

DMAIC Failure Modes

DON'T WASTE
DMAIC'S
USEFULNESS
ON THE WRONG
PROBLEMS.

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Six Sigma has penetrated a wide range of settings, including small, medium and large organizations in manufacturing and service industries such as hospitality and banking.

To create initial acceptance and commitment across organizations for a true Six Sigma journey, success of the first few high potential projects is critical. As all these projects are based on the define, measure, analyze, improve and control (DMAIC) approach, the role played by DMAIC in gaining the overall success of Six Sigma is equally critical. In fact, in such situations DMAIC can be viewed as a marketing tool.

DMAIC is the one of the basic elements of Six Sigma. Even those who have attended only a four-hour Six Sigma overview training module are aware of its fundamentals. Ample reading material is available to understand DMAIC in depth, so this article will focus on actual experiences related to some of the key failure modes associated with the DMAIC methodology and effective countermeasures to overcome the failure modes (see Table 1).

Solving Pseudo Problems With DMAIC

DMAIC is an effective problem solving methodology that has evolved over time as the first cousin of total quality management's (TQM's) plan-do-check-act cycle. The true value of DMAIC can be realized only when it is used to identify root causes for problems and derive solutions to overcome the root causes.

One of the most common failure modes for DMAIC is when it is used in situations in which either the root causes are obvious or the problem is trivial. Such problems are referred to as pseudo problems, and solving them using DMAIC will neither justify the investments of time or effort nor utilize the best of DMAIC.

Table 1. **DMAIC Failure Modes**

S#	Failure mode	Countermeasure
1	Pseudo problems spotted in process with high detectability.	Use quality control story approach of total quality management for small problems.
		Trim off analyze in DMAIC and use DMIC to solve pseudo problems.
		Strategically focus on lean techniques before starting a serious Six Sigma program.
2	Pseudo problems due to absence of business process management system (BPMS).	Champions and Master Black Belts (MBBs) focus on creating BPMS as a first step in Six Sigma deployment.
3	Lack of control in completed DMAIC projects.	MBBs conduct audits on completed projects.
4	Acute focus on cost reduction.	Champions and MBBs include the suggested three questions in the project selection approach.
5	Inappropriate use of DMAIC.	MBBs check for inappropriate usage of DMAIC in project selection and other tollgates.
		Globally standardized Six Sigma program.

Pseudo problems can be spotted in:

- Processes with high detectability of defects.
- Processes lacking a business process management system (BPMS).
- Processes lacking control of already completed projects.
- Projects that focus on cost reduction rather than customer impact.

Readers should appreciate that the inappropriate use of DMAIC is very different from solving pseudo problems. When DMAIC is used in situations other than problem solving, we refer to it as inappropriate use, but pseudo problems are actual problems that need to be solved but do not require DMAIC.

Processes With High Detectability of Defects

In processes with high detectability, inputs and outputs are in a state of control. Hence, there will be a proven reaction plan, and all managers have to do is execute it.

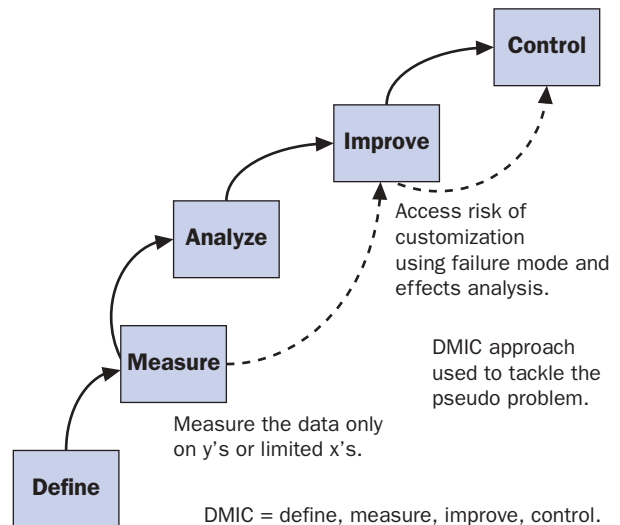
A manufacturer assembles small engines by joining two pieces of the crankcase with screws. Oil leakage between the joined crankcases is detected in the assembly line inspection. If there is a time pattern in the occurrence of leakage, the obvious solution is to revisit the tool change frequency at the crankcase surface finishing stage or the torque of the automatic tightening tool.

