CQIA Process Improvement

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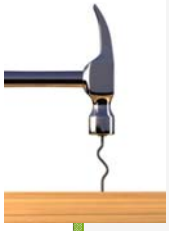
Process Improvement Outline

Process Improvement (From CQIA Body of Knowledge)

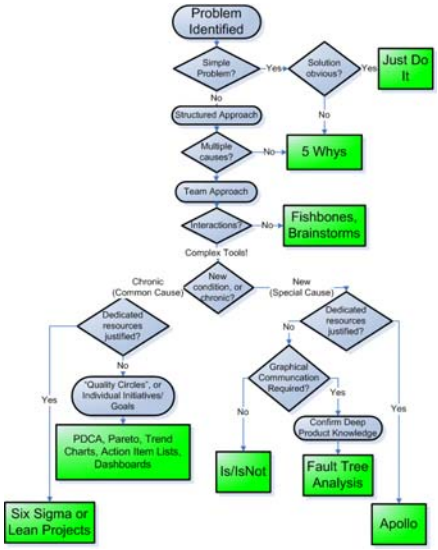
- **1. Six sigma**
  - Identify key six sigma concepts and tools, including the different roles and responsibilities of green belts and black belts, typical project types that are appropriate for six sigma techniques, and the DMAIC phases: design, measure, analyze, improve, and control. (Understand)
- **2. Lean**
  - Identify lean tools that are used to reduce waste, including set-up and cycle-time reduction, pull systems (kanban), kaizen, just-in-time (JIT), 5S, and value stream, mapping. (Understand)
- **3. Benchmarking**
  - Define benchmarking and describe how it can be used to develop and support best practices. (Understand)
- **4. Incremental and breakthrough improvement**
  - Describe and distinguish between these two types of improvements, the steps required for each, and the type of situation in which either type would be expected. (Understand)

When your only tool is a hammer



All your problems will look like nails

When to Use Lean, 6σ, or Other?



What is 6 Sigma?

- Six Sigma is an improvement strategy that targets reducing variation to achieve virtually defect free output
- Follows defined phases (DMAIC)
- Uses data and (sometimes complex) statistics to support decisions.
- Assigns "Belt" terminology to define training and project impact levels
- Was initially developed by Motorola in the 1980s

Graphic Example

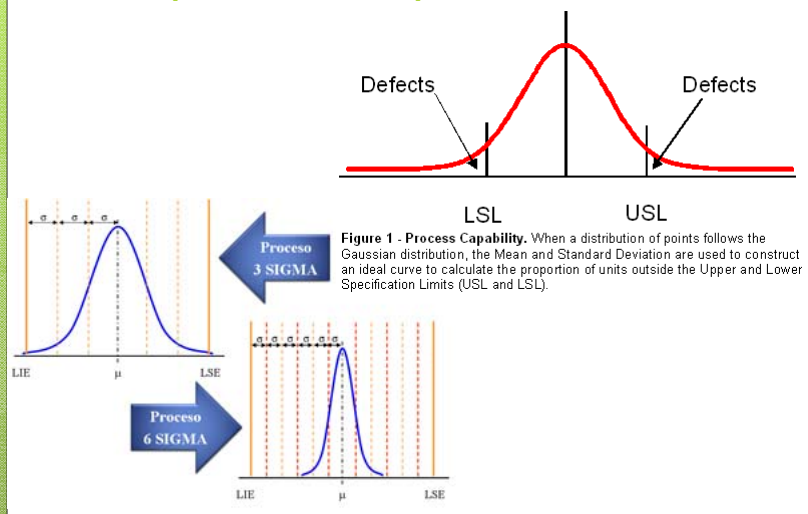


Figure 1 - Process Capability. When a distribution of points follows the Gaussian distribution, the Mean and Standard Deviation are used to construct an ideal curve to calculate the proportion of units outside the Upper and Lower Specification Limits (USL and LSL).

Six Sigma DMAIC Projects

- Consider a Six Sigma Project approach when
  - The problem is Systemic,
  - High Value to the organization,
  - Has not been resolved with simpler approaches
- Requires a project leader, especially for Black Belt level projects, that is trained in
  - DMAIC process and expectations
  - Statistical analysis tools (DOE, Regression, Measurement GRR, etc.)
  - Leadership and communication
- Typical BB projects are 3 weeks to 3 months, and savings from $25 to $500K+

Six Sigma Roles

- **Green Belt-** Understands DMAIC steps, and simpler tools. May support SSBB, or take on smaller, simpler projects on their own
- **Black Belt-** Trained in all SSGB, plus more complicated statistics, project management and team leadership.
- **Master Black Belt-** Provides training, and mentors GBs, BB candidates, and consults with BBs as projects require
- **Executive Champion-** Organizational stakeholder. Authorizes projects, provides resources, monitors project status, and removes roadblocks if needed.

