

Granite State Section ASQ
Monthly Dinner Meeting
February 20, 2008
The Yard
Manchester, NH

The Seven-Step Problem Solving Method

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The Seven-Step Problem Solving Method

Our companies have done an inadequate job of helping people solve problems. The evidence is painful:

- Teams work for years on problems with little to show for it. Problems thought to be solved keep popping up.
- Teams jump to solutions without any data analysis to show that the root cause of the problem has been identified.
- Teams evaporate after failing to identify the problem. Attendance at meetings is poor.
- Groups *within* the same company do not know that another group has already solved a similar problem.

Help comes in the form of a standardized, disciplined approach to exploring problems, understanding root causes and implementing solutions that stick.

The Seven-Step Process

PDCA

Step

Plan

Step 1: Theme Selection

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Step 2: Data Collection and Analysis

“

Step 3: Causal Analysis

Do

Step 4: Solution Planning and Implementation

Check

Step 5: Evaluation of Effects

Act

Step 6: Standardization

“

Step 7: Reflection

When to use the 7-Step Problem Solving Method

- For Reactive Problems: When a process goes “out of control”, and a problem recurs over and over again, it is a weak process.
- Five Reactive Evils: defects, delays, mistakes, waste and accidents.
- The 7-Step Method is a reactive problem-solving methodology. Teams apply the method when a correction must be made to the plan based on recurring incidences of one of the five reactive evils.

When to use the 7-Step Problem Solving Method

- Reactive problems require an orientation toward the weaknesses that undermine the successful operation of standardized processes.
- The 7-Step Problem Solving Method is a step-by-step process of problem solving that enables executives, managers, quality improvement teams and workers to get to the root of a problem and respond effectively.

When to use the 7-Step Problem Solving Method

The 7-Step methodology is an important contribution to the art of problem solving because

- the 7-Steps allow more people to participate in problem solving;
- the 7-Steps are used in solving many different types of problems;
- the methodology helps to focus on the most important problem;
- it allows teams to develop more effective solutions;
- by following a standardized approach, the 7-Step methodology fosters organizational learning.

When to use the 7-Step Problem Solving Method

- The 7-Step Method is used for solving problems where the solution is not obvious.
- Quality Improvement teams most commonly use the 7-Steps to respond to a known defect or weakness such as late deliveries, yield loss or product failure.
- Managers can use the 7-Steps process to make sure teams are focusing on the most important problems and have chosen a good solution.
- The 7-Step Method is also useful in refining a product development process or in diagnosing quality improvement efforts.

Team Guidelines

- The 7-Step Problem Solving Method is most often applied in a team setting.
- The Team should
 - have a clearly defined, written theme;
 - use a metric that correlates to the theme;
 - have a measurable, quantifiable goal;
 - operate as a team;
 - publish minutes of each meeting;
 - maintain high attendance at meetings;
 - use PDCA and follow the 7-Steps;
 - have 4-7 members;

Team Guidelines (Cont.)

- have a team leader and trained facilitator;
- allow membership to be voluntary;
- focus on facts; emphasize data collection (not opinion, judgment and abstraction);
- own both the problem and the solution;
- be able to implement the solution themselves;
- learn about team recognition opportunities;
- deliver the 7-Steps QI Story to management after the problem is solved.

General Instructions

- The essence of the 7-Steps is that it is a standardized process for improvement.
- If everyone follows the same 7-Steps process, uses a common vocabulary and follows standard formats, it is easy for others to learn from the experience.
- Employees do not have to waste time trying to translate what you did into their language.
- Ideally, a team should be able to execute the 7-Steps in three to four months

Step 1. Theme Selection

- The purpose of Theme Selection is to recognize the importance of the problem and to define the problem clearly.
- Some tools: Block Diagrams, Run Charts, Graphs, Brainstorming, LP method, Theme Selection Matrix, Flowcharts and Benchmarking

Step 1. Theme Selection

Identify The General Problem That The Team Is Addressing:

- Collect any examples (facts) that help describe the problem.
- Identify the pain caused by the problem.
- Team should consider the theme that works best for the problem *they* need to solve. It's up to the team to select an approach that will work for them.
- Explore many problems at the outset. This can be accomplished by **brainstorming** or using the **LP Method**. Use the **Theme Selection Matrix** to choose the best problem to explore.