Because the solution to this problem is well proven and obvious, we would refer to this as an example of a pseudo problem. But, organizations anxious to prove Six Sigma works might run a full-fledged DMAIC project to solve this pseudo problem.

Assuming the process engineers are ignorant of these obvious root causes, a structured thought process is more than sufficient to solve this problem. TQM's QC story is one such structured thought process. It describes the problem statement, initial status, analysis plan and results, approaching the problem like an orthodox investigator or detective conducts an investigation.

If the Champions think the organization is strategically aligned to Six Sigma and introducing TQM is

Figure 1. **DMAIC vs. DMIC**



inappropriate, the other countermeasure will be to trim off the analyze phase of DMAIC, creating DMIC. Strong advocates of Six Sigma may not really like this idea, but they should appreciate the big picture of Six Sigma—to align to customers and improve processes. DMAIC and projects are merely enablers to achieving this goal.

Figure 1 differentiates between DMAIC and DMIC. Probable risk associated with DMIC is taking problems for granted and bypassing problem analysis all together. However, a good Master Black Belt (MBB) should be able to evaluate the real need for tool/analysis vs. forcefully fitted tools.

Apart from the DMIC approach, it is also worthwhile to focus strategically on adapting lean techniques before even attempting Six Sigma. While it is not within the scope of this article to discuss on how to combine lean and Six Sigma, you should appreciate the common goals—reducing variation, eliminating waste and removing irrationality.

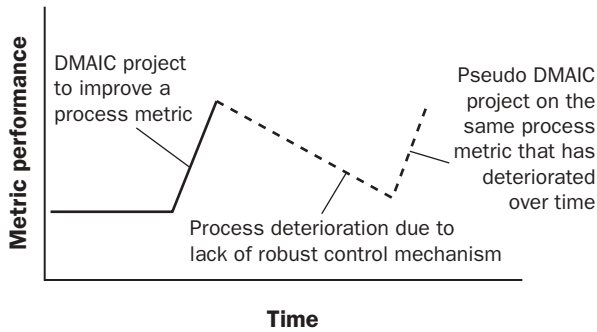
On the other hand, lean takes an inductive approach, while Six Sigma takes a deductive approach toward process improvements. If blended well, they will go a long way.

Processes Lacking a BPMS

A BPMS is the foundation of a strong metrics based organization. Ingredients of a BPMS include:

- Identification of critical inputs and outputs for given processes.

Figure 2. **How Loss of Control Leads To Pseudo Projects**



- Establishment of strong relationships between the outputs and inputs.
- Creation of an effective data collection mechanism.

In the initial phase of an organization's Six Sigma program, the focus will be on creating buy-in with project success stories. At that point, a BPMS may not exist. As a result, projects in the initial phases of the Six Sigma program usually will prove the obvious relationships between the outputs (y's) and inputs (x's) in the analyze phase of the DMAIC project. While such projects may be deemed successful, they merely create a negative impression on the part of middle management.

For example, reduction of employee overtime (y) is usually a function of a manager's effectiveness, cross functional training, effective resource deployment and utilization, capability of equipment and technology (x's). Unless the overtime issue is acute and correlation of it to any of the x's is minimal, there is no need for a DMAIC project.

To counter this problem, organizations implementing Six Sigma should create a BPMS before focusing process improvements.

Processes Lacking Control Of Already Completed Projects

Another common source of pseudo problems is lack of control or incomplete control of completed Six Sigma projects. Especially when the senior management pushes Six Sigma hard, middle managers will quickly want to get into the act. There will be a rush to complete Green Belt (GB) projects before the next annual performance appraisals.