5 Steps of a 6 Sigma Project

- The Six Sigma projects consist of 5 distinct phases,
  - **Define-**Output is a Project charter: Problem Statement, Project Scope, Performance Metrics, Goals and Objectives
  - **Measure-**First assess if the measurement processes are capable (repeatable, reproducible, unbiased, etc.), then baseline the current state.
  - **Analyze-** Determine how input variables affect output performance. Correlation, regression, DOE, etc.
  - **Improve-** Implement changes, verify improvements meet goals
  - **Control-**Permanently lock in the gains.

What is Lean?

- The term Lean was first coined to describe the Toyota Production System.
- Lean is a system, focused on minimizing waste, while maximizing value as defined by customer.
- Some key features of Lean are
  - Build only what is needed, when it is needed
  - Decreased cycle time, especially wait states
  - Minimized work in process
  - Active involvement by all levels of management

Signatures of Lean

1. **Pull Systems-** Builds when downstream/customer needs it. Recyclable Kanban cards used to request more
2. **Cycle-time reduction** Use various tools and techniques for reducing cycle time, e.g., continuous flow, single-minute exchange of die (SMED), heijunka (production leveling).
3. **Waste elimination** Select and apply tools and techniques for preventing waste, e.g., pull systems,, 5S, standard work, poka-yoke
4. **Kaizen-** Both kaizen (slow, steady improvements) and kaizen blitz (complete overhaul in very brief period)
5. **Other improvement tools** and techniques, e.g., theory of constraints (TOC), overall equipment effectiveness (OEE).

7 Types of Lean Waste (Muda)

- Value added steps/processes are activities the customer would be willing to pay for. Non-value activities should be minimized, if not eliminated
  1. **Overproduction**-excess material, space, labor
  2. **Inventory-** space, interest on material costs
  3. **Repairs/Rejects-** materials, labor, takt time
  4. **Motion-**excess steps, ergonomics, multiple hand-offs
  5. **Transport-** all forms of transport are muda
  6. **Extra Processing-** deburr, inspections are NV
  7. **Waiting-** idle operators, machinery breakdowns,

Some Lean Terms

- **Andon Board-** Visual control board in a production area
- **Gemba-**Management by going to where work is done
- **Kaizen-** continuously improving everywhere, everyday
- **Kaizen Blitz-** A complete redesign of a process in short time period
- **Poka Yoke-** to error proof
- **Pull Systems-** production control in which nothing is produced upstream until a downstream process indicates a need
- **Single Piece Flow-** A single part moves along without waiting for other parts to complete the same process. Contrast with "batch and queue"
- **SMED** (Single Minute Exchange of Die)
- **Takt Time-** available time divided by the rate of customer demand
- **Value Stream-** Process flow charts, showing each step as value added/non value added steps, wait periods, cycle time & WIP levels. Includes 3 Streams : Material, information, and problem solving

5S –Workplace Organization

English Version

Sort- remove unneeded

Straighten- a place for everything

Scrub/Shine- clean

Standardize- make clean and checking routine

Sustain- commit to above, and improve

Japanese Version

Seiri *(proper arrangement)*

Seiton *(orderliness)*

Seiso *(clean up)*

Seiketsu *(standardize)*

Shitsuke *(personal discipline)*

Organized work areas are a prerequisite for any effective process improvements

Benchmarking Steps

- Determine Current Practice
- Identify Best Practice (may be in different industry)
- Analyze Best Practices
- Model Best Practice within your organization
- Implement, and monitor results
- Repeat

Typical vs Breakthrough Benchmark

- Typical benchmarking method mimics the best competitor, goal is to close a gap/weakness
- Breakthrough benchmark's goal is to vastly exceed best competitor by identifying world class processes regardless of industry, and bringing that level of performance to your organization

References and Readings

- *The Machine that Changed the World. By Womack, Jones & Roos.*
- *Implementing Six Sigma. By* Forrest Breyfogle III
- *The Toyota Way*. By Liker and Meier

Any Questions?