

DMAIC Method

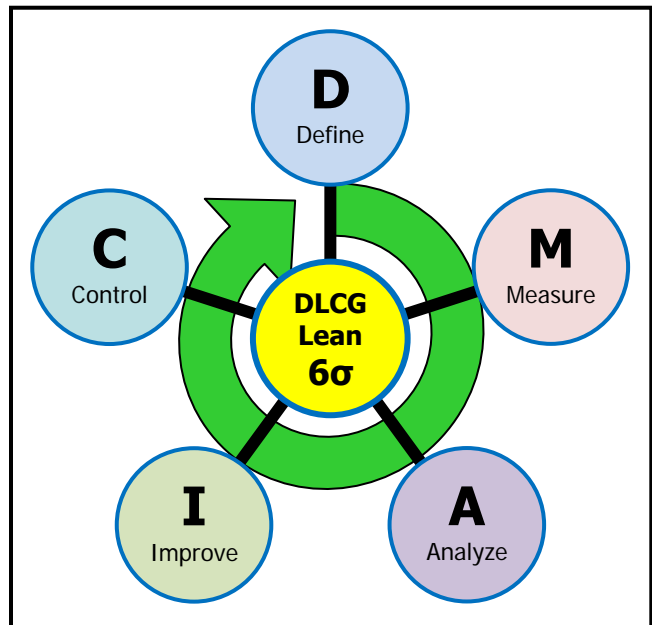
Background: Lean Six Sigma consists of several proven methods brought together to form a more complete Quality Management System. Six Sigma uses two key methodologies: DMAIC and DMADV, both inspired by Deming's Plan-Do-Check-Act Cycle. DMAIC (pronounced Deh-may-ihk) is used to improve an existing business process while DMADV is used to create new product or design new processes.

The DMAIC method is named after the acronym that represents the five steps of the Six Sigma improvement methodology: **Define, Measure, Analyze, Improve, and Control**. Each of these high level steps represent a phase of the improvement process in which a number of activities are performed. Each step is defined as follows:

DEFINE

When going into the Define phase, the first phase of the DMAIC process, executive management has an idea of which processes are not producing the results their customers expect and have a vague problem statement. However, this is not enough to begin a Lean Six Sigma project. Since Lean Six Sigma calls for unmistakable, measurable results, the goal of the Define phase is to identify and articulate the problem in a clear and measurable way. The basic steps to the Define phase of DMAIC are as follow:

- Identify or refine the problems in your process that must be solved in order to meet or exceed the customer's specifications or expectations.
- Identify and quantify customer requirements.
- Identify and quantify the process output and defects that fall short of these requirements and create a problem statement.
- State the project goal, which also must be a clear and measurable goal, and include a time limit for the project's completion.
- Determine the few vital factors that are Critical to Quality which need to be measured, analyzed, improved and controlled.



- Create a project charter, which will contain the problem definition, goal, business case, project scope, team members, and high level project plan for the M, A, I and C phases.

MEASURE

The Measure phase is dedicated to assembling a data collection plan, executing that plan and verifying the data collection is performed properly.

- Select the Critical Quality characteristics in your process. These are the outputs of the given process that are important to the customer.
- Define what that process output should be, which is done by looking at the customer requirements and the project goal.
- Define the defect for the process. Remember, a defect is an output that falls outside the limits of customer's requirements or expectations and must be measurable.
- Find the inputs to the process that contribute to defects.
- Define the exact dollar impact of eliminating the defects in terms of increased profitability and/or cost savings.

- Measure the defects that affect the Critical Quality characteristics as well as any related factors.
- Incorporate Measurement Systems Analysis - a method to make sure the defects are being measured properly.
- Refine data collection procedures, if needed.

Once the defects have been measured, the Sigma Level for the process may be calculated and used as a baseline to compare against the improved process. Within this DMAIC phase, a statistical package, such as JMP, will drastically ease and improve the data collection and analysis to come. Once the defects have been measured and all critical data collected, figure out what is causing the problems--that is, what inputs to the process, as well as parts of the process itself, are affecting the output.

ANALYZE

At this point of the DMAIC process:

- Develop hypotheses about the causes of the defects.
- Analyze the data and process by statistical and non-statistical methods.
- Prove or disprove the hypothesis. If the hypothesis is correct, add it to the short-list of causes. If not, refine it.

IMPROVE

The Improve phase is where the hard work of defining, measuring and analyzing pays off - the point where the ideas for process improvement are formulated and implemented.

- Confirm the key process inputs that affect the process outputs, causing defects.
- Identify the acceptable range of each input so the Critical Quality output stays within the specified limits.
- Adjust the process as needed.
- Plan any special measures that are needed for improvements - for example, implementation of a new or modified software system.
- Implement the changes.

- Install and validate a measurement system for the improved process.
- And verify the new process is working.

CONTROL

The final phase of the DMAIC process is Control. Lean Six Sigma calls for this step, which goes beyond improvement, and includes the control of your improved process. There are many factors that could affect the adjusted inputs and, thus, the output, so ongoing monitoring of the process to make sure it stays "in control" is critical. In most cases, this is done for a limited amount of time by the Lean Six Sigma team or the Black Belt and then handed off to the process owner. The Control process involves quality and statistical concepts that have existed for decades. However, the advent of quality control software makes the process simple enough for anyone to perform.

Application:

DMAIC is a framework methodology through which a number of tools and techniques support each step. It is important for group facilitators to become familiar with the DMAIC Method, tools and techniques so we can fully support the growing number of organizations that are applying Lean Six Sigma or other improvement methodologies.



Resources:

George, Michael (et al), Lean Six Sigma Pocket Toolbook, McGraw Hill, New York, 2005 ISBN: 0-07-144119-0

Deputy Under Secretary of the Army

Knowledge Center:

<http://www.army.mil/ArmyBTKC/focus/cpi/tools3.htm>

Stat-a-Matrix Overview of DMAIC

<http://www.statamatrix.com/sixsigmadmaic/sixsigmadmaicoverview.php>

Isnare.com Articles:

<http://www.isnare.com/?aid=338689&ca=Business+Management>