



go LEANSIXSIGMA



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## DMAIC: The 5 Phases of Lean Six Sigma

Start your journey towards increased revenue, reduced costs and improved collaboration by using Lean Six Sigma Process Improvement.

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# What is DMAIC and Lean Six Sigma?

Lean Six Sigma is simply a process for solving a problem.  
It consists of five basic phases:



**DEFINE**

Define the problem.



**MEASURE**

Map out the current process.



**ANALYZE**

Identify the cause of the problem.



**IMPROVE**

Implement and verify the solution.



**CONTROL**

Maintain the solution.

*Define, Measure, Analyze, Improve, and Control.* This process is also known as DMAIC (pronounced “duh-may-ik”), its acronym.

Lean and Six Sigma complement each other. Lean accelerates Six Sigma, delivering greater results than what would typically be achieved by Lean or Six Sigma individually.

Combining these two methods gives your improvement team a comprehensive tool set to increase the speed and effectiveness of any process within your organization – resulting in increased revenue, reduced costs and improved collaboration.

# Before Beginning DMAIC: Select the Right Projects

Before beginning any process improvement project, it's vital that you choose projects that are good candidates for improvement. A good project for improvement:

- Has an obvious problem within the process
- Has the potential to result in increased revenue, reduced cost or improved efficiency
- Has collectable data

DMAIC (Lean Six Sigma) is also a system of management that results in a steady pipeline of projects that are ready for improvement. There are obstacles to smooth operations in any business, and Lean Six Sigma provides guidelines to help you select the right projects at the right time. Once projects are selected, you and your improvement team(s) can use DMAIC to further refine the projects and deliver quantifiable, sustainable results.

*Now, on to the DMAIC process!*

# Define



## DEFINE

Define the problem.

### Define the Problem

What problem would you like to fix? 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.

### Define the problem by developing a “Problem Statement”

#### Confirm the process is causing problems.

At this stage the team should have access to some existing data that shows an ongoing problem. They will refine the data during data collection, but they must confirm that there are indications of an issue.

#### Confirm the problem is high priority and will have a high impact.

Having established the existence of a process issue, the team must create a Problem Statement. The Problem Statement includes:

- **Severity:** How big is the problem? This can consist of the percentage of the time there are errors, the number of late orders per month, etc. Be specific to put data into perspective. Specific data may not be available right away, so the team can fill in the blanks later during the Measure Phase.
- **Business Impact:** What is the pain felt by the business or why should anyone care about the solving this issue? Will solving the problem result in greater revenue or cost savings?
- **Specific Area:** What department or what units are involved?

#### Confirm resources are available.

Are there people close to the issue who can spend time working on the issue? Is there someone in a leadership position who would like to see the issue resolved? It is critical to have some form of team leader (also known as a Black Belt or Green Belt), as well as someone in a leadership position, who is called a Sponsor or Project Champion, involved with the project. Team members can come from different areas but should all have some connection to the project area.

## Define the goal by developing a “Goal Statement”

The Goal Statement should be a direct reflection of the Problem Statement. For example, if orders are 10% late, then the goal might be to cut that down to 5% late. This statement defines measurable, time-bound terms of exactly when the team and project will be considered successful.

## Define process by developing maps of the process

The team begins with the a bird’s eye view of the process, also known as a high-level process map. The classic tool here is called a SIPOC which stands for Suppliers, Inputs, Process, Outputs and Customers. This initial one-page document is used throughout the life of the project.

Once the high-level map is completed, the team can choose a key area of the process to conduct a deep dive into more process detail. This is called Detailed Mapping. This can be done in lanes representing departments, or it can be done as a simple flow-chart.

## Define your customer and their requirements

The focus of each project is the customer of the process. The customer is defined as the individuals or groups who receive the goods or services of the process. Customers can be external to the organization or an internal component of the organization.

During the Define phase, the team must contact customers to better understand their requirements of the process, or the “Voice of the Customer.” After interviewing or surveying customers, the team must translate that information into measurable requirements that will give the team insight on how to improve the process or solve the problem.

# Measure



## Map Out the Current Process

How does the process currently perform? 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.

## Determine how the process currently performs

First, your team must establish the current state, or the “baseline” of the process before making any changes. The baseline becomes the standard against which any improvement is measured. This is a key step as the data collected will be used throughout the life of your project.

## Look for what might be causing problem

To do this, your team collects data and reviews it to try to uncover the reasons, or the “root cause” for [Waste](#) in the process or defects as a result of the process.

## Create a plan to collect the data

Once the team has determined how to find both baseline and root cause data, they must consider where to get the data, how much to get and who will do the collecting. A well-thought out data collection plan is critical as the data that is gathered must be accurate and reliable.

## Ensure your data is reliable

By defining, testing and refining their measurements throughout the life of the project, the team will be able to make good decisions on sound information. This ensures future corrective action is based on facts and data, rather than assumptions and opinions.



## Update your project charter

Once the team has conducted their initial data collection they will have more details around process performance, potential causes and potential goals. This data is incorporated into the Charter to more accurately describe the issue.

# Analyze



## ANALYZE

Identify the cause of the problem.

