Analyze Stability

Processes that are “out of control” need to be stabilized before they can be improved using the problem-solving process. Special causes require immediate cause-effect analysis to eliminate variation.

The following diagram will help you evaluate stability in any control chart. Unstable conditions can be any of the following:

Various trends are also considered unstable conditions. For a complete list see qimacros.com/qiwizard/stability.html. Any of these conditions suggest that an unstable condition may exist. Consider investigating the special cause of variation. The QI Macros automatically identify these for you.

Use the Ishikawa diagram to analyze potential root causes.

Once you’ve eliminated the special causes, you can turn your attention to using the problem solving process to reduce the common causes of variation:

Analyze Capability

When Cp, the process capability index, and Cpk, the centering index, are over 1.0, the process is capable, but most manufacturers require Cp>1.33.

Use the problem solving process to identify and prevent the root causes of waste (usually below the lower specification limit) and rework (usually above the upper specification limit). The goal, is to reduce variation so that all of your points fit within the specification limits, clustered around a target.
Sustain the Improvement

**Purpose:** Stabilize and Sustain the Improvement

**Key Tools**

- **Flowchart or Value Stream Map:** Show the flow of work through a process including all activities, decisions, and measurement points.

- **Control Chart:** Help analyze, sustain, and monitor the current levels of process stability and to identify key issues for problem solving or root cause analysis.

- **Histogram:** Determine the capability (i.e., the level of performance the customers can consistently expect) of the process and the distribution of measurable data.

**Sustain The Improvement (Control)**

<table>
<thead>
<tr>
<th>FISH</th>
<th>Step</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>1</td>
<td>Refine the process</td>
</tr>
<tr>
<td>Define</td>
<td>2</td>
<td>Identify the critical to quality indicators (CTQs)</td>
</tr>
<tr>
<td>Measure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improve</td>
<td>3</td>
<td>Implement the critical to quality indicators</td>
</tr>
<tr>
<td>Analyze</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustain</td>
<td>4</td>
<td>Check the process for stability and capability</td>
</tr>
</tbody>
</table>

**Defect Data**

- **Attribute (counted)**
  - Integer: 1,2
  - Defects People Events
  - Defective
  - Defective?
    - Yes/No
  - How many defects?

- **Variable (Measured)**
  - Decimal: 1.3
  - Individuals
  - Individuals
  - Sub groups
  - Sub groups
  - Length
  - Time
  - Cost

**Choosing The Right Chart**

- **np Chart**
  - Constant defects/100

- **p Chart**
  - Varies wrong orders/orders medication errors infections/patient days
  - Defective?
    - Yes/No
  - How many defects?

- **c Chart**
  - Constant injuries/month Patient falls/month
  - Count Number of Defects Per Item
  - Rates or Ratios?

- **u Chart**
  - Varies errors/orders components/assemblies Patient falls/days
  - Count Defective Items?
  - Count Number of Defects Per Item

**Cycle Time**

- **XmR**
  - Services & Manufacturing
  - 1 length or weight per item time/project cost/project infections/1000 patient days
  - 2-5 diameters, lengths tensile strength resistance
  - 6-25 diameters, lengths tensile strength resistance

**Sample Data**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Obs 1</th>
<th>Obs 2</th>
<th>Obs 3</th>
<th>Obs 4</th>
<th>Obs 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
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<td>74.007</td>
<td>74.019</td>
<td>73.992</td>
<td>74.008</td>
</tr>
<tr>
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<td>73.992</td>
<td>74.001</td>
<td>74.011</td>
<td>74.004</td>
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<tr>
<td>S3</td>
<td>73.686</td>
<td>74.024</td>
<td>74.021</td>
<td>74.005</td>
<td>74.002</td>
</tr>
</tbody>
</table>

**Defect Data**

- **Defective**
  - Count Defective Items?
  - Count Number of Defects Per Item

**Variable Data**

To learn more about SPC, consider our one hour training video: [www.qimacros.com/store/spc-simplified-training-video](http://www.qimacros.com/store/spc-simplified-training-video)

To automate these charts, try QI Macros

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**QI Macros Control Chart Wizard**

The QI Macros can analyze your data and select and run the right control chart for you.