SIX SIGMA CONCEPT AND DMAIC IMPLEMENTATION

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SIX SIGMA CONCEPT AND DMAIC IMPLEMENTATION

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ABSTRACT

Six Sigma is an industry-accepted and proven methodology used for business process improvement. This methodology helps an organization achieve a superior performance and improved profitability, and is very effective for service-based businesses as well as those that are product-related. The Six Sigma program applies several specialized skill sets to streamline operations including process analysis, statistical measurement, and group facilitation.

KEYWORDS: History, Process, Methods, Belts, Green Belts, Black Belts, Master Black Belt

INTRODUCTION

Six sigma is a statistical measure of variation. The full six sigma equals 99.9997% accuracy. Six sigma is a methodology for improving key processes. Six sigma is a "tool box" of quality and management tools for problem resolution. a business philosophy focusing on continuous improvement. It is an organized process for structures analysis of data.Type

HISTORY

Motorola is the first company to developed the six sigma methodology in mind 1980`s as a result of recognizing that products with high first pass yield rarely failed in use.

Statistical term dates back to the 1800`s (carl Frederick gauss)

PROCESS OF SIX SIGMA

Everything we can do can be considered a process or part of a process. Every process can be characterized by:

- Average performance

- Variation

Process is performing optimally when the result of the process is at the expected value (meaning there is minimal variation).
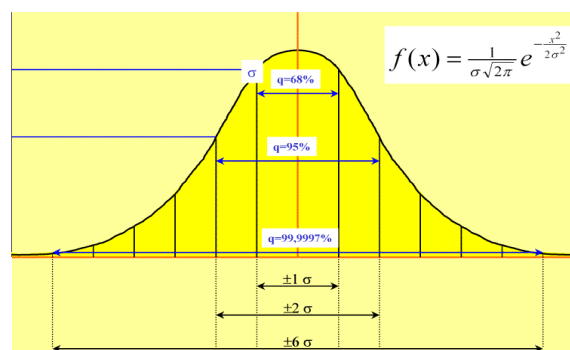

Figure 1: Level of Six Sigma

SIX SIGMA METHODOLOGY

The Six Sigma DMAIC (Define, Measure, Analyze, Improve, and Control) methodology can be thought of as a roadmap for problem solving and product/process improvement. Most companies begin implementing Six Sigma using the DMAIC methodology, and later add the DFSS (Design for Six Sigma, also known as DMADV or IDDOV) methodologies when the organizational culture and experience level permits.

While the DMAIC methodology presented below may appear linear and explicitly defined, it should be noted that an iterative approach may be necessary – especially for Black Belts and Green Belts that are new to the tools and techniques that make up DMAIC. For instance, you may find that upon analyzing your data (Analyze phase) you did not gather enough data to isolate the root cause of the problem. At this point, you may iterate back to the Measure phase. In addition, prior knowledge of the tools and techniques is necessary in determining which tools are useful in each phase. Remember, the appropriate application of tools becomes more critical for effectiveness than correctness, and you don't need to use all the tools all the time.

Figure 2: Methods of Six Sigma

Define

The Define Phase is the first phase of the Lean Six Sigma improvement process. In this phase, the leaders of the project create a Project Charter, create a high-level view of the process, and begin to understand the needs of the customers of the process. This is a critical phase of Lean Six Sigma in which your teams define the outline of their efforts for themselves and the leadership (executives) of your organization.

Table 1: Phases and Tools in Define

DMAIC Phase Steps	Tools Used
D – Define Phase: Define the project goals and customer (internal and external) deliverables.	
Define Customers and Requirements (CTQs)	Project Charter
Develop Problem Statement, Goals and Benefits	Process Flowchart
Identify Champion, Process Owner and Team	SIPOC Diagram
Define Resources	Stakeholder Analysis
Evaluate Key Organizational Support	DMAIC Work Breakdown Structure
Develop Project Plan and Milestones	CTQ Definitions
Develop High Level Process Map	Voice of the Customer Gathering

Measurement

Measurement is critical throughout the life of the project and as the team focuses on data collection initially they have two focuses: determining the start point or baseline of the process and looking for clues to understand the root cause of the process. Since data collection takes time and effort it's good to consider both at the start of the project.

