Process Improvement Projects: Using Six Sigma Methodologies

OR

How to Add Value to your Organization (while successfully Avoiding Budget Responsibilities)

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### PMBOK

**INITIATE**
- Project Charter
- Project Scope Statement

**PLANNING**
- Project Management Plan

**EXECUTING**
- Deliverables
- Requested Changes
- Implemented Change Requests
- Implemented Corrective Actions
- Implemented Defect Repair
- Work Performance Information

**MONITOR/CONTROLLING**
- Approved Change Requests
- Rejected Change Requests
- Approved Corrective Actions
- Approved Defect Repair
- Project Management Plan (update)
- Project Scope Statement (update)
- Recommended Corrective Actions
- Recommended Preventive Actions
- Performance Reports
- Recommended Defect Repair
- Forecasts
- Validated Defect Repair
- Approved Deliverables

**CLOSING**
- Administrative Closure Procedure
- Contract Closure Procedure

**FINAL PRODUCT, SERVICE, RESULT**

### DMAIC

**DEFINE**
- Project Charter/Mission Statement
- Project Plan
- SIPOC
- Voice of the Customer (VOC)

**MEASURE**
- Data
- Sampling
- Gage R&R
- Patterns
- Capability

**ANALYZE**
- Root Cause Analysis
- Process Analysis
- Data Analysis
- Hypothesis Testing
- Regression
- Design of Experiments (DOE)

**IMPROVE**
- Solutions
- FMEA
- Pilot
- Implementation

**CONTROL**
- Control
- Standardize
- Document
- Monitor
- Evaluate
- Closure

**FINAL PRODUCT, SERVICE, RESULT**
When To Use a “DMAIC” Design For Six Sigma

• Processes are out-of-date
• Resources are reduced
• Budgets are slashed
• At the whim of upper management
Why You Would Use a DFSS

• New industry standards
• New processes in other areas
• Must outperform competitors
• Must keep underlings busy
Where You Would Use a DFSS

- Front office
- Manufacturing areas
- Business support areas
- Where someone has M E S S e d up
- Wherever improvement is needed
What is Six Sigma?

- A method or set of techniques, Six Sigma has also become a movement focused on business process improvement. It is a quality measurement and improvement program originally developed by Motorola that focuses on the control of a process to the point of ± six sigma (standard deviations) from a centerline, or put another way, 3.4 defects per million items. A Six Sigma systematic quality program provides businesses with the tools to improve the capability of their business processes. ...

- A rigorous and disciplined methodology that utilizes data and statistical analysis to measure and improve a company’s operational performance, practices and systems. Six Sigma identifies and prevents defects in manufacturing and service-related processes. In many organizations, it simply means a measure of quality that strives for near perfection.*
  [www.dmreview.com/resources/glossary.cfm](http://www.dmreview.com/resources/glossary.cfm)

- A ‘measure of goodness’ involving the application of statistical methods to business processes to improve operating efficiency, reduce variation, avoid defects and reduce waste
  [www.industryforum.co.uk/glossary.htm](http://www.industryforum.co.uk/glossary.htm)

- a failure rate of 3.4 parts per million or 99.9997%
  [www.thequalityportal.com/glossary/s.htm](http://www.thequalityportal.com/glossary/s.htm)

- A process improvement methodology created by Mikel Harry and Richard Schroeder at Motorola in the early 1980’s. The approach employs a rigorous project methodology, which utilizes statistical analysis to identify root causes. As a process measure, it means 3.4 defects per million opportunities.
  [www.ketch.ca/resources_glossary.html](http://www.ketch.ca/resources_glossary.html)

- A measurement of process quality. Sigma is the mathematical symbol for standard deviation. As an example, about 93% of all results from a normal population (ie results are equally distributed above and below the mean) fall within 3 standard deviations. The use of six sigma in a manufacturing situation means that the company uses all the total quality tools to improve a process so that the tolerances for the process is at or better than six standard deviations of the process spread. ...
  [www.bpic.co.uk/jargon.htm](http://www.bpic.co.uk/jargon.htm)

- Six Sigma is a highly structured program for improving business processes and represents the latest incarnation of the quality movement. The program, grounded in efforts to improve manufacturing quality during the 1980s, brings the methods and analytic tools of engineers to bear on the questions, What matters to customers?, and Where will changes to work processes most improve these points?