Step 1. Theme Selection

- Use as much data as necessary to identify the most important problem.
- Address methods or machines, not human behavior.
- Consider the company's and division's goals in your theme selection.
- Address one of the “five evils”: defects, delays, mistakes, waste and accidents.

Step 1. Theme Selection

- Avoid problems that focus on accidents. They are more difficult to address than the other four evils.
- Remember, there should be a high probability of success within a reasonable time frame (limit the scope of the project)
- Team members tend to lose their motivation if the project takes too long.

Step 1. Theme Selection

Hint: The 7-Steps process is most effective on problems with an existing documented process that people understand. Many teams begin working on a problem and soon find that a process is not documented, or understood, or does not even exist.

Step 1. Theme Selection

Write the theme, addressing the problem you have chosen.

➤ Make your theme measurable.

Example:

Poor: Reduce customer frustration.

Better: Reduce the number of days
required to respond to customer inquiries.

Poor: Reduce employee dissatisfaction.

Better: reduce the employee turnover rate.

Step 1. Theme Selection

- Consider at what “level” to tackle the problem. It is better to start a few levels down the ladder of abstraction.
- Spend the right amount of time on the problem definition.
- The theme should be customer focused.
- The theme should be weakness oriented.

Example:

Poor: Improve yield at system test.

Better: Reduce defects at system test.

Step 1. Theme Selection

The best application of the 7-Step Method is problems and deviation from a given standard. Focusing on a weakness fosters continuous improvement by drawing attention to problems.

- The theme must be one complete sentence.
- Make the theme action oriented.
- Avoid the use of abstract words, acronyms and location-specific lingo.

Example: Reduce the FLTS/BD on SMT mods tested at FDY west BTE.

Step 1. Theme Selection

- Do not use absolutes. Words such as eliminate can convey the meaning that something is either present or not.

Example:

Poor: Reduce mistakes at order entry due to input errors.

Better: Reduce order entry mistakes.

- Do not state judgments and opinions.
- Do not state the root cause in the theme.
- Do not state the solution in the theme.

Do not spend too much time initially developing your theme. You can refine it later.

Step 1. Theme Selection

Visualize the problem:

- Use a **block diagram** or **flowchart** to show the area being addressed and location of the customer in the process.
- Use a **graph** or a **run chart** to show the magnitude and importance of the problem over time.

Verify that the data you need to collect can be generated and will be available frequently. Data every week will be more helpful than once per quarter.

Step 1. Theme Selection

Develop a planned schedule:

- It is difficult at this stage to predict the exact schedule for the 7-Steps. It will help the team if they can bound the scope of the work. Is this a 3-month, 6-month or 9-month project?
- The team and sponsor should work together to make a reasonable estimate as to how to allocate time on each step.

Step 2. Data Collection and Analysis

- The purpose of Data Collection and Analysis is to investigate the specific features of the problem from a wide range of different viewpoints.
- Some Tools: Checksheets, Graphs, Pareto Diagrams, Milestone Charts, Histograms and Voice of the Customer Interviewing Techniques

Step 2. Data Collection and Analysis

Develop a *checksheet* to collect data:

- Verify that the desired data is being collected. Make modifications to the checksheet as necessary. It usually takes several iterations on the sheet and training of those providing the data before the correct data is being collected.
- Think about what all the possible causes may be and maybe do a fishbone diagram. This will help avoid collecting the wrong data.
- Design a checksheet with enough categories – avoid discovering later that you wish you had other relevant data.

Step 2. Data Collection and Analysis

Collect data:

- Go to the site and collect your own data first.
- Spot-check the data to prove its validity.
- Assist in designing the data collection scheme.
- Do not rely on existing data or historical information.
- Collect data on as many variables as possible.
- Collect data that represents many different viewpoints.
- Collect only as much of the data as you need.

Step 2. Data Collection and Analysis

Develop a broad *checksheet* which can be used to organize the data and generate many *Pareto diagrams*. Once the data has been collected, stratify the data in many forms. Do multiple *Paretos*.

- Be certain to put the team's conclusion(s) at the bottom of the Pareto.
- Highlight the "bar" on the Pareto that the team will investigate further.
- Use the highlighted bar of the first Pareto diagram as a starting point to develop the next Pareto and so on.

