



Six Sigma Implementation

Training, Tools and Success
Factors

Lorraine Daniels



Lorraine Daniels

- Master Black Belt – 9 years
- Ph.D. in Industrial Engineering
- Master Instructor for Motorola University
- Worked in electronics, banking, and information technology
- Independent consultant and trainer to Motorola's Master Black Belts, Black Belts and Green Belts
- Co-author of "The Six Sigma Black Belt Handbook"
- Provide same consulting and training to Motorola's clients – from all types of businesses and organizations



Agenda

- Developing a Six Sigma Culture
- Preparing the Six Sigma Methodology
- Using Six Sigma Metrics
- Common Mistakes and Misconceptions about Six Sigma



History of Six Sigma

- Developed in 1986 by Motorola
- Answer to quality problems
- Shared with other companies
- Grown in application
- Applied in service, transactional, government, health care and manufacturing

Evolution of Six Sigma

Tool to measure the ability of the process to perform



Methodology to improve the ability of the process to perform



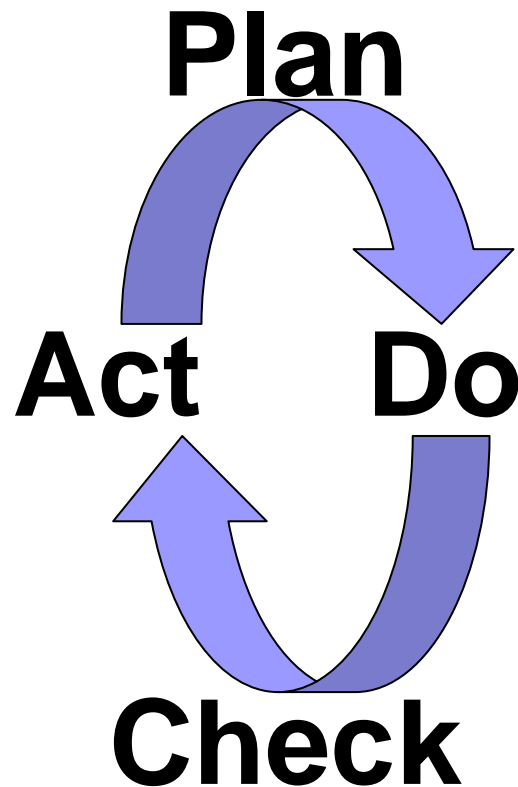
Cultural change to improve the business and the financial results



TIME



Shewhart's PDCA



We will think about Six Sigma as a Business Culture and Methodology in terms of *Planning, Doing and Checking* so that we can *Act*

Four Examples Will Be Used

- Compare and contrast:
 - Two Divisions - of the same healthcare company
 - Two Different Companies – one in information technology and one in manufacturing





The Six Sigma Culture



What is a Six Sigma Company?

6σ

Top Critical Factors*

- Leadership and commitment from the top
- Customer is the focus of quality improvement
- Providing effective training for management and employees

**From "Six Sigma: A Framework for Small and Medium-Sized Enterprises to Achieve Total Quality", dissertation written by Tsung-Ling Chang (2002)*



Planning a Six Sigma Culture

- People Issues
- Tactical Issues
- Financial Issues
- Communication Plans



People Issues

- Job functions of the belts
- Selecting people for the roles
- Reporting structure



Planning / Doing / Checking People Issues

■ Planning

- HR needs to develop job descriptions
- Management needs to identify possible belt candidates

■ Doing

- Select people who are enthusiastic about new role
- Consider people who have a quality / process mentality and have shown leadership potential
- Report project status to champions once a week
- Reallocate resources to free up belts from previous duties

■ Checking

- Review number of belts and the need for more

Example Six Sigma Implementation at Two Divisions of a Company

- Mid-size company
- Provides services in the healthcare industry
- Corporate President was enthusiastic about Six Sigma
- Two divisions launched Six Sigma