- a lean manufacturing methodology based on 3.4 defects per million products; a similar certification process to ISO to improve performance.
  [www.navigateinternationalstandards.com/terminology.htm](http://www.navigateinternationalstandards.com/terminology.htm)

- A term generally used to indicate that a process is well controlled, ie plus or minus 6 sigma points from the midpoint in a control chart. The term is usually associated with Motorola, which named a major quality initiative “Six-Sigma Quality.”
  [www.leanmean-manufacturing.com/glossary2.html](http://www.leanmean-manufacturing.com/glossary2.html)

- Structured process improvement program for achieving virtually zero defects (3.4 parts per million) in manufacturing and business processes
  [www.qlic.ca/glossary.htm](http://www.qlic.ca/glossary.htm)

- An invention of Motorola in the 80’s to try to turn SPC into a philosophy and apparently to make it “FUN”. SPC is one of many practical tools that helps to solve problems, nothing more, nothing less; to turn into anything else is to miss the point.
  [www.spctraining.co.uk/jargon.html](http://www.spctraining.co.uk/jargon.html)

- Six Sigma is a quality management program to achieve “six sigma” levels of quality. It was pioneered by Motorola in the mid-1980s and has spread to many other manufacturing companies. GE Aircraft Engines strives to operate at six-sigma levels of quality. It continues to spread to service companies as well. In 2000, Fort Wayne, Indiana became the first city to implement the program in a city government.
  [en.wikipedia.org/wiki/Six_Sigma](http://en.wikipedia.org/wiki/Six_Sigma)
• Save $$$$$$!!!

• Impress the masses!!!

• Make the boss look good!!!

• Make your job easier!!!

• Look better, Live longer
DFSS - DMAIC

The Six Sigma Method for Improving Existing Processes

1. DEFINE
2. MEASURE
3. ANALYZE
4. IMPROVE
5. CONTROL
Process Deliverables

**Define**
- Identify core team
- Develop preliminary team charter
- Identify and map as-is processes

**Measure**
- Identify input process and output indicators
- Collect and measure data
- Benchmark

**Analyze**
- Prioritize causes of defects
- Analyze current performance vs. goals
- Develop problem statement

**Improve**
- Break down work structure
- Develop and test possible solutions
- Communicate plan to stakeholders

**Control**
- Create process maps
- Standardize improvement processes
- Communicate procedures
DEFINE

- Identify core team
- Develop preliminary team charter
- Identify and map as-is processes
Actions/Deliverables

- Identify: Problem/Process
- Create: Project Charter
- Select: Project Team
- Define: Existing Processes
Identify the Problematic Process

- Outline quality/business goals
- Identify critical processes
- Evaluate impact and rank proposals (VOC)
  - Increased capacity?
  - Increased revenues?
  - Decreased material costs?
  - Decreased rework?
Create the Project Charter

- Problem and goal statements
- Project scope
- Team expectations and member roles
- Decision model
- Milestones/deliverables
- Required support
Select Project Team

- Areas/persons most affected by project results
- Areas responsible for process(es)
- Subject Matter Experts (SMEs)
- Supporting Areas
The more people involved in a process, the less efficient it gets.
Process Documentation

• Guidance Documents
• General Operating Procedures
• Standard Operating Procedures
• Work Instructions
SIPOC Diagrams

**S** Supplier

- Manufacturer
- Office Supplies
- Yourself
- Power Company

**I** Input

- Copier
- Paper
- Toner
- Original

**P** Process

- Making a Photocopy

**O** Output

- Copies

**C** Customer

- You
- File
- Others
Define Baseline Data Acquisition

• Cost of poor Quality/Financial impact
  - time savings
  - resource savings (translate to $$$)

• Operational/Strategic impact
  - error reduction
  - supports other efforts
  - supports new technologies
VOC (Voice of the Customer)

1. Identify customers and determine what you need to know
2. Collect and analyze reactive system data, then fill gaps with proactive approaches
3. Analyze data to generate a key list of customer needs in their language
4. Translate customer language into CTQs
Wadda ya WANT?

- The World, and everything in it
- To be Master of the Universe
- World peace, riches beyond measure, and immortality
- A perfect cup of coffee
- Jeans that actually fit everywhere
- Free cotton candy at work
Categorize/Characterize Stated Needs

Affinity Diagram
Define “Critical Few”

1. Must Haves
2. Nice to Haves
3. Delighters
CTQs

- Reduce resources by 25%
- Increase revenue by 15%
- Reduce rework by 50%
- Interact seamlessly with new technology in related area
- Increase the boss’ popularity by 75%
- No more than 4 defective persons per 100 people per department
MEASURE

- Identify input process and output indicators
- Collect and measure data
- Benchmark
Actions/Deliverables

• Data collection plan
• Forms, charts, plots
• Solution prioritization matrix
• Design Concept Diagram (Rev 2)
• FMEA
Data Collection Plan

• Data/ Measure Type

• How measured?