In the absence of a robust project identification mechanism, projects completed some time ago would

Figure 3. **Project Audit Sheet Sample**

Green Belt (GB)/Black Belt (BB) project audit sheet				
Name of GB/BB:				
Project title:				
Project critical to quality:				
Month of completion:				
Attach hard copy of improvement plan and control plan.				
Attach updated control chart as per control plan.				
Add comments/issues you want to highlight.				
Audit observations:				
Number	Observation (to be filled by auditors)	Action recommended (To be filled by the GB/team leader)	Responsibility	Target date

be initiated again with minor changes in the scope or with an idea to revamp an old Six Sigma project because the benefits have stopped flowing.

Figure 2 demonstrates how loss of control in completed projects leads to pseudo projects. As a countermeasure in such cases, Champions should insist process owners be on top of the project control plan. This can also be ensured if MBBs conduct quarterly audits of completed Six Sigma projects. Figure 3 is a sample of a project audit sheet.

Projects That Focus on Cost Reduction Rather Than Customer Impact

The fourth common reason for pseudo projects is stripped down Six Sigma. Many organizations today focus purely on cost reduction. It's estimated half of beginners think Six Sigma is all to do with cost reduction. While cost reduction strongly influences the bottom line, it may not have huge customer impact.

As suggested by the balanced scorecard approach, four key focus areas for any organization are:

1. Customer perspective.
2. Financial perspective.
3. Internal process perspective.
4. Learning and growth perspective.

All four focus areas are interrelated, and Figure 4 shows the linkage. Champions should remember a positive customer impact certainly drives revenues.

As a countermeasure, we suggest Champions and MBBs ask their Black Belts (BBs) and GBs the following questions to ensure DMAIC projects create positive customer impact:

- What is the problem/need/concern our customers currently have (as perceived by us)?
- How will our customers describe this problem to us? (This question allows us to know whether there is a difference between what the customers want and what we perceive.)
- How would our customers describe the benefit they would get if we solve the problem (essentially to know the underlying need to solve this problem)?

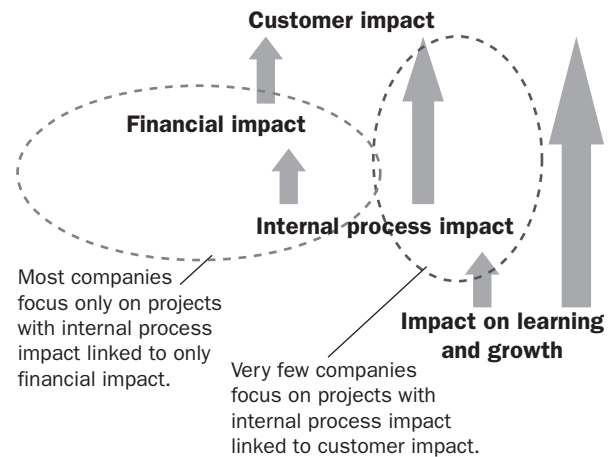
Inappropriate Use of DMAIC

While the primary objective of DMAIC is to provide an approach for solving problems, there are several other situations in which DMAIC has been misused in the past:

- Designing survey questionnaires.
- Transitioning business processes.
- Redesigning engineering components.

The use of DMAIC is not warranted in these situations. Six Sigma should not be used as a substitute for logical thinking or common sense, and such inappropriate use should be discouraged by Champions and MBBs.

Figure 4. **Interrelated Focus Areas**



As a countermeasure, MBBs should check for inappropriate DMAIC use during project selection and subsequent tollgates. But there will be subjectivity among MBBs, and some organizations may be better than others at arresting inappropriate use.

To keep the subjectivity element low, we suggest the global standardization of Six Sigma practices. This could be as simple as getting an organization's Six Sigma program ISO 9001 certified. Or, similar to the Customer Operations Performance Center's COPC-2000 standard and the Software Education Institute's Capability Maturity Model, a global certifying body for Six Sigma programs could establish and maintain

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the standards. It's only a matter of time before this occurs.

While DMAIC is simply a problem solving approach, it plays a vital role in the Six Sigma journey of every organization. But application of DMAIC is prone to several failure modes that most organizations implementing Six Sigma will encounter.

Champions and MBBs should provide strategic direction to organizations to ensure countermeasures are incorporated in the Six Sigma program before deployment. While some of the countermeasures, such as standardization, might be more complex, most of the others can be easily implemented.

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