"HOW TO"
STEPS FOR IMPROVEMENT TOOLS

Brainstorming:

- Share all ideas that come to mind
- Never criticize ideas
- Either write ideas on a flip chart or on stickies that can be added to a flip chart
- Everyone must agree on the idea or question being brainstormed, but not the solution
- Record ideas in the words of the speaker – don't interpret or have each person write their ideas down on paper or stickies and share or do a round robin asking for ideas from each
- Do brainstorming quickly: 5 to 15 minutes
- Don't interrupt
- Think "outside the box"

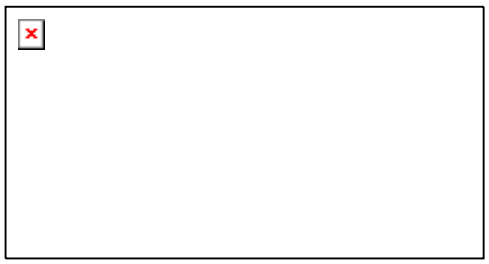
Constructing a Flow Chart:

- Get the "right" people in the room. Agree on the immediate use and level of detail
- Decide on format of flow chart
- Define first and last steps
- Begin documenting steps in sequence

  Sticky notes can be used to document steps, using a note for each step – this allows you to change the steps – adding or deleting new steps
- Use "Clouds" or notes for unfamiliar steps and continue to the end of the process
- When you reach the last step, go back to "branches"
- Read through the flowchart as a check for accuracy and completeness
- Assign action items to fill in unfamiliar steps and verify accuracy
- When complete and accurate, analyze it, use it, *keep it up to date*

Constructing a Check Sheet:

1. Agree on exactly what event is being observed
2. Decide on the time period during which data will be collected. This could range from hours to weeks
3. Design a form (If one does not already exist) that is clear and easy to use, making sure that all columns are clearly labeled and that there is enough space to enter the data
4. Collect the data consistently and honestly. Make sure there is time allowed for this data gathering task.



Constructing a Histogram:

1. Sort and tally individual values in the data set and determine the high and low values
2. Choose a cell width that divides the range into 6 to 12 categories of equal width
3. Determine the cell boundaries.

   Choose a convenient starting point at, or below, the lowest value.
4. Be consistent in handling values that fall in the boundaries (put all boundary values in the next higher cell)
5. Tally number of observations in each cell. Check total tally
6. Draw and provide clear labels on axes.

   The vertical axis is frequency; the horizontal axis is the variable being analyzed
7. Draw bars to represent number of data values in cell. Adjacent bars should touch. Leave space between the first bar and the vertical axis.
8. Title the chart, indicate total number of data values, and show any standards and limits
9. Analyze and develop explanations for the pattern.

Constructing a Run Chart:

1. Obtain a set of 15 or more data points in their natural time sequence.
2. Plot a line graph
3. Determine the median of the data and draw the median on the line graph
4. Identify trends. A trend is seven or more consecutive points going either up or down.

   *Ignore any points that are EXACT repeats of the preceding point.

   A repeat point neither adds to nor breaks the sequence.
5. Identify runs and count the length of each run. A run is a set of consecutive points all on the same side of the median. The run length is the number of points in the run. Runs of one data point are possible.

   *Ignore any points exactly on the median. It does not end a run and is not counted in the run length.
6. A run of length 8 or more is statistical evidence that the process has changed over the course of the data collection.
7. Compare the number of runs to the Runs Test Table. If the number of runs is less than the lower critical value, there is statistical evidence that the process is exhibiting more than one average. If the number of runs is above the upper critical value (a rare occurrence), the process is cycling, extremely unstable, or the data collection is unreliable.

Constructing a Pareto Chart:

1. Select the problems that are to be compared and rank ordered by:
   - Brainstorming
   - Using Existing Data
2. Select the standard for comparison unit of measurement (annual cost, frequency, etc)
3. Select time period to be studied
4. Gather necessary data on the site of each category
   (defect A occurred X times in the last six months)
5. Compare the frequency or cost of each category relative to all other categories
6. List the categories from left to right on the horizontal axis in their order of decreasing frequency or cost. The categories containing the fewest items can be combined into an "other" category, which is placed on the extreme right as the last bar.
7. Above each category draw a rectangle whose height represents the frequency or cost in that category.

Affinity Diagram (Fish bone Diagram or Cause and Effect Diagram)

Generate the causes needed by brainstorming and placing in appropriate categories or spending time between meetings using simple check sheet to track possible causes and to examine the production process or any causes that are helpful in organizing the most important factors.

Construct the actual diagram by:

1. Placing a problem statement in a box on the right, drawing the traditional major cause category steps in the process, or any causes that are helpful in organizing the most important factors, placing brainstormed ideas in the appropriate categories.
2. For each cause, ask why does this happen and list causes as branches off the major causes
3. Interpretation

In order to find the most basic causes of the problem:

- Look for causes that appear repeatedly
- Reach a team consensus
- Gather data to determine the relative frequencies of different causes.