• How/ Where recorded? By whom?
Data Collection

• Data Stratification
  - Who
  - What
  - Where
  - When
  - How
Forms, Charts, Plots... ugh,,, paperwork...

- Operational definitions
- Gage R&R
- Sampling strategy
- Control charts
Prioritization Matrix

• When there are too many variables
• Link outputs to customer reqs
• Link input and process to outputs
• Identify critical few CTQs
• Focus data collection effort
## Solution Prioritization Matrix

<table>
<thead>
<tr>
<th>Solution</th>
<th>Easy</th>
<th>Quick</th>
<th>Tech</th>
<th>High Impact</th>
<th>Customers</th>
<th>Sum</th>
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<td>3.0</td>
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<tr>
<td>C</td>
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<tr>
<td>D</td>
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<td>2.7</td>
<td>19.8</td>
<td>5.4</td>
<td>36.6</td>
</tr>
</tbody>
</table>

### Criteria and Weights
- **Easy**
- **Quick**
- **Tech**
- **High Impact**
- **Customers**

Summarizing the scores, **Solution B** has the highest sum of 47.7, indicating it is the top priority.
Identifier: Failure Mode & Effect Analysis

- Failure mode detection probability
- Failure mode mitigation strategies

D. H. Stamatis

ISBN: 0873895983

Cost ~$80.00

http://www.isixsigma.com/
ANALYZE

- Prioritize causes of defects
- Analyze current performance vs. goals
- Refine the problem statement
Actions/Deliverables

• Functional requirements
• Design alternatives
• Select optimum design alternative
• Assess design capability
• Assess design risk
Functional Requirements

• Analyze functional data

• Translate CTQs into functional requirements
  - Category
  - Primary need
  - Characteristic
  - Measure
  - Target
Existing Process Analysis

• Cause-and-effect diagrams

• Activity flow diagrams
  - Start
  - Action/ Task
  - Decision
  - End
Hypothesis Testing

• Tests the *null* hypothesis...
  – $H_0$: No difference between groups
• Against the *alternative* hypothesis
  – $H_a$: Groups are different

• Use hypothesis testing when comparing two or more processes

• Types of data
  – Discrete
  – Continuous
DEB'S DAD'S LAW

DON'T CONFUSE ME WITH FACTS,
MY MIND'S MADE UP!!!
Hypothesis Testing

• Prove the Null Hypothesis

OR

• Fail to Prove the Null Hypothesis
DON’T CONFUSE ME WITH FACTS,
MY MIND’S MADE UP!!!
DOE (Design of Experiments)

- Involves all possible combinations
- Identifies vital view source variations
- Predict resulting gain or loss
- Full Factorial
  - Change several variables simultaneously
  - Handles random variation
  - Easy to analyze
Completion Checklist

• Describe identified potential causes

• Describe which causes to investigate and why

• Describe data collected to verify causes

• Describe data interpretation
IMPROVE

• Work breakdown structure (WBS)
• Develop and test possible solutions
• Communicate plan to stakeholders
Actions/Deliverables

- Pilot a final solution
- Further assess risks
- Perform a Cost/Benefit Analysis
- Implement our final solution
Pilot Program

- Brief participants
- Plan pilot
- Inform associates
- Train employees
- Conduct pilot
- Evaluate results
- Increase scope
Final Solution

• Compare to Requirements

• Award solution scores

• Pick IT
Implementation Plan

- Logistical Needs
- Impact(s)
- Timeline
- Purpose
Procedural Support

• Update Procedures
  - GOPs
  - SOPs
  - WIs
  - etc.

• Identify the “Help-Desk”
CONTROL

• Create process maps
• Standardize improvement processes
• Communicate procedures
Actions/Deliverables

• Verify results and validate changes

• Document new methods

• Monitor implementation and make regular course corrections

• Lessons Learned
Verify & Validate

- Document & distribute “know-why” information
- Damage Control
- Process Adjustment(s)
- System Improvements
Create Standard Practices & Procedures

- Document procedural work context
- Collect documents representing the new procedure
- Compare documented procedures with actual practices
- Reconcile actual practice and document procedures
- Roll-out documented procedures
- Check use of standard procedures
Monitor Implementation

- Document variation
- Document failures/ errors
- Internal process consultants
Lessons Learned

• What went wrong?

• What went right?

• What to do differently next time

• What NOT to do next time

• Update/ document new process improvement methodologies
CELEBRATE!!!

- Participant Recognition
- Bonuses/Gifts
- Party!!!
Prepare for the next one...
Questions & Answers
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