SIX SIGMA - TECHNICAL TOOLS

This chapter gives an overview of the 10 most important technical tools, which a Six Sigma team member needs to master as they progress through the DMAIC methodology.

While these tools are considered technical in nature, most of them are relatively easy to learn and apply. They are covered in the order they are used in the DMAIC methodology.

Tool #1 - The Critical to Quality *CTQ* Tree

The critical-to-quality tree is used during the design phase of DMAIC. It is used to brainstorm and validate the needs and requirements of the customer of the process, targeted for improvement.

The steps in creating a CTQ tree are as follows:

- Identify the customer of the process targeted for improvement.
- Identify the need of the customer.
- Identify the first level of requirements of the need, that is, some characteristic of the need that determines whether the customer is happy with the need.
- Drill down to more detailed level*s* of the requirement if necessary.

Tool #2 - The Process Map:

During the Define phase, the project team creates the first of several process maps. A process map is a picture of the current steps in the process targeted for improvement.

A process map has five major categories of work from the identification of the suppliers of the process, the inputs the suppliers provide, the name of the process, the output of the process, and the customers of the process. Each of these steps is summarized as SIPOC to indicate the steps to the team that must be conducted to complete a process map.

Tool #3 - The Histogram:

This tool is used during the Analysis stage of DMAIC. The project team reviews data collected during the Measure stage of DMAIC.

It is often suggested that the data be organized into graphs or charts, which makes it easier to understand, what the data is saying about the process.

Data is of two types - Discrete data *go/nogo*, *failorpass* and Continuous data *time*, *hightetc.* .

Tool #4 - The Pareto Chart

Histogram is useful for continuous data, same way when the data is discrete, most teams create a Pareto chart. Discrete data is counted data - go/no-go, off/on, yes/no, and defect/no defect type data.

An Italian economist Vilfredo Pareto, in the sixteenth century proved mathematically that 80 percent of the world's wealth was controlled by 20 percent of the population. This 80-20 rule eventually proved applicable in arenas other than economics.

When dealing with discrete data, the project team should create reason codes for why a defect occurs, and count and categorize the data into these reason codes and a pareto chart should be prepared.

Tool #5 - The Process Summary Worksheet

The goal of a Six Sigma project team is to improve effectiveness and efficiency. Efficiency is measured in terms of cost, time, labor, or value.

The process summary worksheet is a "roll-up" of the sub process map indicating which steps add value in the process and which steps don't add value.

Tool #6 - The Cause-Effect Diagram

The most important tool to assist the project team in determining root causation is the cause-effect diagram. This tool captures all the ideas of the project team relative to what they feel are the root causes behind the current sigma performance and finally help in finding a root cause of the problem.

Tool #7 - The Scatter Diagram

Once ideas have been prioritized after use of the cause-effect diagram, the most important thing the project team does is to validate the remaining ideas with fact and data.

The scatter diagram takes an idea about root causation and tracks corresponding data, in the response the team is trying to improve. The team can validate an idea about root causation through one of the three methods. Using basic data collection, a designed experiment, or through the scatter diagram.

Tool #8 - The Affinity Diagram

An affinity diagram is used to help sort and categorize a large number of ideas into major themes or categories. It is especially useful when the team is ready to brainstorm solutions in the Improve stage of DMAIC. The steps in creating an affinity diagram are:

- Have each team member write one idea per Post-it note and post on a wall randomly.
- As ideas are read off for clarification, sort ideas into similar groups.
- Create a 'header' card for each general category of ideas below it.

Tool #9 - The Run Chart

We have discussed the histogram and Pareto chart. Think of both of these tools as similar to a camera where a snapshot of the process has been taken. But the run chart is similar to a camcorder, recording some process element over time.

Tool #10 - The Control Chart

Similar to a run chart, a control chart uses the data from a run chart to determine the upper and lower control limits. Control limits are the expected limits of variation above and below the average of the data. These limits are mathematically calculated and indicated by dotted lines.

Conclusion

We saw 10 major technical tools that project team members use during the time they are on a Six Sigma team. These are not the only tools a Six Sigma team may use. However, the tools covered here are those that are most common for every team member to be aware of and knowledgeable about.