Lean Manufacturing or Six Sigma: How Do You Choose?

Presented to

Orange Empire ASQ 701

by

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Tonight's Agenda

- Why Lean or Six Sigma?
- Lean Manufacturing: A Brief History
- Six Sigma: A Brief History
- Comparing Lean and Six Sigma
- Similarities/Differences/Criticisms
- Implementing Lean or Six Sigma
- Selecting
- Barriers to Implementation
- Conclusions

Why Implement Lean or Six Sigma?

Businesses generally hold competitive advantages over their competitors for one of two reasons:

1. Unique Products -These businesses create a competitive advantage by **having a superior product** to their competition, often in the form of technological capabilities or niche marketing.
2. Low Cost Products - These businesses create a competitive advantage by **having a superior process** to their competition, often in the form of internal efficiencies or low cost production.

Lean and Six Sigma focus on

customer needs

improving processes

reducing costs

What is Lean Manufacturing?

Lean is the antidote to waste. It provides a way to specify value, line up value-creating actions in the best sequence, conduct these activities without interruption whenever someone requests them, and perform them more and more effectively.

In short, lean manufacturing is lean because it provides a way to do more and more with less and less – less human effort, less equipment, less time, and less space.

Lean Manufacturing: A Brief History

Ford

"One of the most noteworthy accomplishments in keeping the price of Ford products low is the gradual shortening of the production cycle. ***The longer an article is in the process of manufacture and the more it is moved about, the greater is its ultimate cost."***

Henry Ford, 1926

Henry Ford identified 5 of the 7 lean wastes in the 1920's

Lean Manufacturing: A Brief History

Toyota

- Manufacturer of trucks and small automobiles in post-WWII Japan.
- A “need” was declared by Toyota’s President to discover a new production method that would eliminate waste and help Toyota catch up with foreign competitors.
- Chief Engineer studied writings of Henry Ford, then visited Ford plants extensively in the 1950’s- begins the “war on waste”
- IMVP study in early 1980s identified “Lean Manufacturing”
- 1984, Toyota becomes a North American manufacturer with joint-venture at NUMMI Plant in California. Stellar Results!
- 1990s and Beyond, Lean Production strategies adopted in numerous industries.
- *All other car manufacturers have adopted Lean* ***principles*** *!*

Organizations Working on Lean

- Boeing
- BMW
- Carrier
- Caterpillar
- Chrysler
- Coca Cola
- Dell
- Delphi
- Exxon Mobil
- Ford*
- Framatone
- Gateway
- General Dynamics
- General Motors*
- IBM
- John Deere*
- Johnson Controls
- Johnson & Johnson*
- Lockheed Martin
- Northrop Grumman*
- Pepsi, Co.
- Porsche
- Southwest Airlines
- Subway
- Toyota
- TRW
- U.S. Air Force
- U.S. Navy*

* = both Lean and Six Sigma

What is Six Sigma?

- Six Sigma is a company-wide initiative to generate breakthrough results in business performance
- Six Sigma also represents a measure of product, process, and transaction quality which strives for nearly 100% conformance
- Six sigma, though, is *a business initiative*, that happens to dramatically improve quality

Six Sigma: A Brief History

- In 1979 President of Motorola announces “Our Quality Stinks”. In response company launched an initiative calling for a 5-year, 10X improvement in quality. Various consultants were brought into Motorola to teach Advanced Statistical Methods (e.g. DOX)
- In 1987 Motorola initiated its “Six Sigma Quality” initiative. The goal was to achieve no more than 3.4 defective parts per million (PPM) across the entire company. This required a 4-year 100X quality improvement objective.