Bullet Points and Abbreviations

Bullet Points

↑ Good Idea

↓ Bad Idea

→ Neutral Idea

Abbreviations

SS = Six Sigma

BB = Black Belt

GB = Green Belt

MBB = Master Black Belt

The Story of the Two Divisions

Division One

- ↓ Part-time; no lessening of workload
- ↓ Bosses from different divisions selected candidates
- ↓ Required to be a BB

Division Two

- ↑ Job function was being a BB
- ↑ Had displayed quality interest
- ↑ Wanted to be a BB



Tactical Implementation Issues

- Review format
- Number of belts
- Selection of key processes
- Goal setting



Planning / Doing / Checking Tactical Issues

■ Planning

- Management team decides key process, metrics, goals, projects
- Select people (belts) to match projects
- Establish review plan for each stage of projects
- Create Scorecards to monitor goals

■ Doing

- Communicate goals to teams
- Conduct reviews in non-threatening manner
- Ensure goals match customer requirements
- Ensure process owners are part of the projects



Planning / Doing / Checking Tactical Issues - Continued

■ **Checking**

- Review team charters
- Review baseline results from projects to see how they relate to goals

The Two Divisions



Division One

- ↓ Reviewed only when Division president asked for an update
- 14 people selected
- ↑ Projects were selected from management's SS planning session
- ↓ No division goals were set

Division Two

- ↑ Reviewed at the end of each phase with mentors
- ↑ 2 people selected
- ↑ Projects were selected from management's SS planning session
- ↑ Specific division goals were set for cycle times and rework



Financial Issues

- Validation of financial savings
- Hard vs. soft dollars
- Budget for preparation
- Rewards for success

Planning / Doing / Checking for Financial Issues

■ Planning

- Budget for projects
- Include finance people in training plans
- Develop rewards / recognition strategy

■ Doing

- Include finance people on project teams
- Include financial reviews in D,M,I,C stages
- Give rewards and recognition in timely manner

Planning / Doing / Checking for Financial Issues - Continued

■ **Checking**

- Review original goals to achieved goals
- Ensure rewards given are consistent with results

Examples of Six Sigma Implementation – For Two Companies

- First company: Large information technology company



- Second company: Large manufacturing company



The Two Companies



IT Company

- ↑ Finance department validated results
- ↓ Did not get any benefit for soft dollars
- ↓ No reward for achieving BB status or project completion
- ↓ Declared BB's as the only people who could be future Vice Presidents

Manufacturing Company

- ↑ Finance department validated results
- ↑ Percentage of soft dollars designated as benefits
- ↑ Received minimum set dollar amount for project completion plus additional amount based on results



Communication

- Communication methods
- Communication frequency
- Target audience
- Enthusiasm
- Involvement

Planning / Doing / Checking for Communication

■ Planning

- Develop communication plan to include all levels of the organization, suppliers and customers
- Decide the participation level required of organizational groups

■ Doing

- Communicate often
- Ensure communication is consistent, constructive and consistent
- Allow for as much involvement as possible

■ Checking

- Provide method for people to give feedback

The Two Divisions



Division One

↓ No
communication
strategy

Division Two

- ↑ All-employee meetings showcased SS efforts
- ↑ Posters around business displayed project success
- ↑ Newsletter discussed SS
- ↑ Division president consistently showed enthusiasm
- ↑ Everyone was encouraged to participate in teams



Six Sigma Methodology - DMAIC



DMAIC Methodology

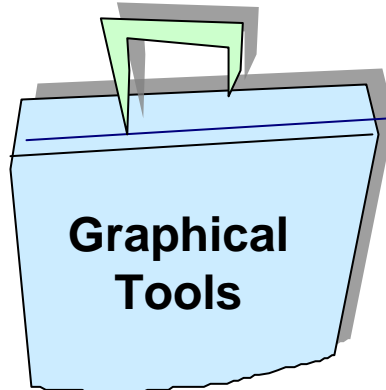
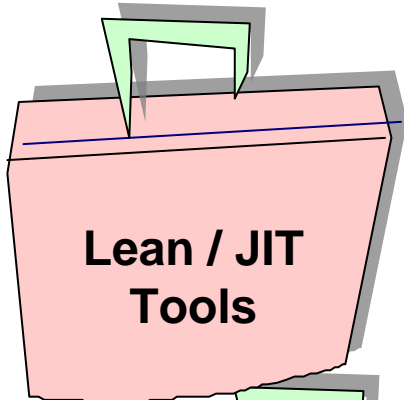
- Training for DMAIC
- Selecting / conducting projects for DMAIC



