Levels of Six Sigma

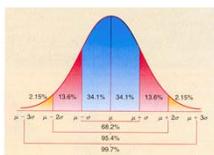
- Metric
- Methodology
- Management system

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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 – which equates to 3.4 defects per one million opportunities



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Six Sigma Methodology

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

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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 |

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Six Sigma Management System

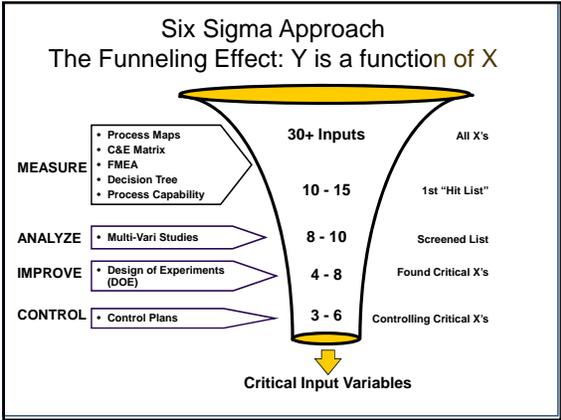
- Culture of the organization
- Improvement tools
- Support system for the tools

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Variation is Evil

- Variation = lack of standardization
- Common causes of variation:
 - Missing information
 - Unsure of the answer
 - Lack of training
 - Non-standard lists, signs, manuals

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Lean Six Sigma

Process improvement 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

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Lean and Six Sigma

| Lean | Six Sigma |
|--|--|
| Two Pillars: Continuous Improvement & Respect | DMAIC Methodology |
| Reduce Time and Waste | Reduce Defects and Variation |
| Reduce cycle time and bottlenecks with an emphasis on flow and pull | Six Sigma Goal: 3.4 Defects per million opportunities |
| Process Mapping, 5S and 7 Wastes – and more | Data and Root Cause Analysis Tools – and more |
| Achieves goals by use of less technical tools such as kaizen, workplace organizational and visual controls. (ASQ) | Achieves goals by use of statistical data analysis, design of experiments and hypothesis testing. (ASQ) |

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Start with Lean

- According to ASQ: "The most successful users of implementations have begun with the lean approach, making the workplace as efficient as possible, reducing the eight wastes and using value stream maps to improve understanding and throughput. When process problems remain, the more technical Six Sigma statistical tools may be applied.
- LeanOhio experience supports this statement

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Lean Boot Camp: Transforming the Public Sector

History of Continuous Improvement

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History of Continuous Improvement

1793



Lean thinking may be traced to Eli Whitney who is credited for spreading the concept of interchangeable parts



1800s



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



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History of Continuous Improvement

1901 Henry Ford went to great lengths to reduce cycle time and lower costs



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History of Continuous Improvement

1940s U.S. Military becomes primary proponent of quality to help support the war effort



Quality

Japan enters the quality revolution following Joseph M. Juran and W. Edwards Deming: total quality control (TQC)

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History of Continuous Improvement

1950s Toyota Production System (TPS) developed between 1948-1975 packaged most of the tools now known as lean manufacturing



1970s Japan's high quality outsells U.S. industries. U.S. responds by emphasizing statistics and embracing (TQM)



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History of Continuous Improvement

1986



MOTOROLA

Six Sigma officially begins as a statistics based method to reduce defects at Motorola Inc.

1991

Motorola certifies its first Six Sigma "Black Belt". Allied Signal and GE follow.



2000s

Quality moves beyond manufacturing into service, healthcare, government and education

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Lean Boot Camp: Transforming the Public Sector

Quality Pioneers

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Quality Pioneers

- W. Edwards Deming (1900-1993)
- Walter A. Shewhart (1891-1967)
- Joseph M. Juran (1904-2008)
- Philip Crosby (1926-2001)
- Kaoru Ishikawa (1915-1989)

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W. Edwards Deming

Credited with starting the modern quality improvement movement

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

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

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Walter A. Shewhart

Father of statistical quality control

- Developed control chart techniques – common cause and special cause variation
- Methodology: PDCA Cycle (known as the Shewhart Cycle or Deming Cycle)



Plan, Do, Check, Act

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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

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Phillip Crosby



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”

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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 of 7M Tools

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Questions on Lean / Six Sigma Overview?

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