Six Sigma: A Brief History

- In 1988, Motorola won the Malcolm Baldrige National Quality Award. Motorola subsequently shared its “Six Sigma” approach with other companies
- In 1989, Motorola Chairman, Bob Galvin asked Mikel Harry to head the Six Sigma Research Institute, an organization that received funding from a number of *Fortune* 500 companies

Six Sigma: A Brief History

- 1993 Mikel Harry took Six Sigma to ABB Asea Brown Boveria Ltd.
- AlliedSignal implemented Six Sigma in 1994 and claimed savings of $1.2 Billion by 1998
- Bossidy, CEO of AlliedSignal, convinced General Electric's Jack Welch to try Six Sigma

Six Sigma-Driven Organizations

- Allied Signal/Honeywell
- Black & Decker
- Dow Chemical
- Dupont
- Federal Express
- Ford*
- General Electric
- General Motors*
- Iomega
- John Deere*
- Johnson & Johnson*
- Kodak
- Motorola
- NBC
- Northrop Grumman*
- Polaroid
- Raytheon
- Sony
- U.S. Navy*

* = both Lean and Six Sigma

Lean and Six Sigma

Some Comparisons

Goal

Six Sigma = Reduce variation

- Understand customer requirements (QFD)
- Focus on Critical to Quality variables

Lean = Remove waste

- Understand what customer sees as “value” (QFD)
- Eliminate everything that does not add value

Focus

Six Sigma = Problem focused

- Variation is a problem that can be addressed
- Find the sources with the largest economic impact

Lean = Flow focused

- The constant “start and stop” of product results in costs that cannot be passed on to the customer
- Find the barriers to flow

Primary Benefit

Six Sigma = Uniform process output

- Predictable, dependable processes are always less expensive to operate (less scrap, rework, OT)
- Most companies grossly underestimate their costs of poor quality

Lean = Reduced flow time

- Improving flow will always reduce manufacturing costs (Ford, 1926)

Secondary Benefits

Six Sigma

- Less waste
- Faster throughput
- Improved quality
- Less inventory

Lean

- Less variation
- Uniform output
- Improved quality
- Less inventory

Lean and Six Sigma are complementary

Tools

Lean:

- Value Stream Map
- 5-S
- One Piece Flow
- Pull Systems
- Cells
- Kanban
- Visual Controls
- Setup Reduction

Six Sigma:

- DMAIC Process
- Statistical Tools
- FMEA
- Cause & Effect
- Cp and Cpk
- Gage R&R
- ANOVA
- DOE

Similarities

- Both start with customer wants
- Both use trained teams, led by experts
- Both require top management commitment (mere support is not enough)
- Both require significant investment of time and money
- Both *can have* extraordinary results

Similarities

- Both will produce mediocre results if management is supportive, but not committed
- Both feel overwhelming in the beginning
- Both deliver the best results when more, rather than fewer employees are involved

Differences

- Lean is long term - there is no done
- Lean is enterprise wide - it will ultimately involve all employees, as well as suppliers and customers
- Six Sigma is project focused, projects usually last 3-6 months
- Six Sigma promotes product reliability, Lean promotes organizational reliability

Criticisms

Of Lean:

- Statistical analysis not a key part of lean
- Insufficient attention to reducing variation
- Complicated, hard to understand
- Is not “the magic bullet”

Of Six Sigma:

- Processes are improved independently
- Process interactions are not considered
- Complicated, hard to understand
- Is not “the magic bullet”

Implementing Six Sigma

- Management commitment
- Train core team (Black and Green Belts)
- Understand customer critical-to-quality variables
- Set aggressive improvement goals
- Identify and improve critical processes

Implementing Lean

- Management commitment
- Train core team
- Understand value from customer perspective
- Set aggressive improvement goals
- Identify and remove waste
- Constantly improve flow (reduce lead time)

Actions Required to Institutionalize Improvement (Lean or 6 Sigma)

- **TOP DOWN COMMITMENT AND INVOLVEMENT**
  - **Set the example, be active in the process**
- **MEASUREMENT SYSTEM TO TRACK PROGRESS**
  - **At both macro and micro levels**
- **TOUGH GOAL SETTING (REACH OUT!!)**
  - **Benchmark Best-In-Class -- audit often**
- **PROVIDE THE REQUIRED EDUCATION**
  - **The "Why" and "How To"**
- **SPREAD THE SUCCESS STORIES**

Choosing/Selecting

- Understand your organization and its culture
  - Do we like to analyze?
  - Do we like to change?
- What would be more important right now:
  - shorter lead times?
  - improved quality?