Planning for Training

- Assess skill levels of people and compare to those required
- Providing projects for learning
- Assess people for the ability to succeed

Tools



Summed
together
=





Project Management Tools

- Charter
- Team Building Skills
- Communication Plan
- Project Plan
- Leadership

Graphical Tools

- Used to establish potential causes of problems
 - Histograms
 - Box Plots
 - Pareto Plots
 - Scatter Plots
 - Multivari Charts



Statistical Tools

- Used to VALIDATE causes of problems
 - Comparative Methods
 - Regression
 - Sources of Variation
 - Design of Experiments



Lean / Just-in-Time Tools

- Value Added Analysis
- Poka-yoke
- Value Stream Mapping
- 5s
- Process Leveling
- Standardized Work



Basic Quality Tools

- Process Maps
- Cause and Effect Diagrams
- Control Charts

Training for Black Belt

- Project management
- Change acceleration
- Presentation skills
- Creative thinking
- Statistical tools – intermediate level
- Team building



Example Daily Activities for a Black Belt

- Lead a project meeting
- Help a GB determine the right tool to use
- Evaluate new project ideas
- Conduct statistical analysis
- Present improvement ideas to management
- Meet with Champion to update project progress
- Meet with Process Owner to sell improvement project idea



Training for Green Belt

- Process driven thinking
- Basic problem solving skills
- Basic statistical skills
- DMAIC methodology



Example Weekly Activities for a Green Belt

- Attend a Black Belt meeting
- Lead a team that is an off-shoot of a BB team
- Collect data
- Meet with Champion to report progress on project
- Meet with BB to propose project idea



Training for an Master Black Belt

- Leadership
- Financial
- Mentoring skills
- Advanced statistical tools
- Team facilitation skills

+ Training for Black Belt



Example Daily Activities for a Master Black Belt

- Attend a meeting as facilitator for a team that is not working well
- Update financial projections for current SS teams
- Identify people for training
- Meet with upper management on corporate goals
- Identify key processes and process owners
- Help a BB with more complex statistical analysis

Training for Champions

- Leadership skills
- Mentoring skills*
- DMAIC methodology overview
- Process driven thinking
- Change acceleration

** Dissertation research from “A Case Study Analysis of the Effects of Six Sigma Mentoring on Project Success” by Alice Gobeille (2006) shows that mentoring has a strong influence on project success.*



Example Weekly Activities for a Champion

- Meet with key stakeholders to promote BB's improvement ideas
- Monitor key process indicators
- Meet with BB to review project obstacles
- Attend a SS strategy meeting



Doing the Training

- Start small
- Ensure that trainers have skills to train – not just the knowledge of the topic
- Provide coaches to employees

The Two Divisions



Division One

- ↓ Trained 14 BB, one dropped out
- ↓ BB's were chosen, didn't volunteer
- ↑ Each person had a project to work on
- ↓ Had no mentor to go to
- ↑ Hired Motorola to do the training

Division Two

- ↑ Trained 2 BB
- ↑ BB's volunteered
- ↑ Each person had a project to work on
- ↑ Had experienced BB for mentoring
- ↑ Attended the same Motorola training



Checking that the Training Went Well

- Provide ways to test (certification)
- Assess the use of different training topics
- Check on project results

The Two Companies



IT Company

- ↓ Students required to take test on the last day of class
- ↓ Test took over 16 hours
- ↓ Required to do in one sitting
- Made up own test
- ↑ Required students to interpret analysis results
- ↓ Students only knew Pass/Fail Results