Step 2. Data Collection and Analysis

Hint: If the bars on the Pareto are flat, you have not cut the data enough. Try looking at it in a different way until a major problem surfaces.

Plan for Step 5:

You will need data to confirm the results of the implemented solution or experiment. This preparation in step 2 will assist in shortening the cycle-time of data generated in step 5.

Step 2. Data Collection and Analysis

➤ Consider the schedule of the product or service planned for step 5 verification. If the expected cycle-time of data generated at step 5 is longer than planned, think creatively: do an experiment; run an internal test rather than waiting for field data; apply the solution to historical situations to determine the probability of success.

If appropriate, based on your analyses, revise your theme.

Now that the scope of the project and the theme has been finalized, prepare a milestone chart.

Step 3. Causal Analysis

- The purpose of Causal Analysis is to find the main causes of the problem.
- Some Tools: Fishbone Diagram, Relations Diagram, Scattergram, Pareto Diagram, Flowchart, Tree Diagram, Matrix Diagram and Brainstorming

Step 3. Causal Analysis

Involve people who know the process.

- Talk to and involve people closest to the work to discover the “real” problem.
- Use the brainstorming technique to generate many ideas.

Do or refer to a *flowchart* of the process.

- A flowchart will assist in highlighting potential causes and may point out other areas of concern. It will also assist in identifying possible root causes.

Step 3. Causal Analysis

Construct a *fishbone* diagram.

- The fishbone diagram is used to find root causes, will aid in communication and will document activities for future reference. The highest bar of the Pareto, chosen earlier by the team, establishes the “why” question for the head of the fishbone.
- Make as many fishbone diagrams as the problem dictates.

Step 3. Causal Analysis

- Make the effect (the “head” of the fishbone) as specific as possible.
- Use the brainstorming technique to generate many theories of causes.
- Answer the question, “Why did this evil occur?” Ask it repeatedly (usually five times) until you reach the root cause.

Example: Problem - The car did not start

Why? Fuel problem

Why? Fuel tank was empty

Why? Did not refuel

Why? Ran out of money to buy gas

Why? Did not plan well, bank was closed

Step 3. Causal Analysis

- Do not assume you know the cause.
- Get your facts. Base your decisions on data.
- Make sure the root cause is controllable.
- Be sure to circle the probable causes as indicated by the team's voting.
- Make a conclusion for each fishbone diagram.
- Reaching conclusion about main causes is not a guessing game or democratic process. Simply voting to identify root causes does not prove anything. It is necessary to verify the root cause you have selected. Verification of root causes requires statistical analysis.

Step 3. Causal Analysis

Recycle back to step 2.

Step 3 often begins with theories. You must have data to prove those theories.

- Be certain that you are addressing the largest (or selected) bar on the Pareto.
- If your team cannot reach consensus on the root cause, you must go back and collect additional data.
- Be patient. Finding the root cause will not usually be easy. If it were easy, why would you be going through this process. Being impatient may very well lead to assuming the wrong root cause.

Step 4. Solution Planning and Implementation

- The purpose of Solution Planning and Implementation is to take action that will eliminate the causes of the problem.
- Some Tools: Fishbone Diagram, 4W & 1H Matrix, Brainstorming, Matrix Diagram, Tree Diagram, Contingency Planning (PDPC), Solution Selection Matrix, Benchmarking and 9-Step Project Management System

Step 4. Solution Planning and Implementation

Develop a solution that prevents the recurrence of the root cause:

- Be certain that the solution focuses on the root cause identified in step 3.
- If necessary, develop several possible solutions (alternatives).
- Examine the advantages and disadvantages of each possible solution.
- Consider improving the existing process before revamping the entire process.
- Determine whether any of the solutions will produce negative side effects.

Step 4. Solution Planning and Implementation

- Consider the effect this change will have on other processes.
- If necessary, create a **Solution Selection Matrix** to show how each solution addresses the major root cause.
- Obtain group consensus on the recommended solution.
- Make sure the solution is something the team can implement.

Step 4. Solution Planning and Implementation

Run an experiment:

- Step 4 normally is an **experiment** to **test** the planned solution, providing it is not too time consuming. You will confirm this experiment in step 5 and, if successful, standardize in step 6.
- In describing the solution, explain what it is, not the details on how to do it.
- Be sure to document an action plan that addresses the **4W & 1H**.