Barriers to Implementation

Culture limitations

Knowledge limitations

Management limitations

Culture Limitations

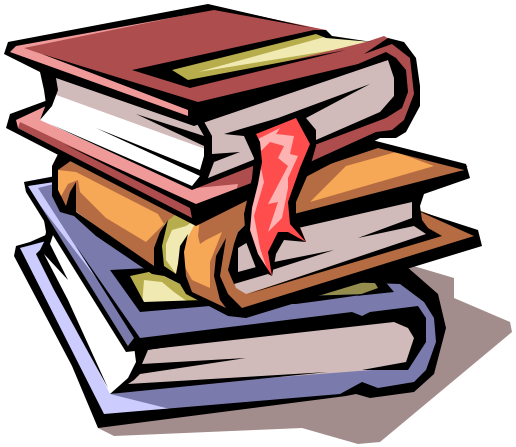
- **Fear**
- **Time pressure**

- **Resistant to change**

- **Lack of trust**
- **Poor communication**

Knowledge Limitations

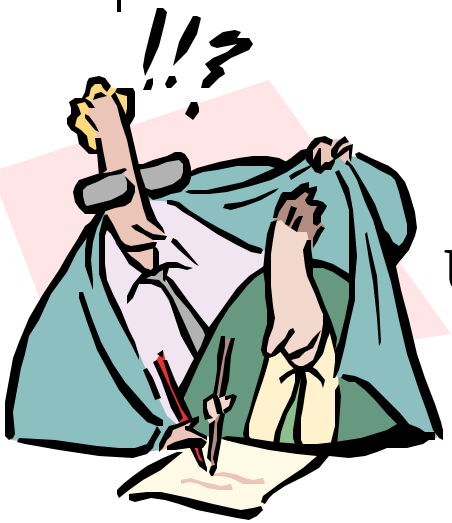
Lack of training



Lack of knowledge:
management as well as among team members

Lack of team and meeting skills

Management Limitations



Unprofessional management behavior

Lack of leadership

Lack of management commitment

Lack of hands-on involvement

Conclusions

- Six Sigma focuses on reducing variation and achieving uniform process results, which leads to less waste, less throughput time and less inventory
- Lean focuses on reducing waste and shortening lead time, which leads to less variation, uniform output and less inventory
- ***Lean and Six Sigma are complementary***
- ***Organizations that do both, will have the greatest competitive advantage***

Lean + Six Sigma . . . a Powerful Marriage

Lean

- **Waste Elimination**
- **Flow**
- **At the Pull Of The Customer**
- **Continuous Improvement**

Six Sigma

- **Variation Reduction**
- **Scrap / Rework Elimination**
- **Process Control**
- **Continuous Improvement**

Speed + Accuracy

= Performance

Lean Exposes NVA/VA And Makes Value Added Flow
Six Sigma Reduces Variation Of Value Added

Why Improvement Programs Fail

"Throughout my research I found that management's failure to commit to an improvement program was the major reason for failure. When management is unable to rally the troops and demonstrate an urgent need for improvement, programs just fade away"

From an MBA research paper, written on why improvement programs don't work.

Benchmarking Tells Us

- There are no secrets to quality/process improvement.
- There are no “Magic Bullets” or short cuts to improvement.
- Quality doesn’t take time, it saves time.
- Average company spends close to 20% of its revenue on waste -- non-value added (COPQ).
- Process improvement applies to the administrative side of business as well.
- Service companies are not different from manufacturing, both have processes.

Management must address:

What are the risks of no change?

QUESTIONS?

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Lean Enterprise, Six Sigma

ISO 9001, ISO 14001

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