Manufacturing Company

- ↑ Students took test at their own pace
- ↑ Test took 8 hours
- ↑ Could do in multiple sessions
- Hired Motorola to do the testing
- ↓ Didn't require students to interpret analysis results
- ↑ Students could see which answers they missed

Project Selection Criteria

- Project goals support important business goals
- Resources are available
- Management supports / is enthusiastic about project
- No solution is known
- Data are available or could be available
- Will produce a strong financial impact
- Can be done in 2-6 months





Planning for the Right Projects

- The keys to having a successful project are:
 - Establishing that the project is a business priority
 - Understanding the true requirements for the process
 - Using data to tell the story
 - Picking the right tool for the right situation
 - Communicating the project goals, accomplishments and successes
 - Building credibility and support for the project
 - Having sufficient resources to support the project



Common problems with project selection

- Taking on too big a project for the timeframe
- Assigning a project where the solution is known or proposed
- Selecting a problem where a process doesn't exist
- Selecting a problem that has never been solved before but has been attempted several times

The Two Divisions



Division One

- Projects were in the area of expertise
- ↓ Projects were understaffed; one project only had the BB assigned to it

Division Two

- Projects were not in the area of expertise
- ↑ Projects were supported at every level
- ↑ Projects were self-contained with reasonable goals

The Two Companies



IT Company

- ↓ BB's selected their own projects
- ↓ Projects were large
- ↓ Goals were required be at least \$250k USD
- ↓ Projects did not have appropriate staff

Manufacturing Company

- ↑ Projects were selected with management and MBB
- ↑ Projects were well-contained
- ↑ Goals were set at over \$100k USD or were high business priorities
- ↑ Projects usually had both a GB and a BB

Doing a Project

- Select the right person to lead
- Have two SS people work on project where possible
- Ensure that key stakeholders have bought in
- Establish a communication plan
- First meeting: Champion attends, review of SS methodology, team guidelines set, develop charter



Checking that the Project is Going Well

- Review with Champions happen on frequent basis
- Feedback from key stakeholders solicited and reviewed

Project Evaluation*

- Evaluate how project affected:
 - Money saved or gained
 - Time saved
 - Affect on customer
- Evaluate Three stages:
 - Project definition
 - Project execution
 - Project delivery

** From "Importance of Training Content for Six Sigma Professionals: Perceptions of Black Belt Trainers", dissertation written by Bruce DeRuntz (2005)*

The Two Divisions



Division One

Division Two

↓ Project reviews only occurred when the President asked for updates

↓ Champions of projects rarely asked about the projects

↑ Project reviews occurred with the BB mentor at timed intervals

↑ BB's met with the Champions bi-weekly

The Two Companies



IT Company

↓ BB's were never asked about progress

Manufacturing Company

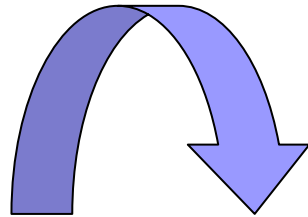
↑ BB's went through tollgate reviews with management at the end of each phase

↑ MBB reviewed analysis as project progressed



Six Sigma Metrics

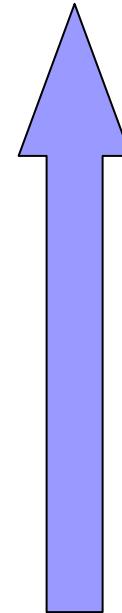
Garbage In – Garbage Out



Having valid
metrics can
make or
break a
project

Sigma Quality Scale

DPMO	Sigma
3.4	6
230	5
6200	4
66800	3
308500	2
691500	1



**More
complex
tools**



Typical Project Metrics

- Cycle time
- Defects
- Cost
- Scrap
- Efficiency
- Accuracy
- Sales volume



Good Metrics are....