### Identify the Cause of the Problem

What does your data tell you? 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.

### Closely examine the process

After creating, verifying and examining detailed process maps created in the [Measure Phase](#), the team will be able to list concerns or pain points within the process. This allows the team to take advantage of the collective wisdom of process participants. Then, the team can determine the value of each step by performing analyzing the process by performing “Process Analysis” which consists of:

- “[Time Analysis](#)”: focuses on the actual time work is being done in the process in versus the time spent waiting. What teams discover is that whereas people are 99% busy, “things” are 99% idle.
- “[Value Added Analysis](#)”: adds another dimension of discovery by looking at the process through the eyes of the customer to uncover the cost of doing business.
- “[Value Stream Mapping](#)”: combines process data with a map of the value-adding steps to help determine where [Waste](#) can be removed.

### Visually inspect the data

After data collection, the team will be able to display the data using charts and graphs for visual indications for problems in the process. The transformation of numbers into visuals allows the team to easily communicate their findings to leadership and other process participants.

## Brainstorm potential cause(s) of the problem

Teams are able to develop theories around possible causes of the problem by brainstorming together. By using a tool called a “[Cause & Effect Diagram](#)”, the teams are able to perform structured brainstorming that can help them narrow down to the vital few causes of lost time, defects and waste in the process.

## Verify the cause(s) of the problem

Before moving on to the next phase (Improve), the team must confirm the proposed root cause is creating the problem by verifying their data through process analysis, data analysis, process observation and comparative analysis.

## Update your Project Charter

After the team has further investigated the data, they will have additional detail around process performance and the potential for improvement. The team can update their Charter with the additional information so they have a more accurate reflection of the project status.

# Improve



## IMPROVE

Implement and verify the solution.

### Implement and Verify the Solution(s)

How will you fix the problem? 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.

### Brainstorm solutions that might fix the problem

The team's efforts at this stage are to produce as many ideas as possible based on the idea that from Quantity, comes Quality. Creative idea generation consists of a host of techniques intended to lead the team to out-of-the-box solutions.

### Select the practical solutions

In many cases, a project team can employ a list of improvements to their processes, but when they are forced to choose between conflicting options, there are tools like the "Weighted Criteria Matrix", which helps your team make the best decision.

### Develop maps of processes based on different solutions

With solutions in mind to reduce rework loops, waste and wait times, the team can draw an improved map of the process, also known as "To-Be Maps." These new maps are helpful in guiding the team's efforts toward the new process, and can be used as a reference for new employees as they are trained on the new process.

### Select the best solution(s)

In order to ensure the right decision is made, the team may employ mini testing cycles known as "PDCA" or Plan Do Check Act, which can help refine the ideas while collecting valuable stakeholder feedback. These cycles are a great way to find out if small improvements are viable in a fast and low impact way.

## Implement the solution(s)

Accomplishing successful implementation requires careful planning. The team must consider logistics, training, documentation and communication plans. The more time the team spends on planning, the faster they reach total adaptation to the improvements by their process participants.

## Measure improvement

Once the team is able to show that the solution has resulted in measurable improvement, then the team can move on to the [Control Phase](#).

# Control



CONTROL

Maintain the solution.

## Maintain the Solution(s)

How do you sustain the newly achieved improvement? 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.

## Continuously improve the process using Lean

### principles

The four principles of Value, Flow, Pull and Perfection should remain a constant focus for every organization. As Continuous Improvement teams hand over the results of each project, they must make efforts to relay this focus to the employees using the newly improved process. The process can always be improved.

- **Value:** Determine what steps are required (are of “Value”) to the customer
- **Flow:** Remove Waste in the system to optimize the process to achieve a smoother pace
- **Pull:** Ensure the process responds to customer demand (“Pull” = want)
- **Perfection:** Continuously pursue “Perfection” within the process.

## Ensure the process is being managed and monitored properly

In order to maintain this focus, the team must narrow down the vital few measurements they want to maintain for ongoing monitoring of the process performance. This monitoring is accompanied by a response plan indicating the levels at which the process should operate and what to do in the case that the process should exceed those levels. This may lead to continued process refinement.

## Expand the improved process throughout organization

At this point, the team must update their documentation: process maps, document checklists, cheat sheets, etc. The better their final documentation, the easier it will be for process participants to adopt the new way of doing things.

## Apply new knowledge to other processes in your organization

One of the ways to increase the power and “bang for the buck” of Lean Six Sigma efforts is to apply the gains from one project into other areas within the organization. This transfer of improvement ideas can come from large and small efforts but quickly multiplies the impact for each business.

## Share and celebrate your success

The sharing of project success leads to greater momentum of change within the organization. Even if the project cannot be transferred to other areas, there may be parts of it that could be adapted and shared. The marketing and publicizing of each success increases the speed with which future gains can be realized. Lean Six Sigma success drives more success.

# About Go Lean Six Sigma



**Go Lean Six Sigma** is dedicated to helping small- and medium-sized businesses (SMBs) increase revenue, reduce costs and improve collaboration in today's increasingly competitive economy.

For more information, please contact us at [contact@goleansixsigma.com](mailto:contact@goleansixsigma.com).