Step 4. Solution Planning and Implementation

Use a time line to describe the implementation schedule:

- Make changes as necessary to the milestone chart from step 2.
- Get knowledgeable and affected individuals involved in the planning stage. This improves the likelihood of a successful solution and helps the team better understand the possible roadblocks to implementation.

Step 4. Solution Planning and Implementation

Determine the measurement which will confirm that the solution actually worked.

➤ Step 5 confirms the results, but this is the time to think about the feedback loops and measurement system that will measure the effect of the solution.

Step 5. Evaluation of Effects

- The purpose of Evaluation of Effects is to make sure that the solution will correct the problem.
- Some Tools: Pareto Diagrams, Graphs, Histograms and Scattergrams

Step 5. Evaluation of Effects

Collect data:

- Use the same method and format as in step 2.
- Confirm the results with the customer if it is practical to do so.

Evaluate the results:

- Compare the data from before and after the implementation of the solution using both **Paretos** and **run charts**.
- Assess and list potential side effects, both negative and positive.

Step 5. Evaluation of Effects

- If there are other effects during the implementation period, list them (e.g., a hurricane or snowstorm shut the plant down or a new product was introduced during the project period).
- Evaluate the intangible results of the solution (satisfaction, motivation and skill development of the people involved in the solution).
- Whenever possible, convert the data into monetary impact for senior management.
- If the evaluation bears out that the solution was successful (target has been or will be reached), go on to step 6. If not, go back to step 4 and revise the solution or go back to step 3 to see if the real root cause was missed. Apply the PDCA philosophy.

Step 6. Standardization

- The purpose of Standardization is to ensure that the cause of the problem has been eliminated permanently.

- Some Tools: Flowchart, Control Chart, Trend Chart, 4W & 1H matrix and Graphs

Describe the task necessary to standardize the solution:

- Use the 4W & 1 HC matrix to develop a matrix as in step 4.

Step 6. Standardization

Document the process change:

- Use the existing documentation system if possible.
- Provide the organization with clear instructions that last over time. Answer why the new standard is necessary. It increases the likelihood that the standards will be observed.

Ensure that your process change has provision for updating and revising the process:

- Other changes may be necessary in the future.
Revise the standard as necessary.

Step 6. Standardization

Make changes to the existing flowchart to communicate the new standard.

Continue to monitor the results over time;

- Use a **graph**.
- Confirm that the results do not deteriorate over time.
- Identify how and by whom the status of the new standard will be monitored.

Step 6. Standardization

Train, inform and/or involve affected individuals.

- Ensure that all affected individuals know about the change and their role in it.
- Put in place appropriate metrics to keep the focus on the intent of the new standard as the quality improvement team fades away.

Ensure that you communicate with other parts of the organization who could benefit from your experience. Chances are that other parts of the organization within the company are wrestling with the same or similar problem.

Step 6. Standardization

Summarize (list) the changes that have been made:

➤ Make it clear to the QIT and others what was actually done. This list is a good communication vehicle for others to see the QIT's progress.

Step 7. Reflection

- The purpose of Reflection is to review the problem-solving process and to identify the next problem.
- Some Tools: 4W & 1H Matrix, Brainstorming, LP Method, Pareto Diagram and Theme Selection Matrix

Summarize the team's achievements:

- Confirmation of results occurred in step 5, but this is an opportunity to step back and look at the big picture.

Step 7. Reflection

Summarize the lessons learned related to the 7-Steps:

- The focus here should be on the process.
- Use the 4W & 1H matrix to describe the practices that worked well and how you plan to standardize these practices.
- Use 4W & 1H matrix to describe the practices that did not work well and how you plan to correct them or avoid them next time.
- Reflect back on the effectiveness of using the 7-Steps problem solving methodology.

Step 7. Reflection

Compare the milestone chart “plan” and “actual”.

- Identify what went wrong and why.
- Recognize the team and other contributors.
- Recognize the team’s efforts.
- Recognize those not on the team but making contributions.
- Evaluate team dynamics and performance.

Recommend a weakness for the next PDCA cycle.

Communicate the report.

- Determine who else needs to know and disseminate your experience. This will help others learn. Others will be motivated by seeing your success.