- Focused on the customer
- Focused on key issues
- Recognize variability – not just the mean
- Valid
- Reviewed over time



Metrics for Six Sigma Implementation

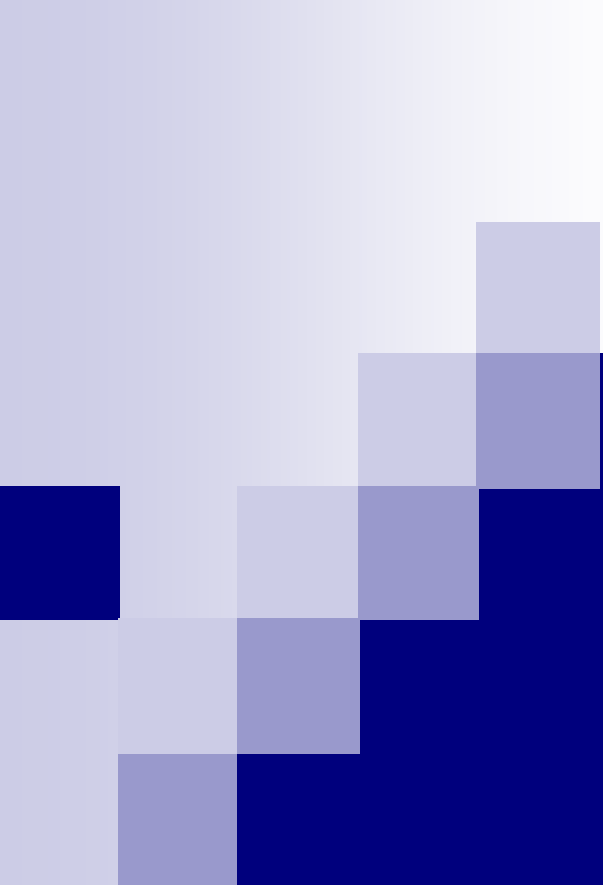
Some suggested areas to monitor with examples:*

- Leadership and Profitability (*ROI, Profitability*)
- Management and Improvement (*Rate of Improvement*)
- Employees and Innovation (*Recommendations per Employee*)

Metrics for Six Sigma Implementation

- Continued

- Purchasing and Supplier Management (*Total Spent / Sales*)
- Operational Execution (*Operational Cycle Time; Defect Rate*)
- Sales and Distribution (*New Business Dollars / Total Sales Dollars*)
- Service and Growth (*Customer Satisfaction; Customer Retention*)



The End of Our Story

The End of the Story of the Two Divisions



Division One

- President of company retired
- Division president never found SS worthwhile
- Six Sigma efforts died
- Two of the 10 teams finished their project
- Four of the original group went to use skills at other companies
- SS training is just a fond memory

Division Two

- President of company retired
- President of division had always been a huge supporter of SS
- Six Sigma continues today
- BB's finished their projects for certification and continue to work on projects today
- Being on a SS team is considered an honor