Table 2: Phases and Tools in Measure

DMAIC Phase Steps	Tools Used
M – Measure Phase: Measure the process to determine current performance; quantify the problem.	
Define Defect, Opportunity, Unit and Metrics Detailed Process Map of Appropriate Areas Develop Data Collection Plan Validate the Measurement System Collect the Data Begin Developing Y=f(x) Relationship Determine Process Capability and Sigma Baseline	Process Flowchart Data Collection Plan/Example Benchmarking Measurement System Analysis/Gage R&R Voice of the Customer Gathering Process Sigma Calculation

Analyze

This phase is often intertwined with the Measure Phase. As data is collected, the team may consist of different people who will collect different sets of data or additional data. As the team reviews the data collected during the Measure Phase, they may decide to adjust the data collection plan to include additional information. This continues as the team analyzes both the data and the process in an effort to narrow down and verify the root causes of waste and defects.

Table 3: Phases and Tools in Analyse

DMAIC Phase Steps	Tools Used
A – Analyze Phase: Analyze and determine the root cause(s) of the defects.	
Define Performance Objectives Identify Value/Non-Value Added Process Steps Identify Sources of Variation Determine Root Cause(s) Determine Vital Few x's, Y=f(x) Relationship	Histogram Pareto Chart Time Series/Run Chart Scatter Plot Regression Analysis Cause and Effect/Fishbone Diagram 5 Whys Process Map Review and Analysis Statistical Analysis Hypothesis Testing (Continuous and Discrete) Non-Normal Data Analysis

Improvement

once the project teams are satisfied with their data and determined that additional analysis will not add to their understanding of the problem, it's time to move on to solution development. The team is most likely collecting improvement ideas throughout the project, but a structured improvement effort can lead to innovative and elegant solutions

Table 4: Phases and Tools in Improve

DMAIC Phase Steps	Tools Used
I – Improve Phase: Improve the process by eliminating defects.	
Perform Design of Experiments Develop Potential Solutions Define Operating Tolerances of Potential System Assess Failure Modes of Potential Solutions Validate Potential Improvement by Pilot Studies Correct/Re-Evaluate Potential Solution	Brainstorming Mistake Proofing Design of Experiments Pugh Matrix QFD/House of Quality Failure Modes and Effects Analysis (FMEA) Simulation Software

Control

This phase is a mini version of process management. The team has been building a form of infrastructure throughout the life of the project, and during the Control Phase they begin to document exactly how they want to pass that structure on to the employees who work within the process.

Table 5: Phases and Tools in Improve

DMAIC Phase Steps	Tools Used
C – Control Phase: Control future process performance.	
Define and Validate Monitoring and Control System Develop Standards and Procedures Implement Statistical Process Control Determine Process Capability Develop Transfer Plan, Handoff to Process Owner Verify Benefits, Cost Savings/Avoidance, Profit Growth ,Close Project, Finalize Documentation Communicate to Business, Celebrate	Process Sigma Calculation Control Charts (Variable and Attribute) Cost Savings Calculations Control Plan

SIX SIGMA BELTS

These belts are based on level of competence in understanding and applying related tools.

- Green belt

- Black belt

- Master Black belt

Actual definitions and competencies for each belt can vary by organization and institutions

Green Belt

This green belt is a basic analytical tools, it will be works on less complex projects

Black Belt

In this black belt emphasis on application and analysis, work projects with help from green belts.

Master Black Belt

It is mainly used to understand applications and statistical theory behind applications, trains other belts, and leads project reviews.

SUMMARY

Six sigma is amazing what can be known when we look at data differently. DMAIC is not for every project, when applied correctly;

DMAIC will produce consistently better results than most other methods.

In this sig sigma method is the new culture at much organization today. It will be very marketable and six sigma approach works.

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