The End of the Story for the Two Companies

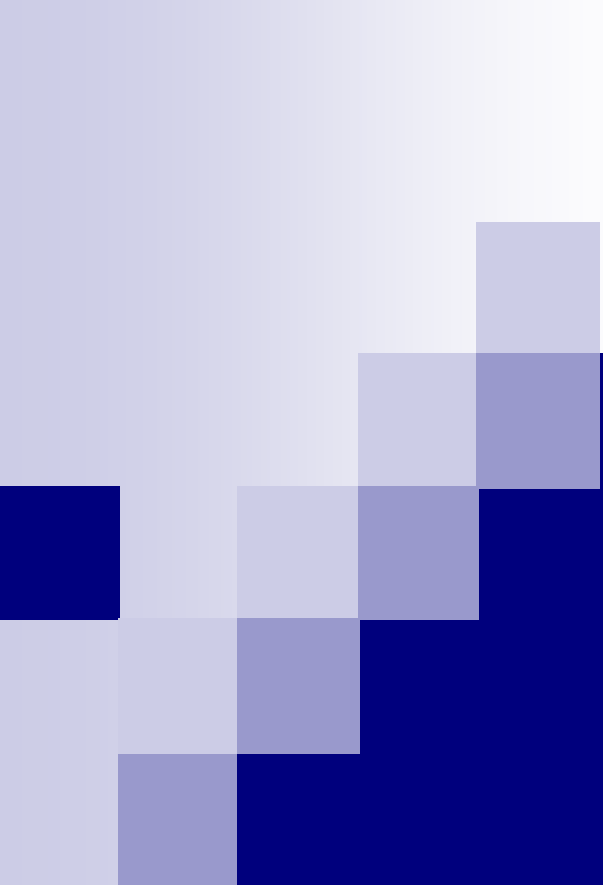


IT Company

- Two years after launching SS – no one had been certified

Manufacturing Company

- Three years after launching SS, projects have been completed by all BB's and most GB's
- Average GB + \$268k (range from \$20k to \$641k)
- Average BB = \$643k (range from \$450k–\$880k)



Six Sigma Misconceptions or Mistakes



Six Sigma Misconceptions or Mistakes

- We need to train lots of people right away
- Six Sigma projects need to take a long time
- Black Belts are an elite group with a secret language
- We should give the BB a project with a goal that no one has been able to achieve



Six Sigma Misconceptions or Mistakes - Continued

- Launching a SS project with the goal of reducing head count
- Thinking that the statistical analysis will be the hard part of the project
- SS can only be applied in manufacturing
- SS can only be applied in high volume businesses



Six Sigma Misconceptions or Mistakes - Continued

- Thinking that training is the end – not the means
- Asking how many BB's and GB's should we train
- Calling it “Six Sigma” doesn't make it Six Sigma
- Calling it something else, doesn't make it less Six Sigma

Research on Critical Success Factors*

- Previous adoption of SPC or Lean has a moderate influence on success
- CEO's enthusiasm, full and continued support, highly visible support has strong influence on success
- Project selection has strong influence on success,
- Education level, engineering background is not important

**From "Critical Success Factors of Six Sigma Implementation and the Impact on Operations Performance", dissertation written by Kuo-Liang Lee (2002)*

Research on Critical Success Factors

- Continued

- However, BB with project management skills, managing teams, communication skills, ability to inspire others to excel and being a good presenter are very important
- New BB's can be as successful as experienced BB
- Full-time is not significantly different from part-time BB's (as judged by costs) but have higher completion rates
- Teamwork training, project management training, problem solving training are equally important to statistical tool training



Research on Critical Success Factors

- Continued

- Customer complaints, customer retention and warranty claims are improved after SS implementation
- There is a positive change in employee attitude
- No difference between large and small, medium sized companies in SS success
- Frequency in communication between Champion and BB has significant impact on success



What a Six Sigma Company Means to Me

- An organization that uses data, where feasible, to make decisions
- With well-supported projects, whether it has one project or 100 going on at one time
- With a focus on the customer and financial results

Assessment of a Six Sigma Implementation

- Key stakeholders / management support SS efforts 1 2 3 4 5
- Key stakeholders / management set goals that are related to business objectives 1 2 3 4 5
- SS way of thinking is evident in how we do everything 1 2 3 4 5
- SS efforts are funded – not just the training 1 2 3 4 5

**1 = Not Doing; 2 = Doing Poorly; 3 = Doing a Fair Job;
4 = Doing a Good Job; 5 = Doing an Excellent Job**

Assessment of a Six Sigma Implementation - Continued

- Our suppliers are part of our SS efforts 1 2 3 4 5
- Our customers are part of our SS efforts 1 2 3 4 5
- We regularly get feedback from our customer chain and incorporate that feedback into our goal setting 1 2 3 4 5
- Everyone in the organization understands the corporate goals 1 2 3 4 5
- We share SS successes within the organization 1 2 3 4 5

Assessment of a Six Sigma Implementation - Continued

- People know where to go for support in their SS efforts 1 2 3 4 5
- We have an organized method for project selection 1 2 3 4 5
- Using data to make decisions is part of the way we do business, as well as part of our projects 1 2 3 4 5
- Rewards and Recognitions have been identified 1 2 3 4 5