The Seven Basic Tools of Quality

- The Seven Basic Tools of Quality refers to a fixed set of graphical techniques identified as being most helpful in troubleshooting issues related to quality.
- They are called basic because they are suitable for people with little formal training in statistics and because they can be used to solve the vast majority of quality-related issues.

The Seven Basic Tools of Quality

The seven tools are:

1. Cause-and-effect diagram (also known as the "fishbone" or Ishikawa diagram)
2. Check sheet
3. Control chart
4. Histogram
5. Pareto chart
6. Scatter diagram
7. Stratification (alternately, flow chart or run chart)

The Seven Basic Tools of Quality

- The designation arose in postwar Japan, inspired by the seven famous weapons of Benkei. It is believed to have been introduced by Kaoru Ishikawa who in turn was influenced by a very famous series of lectures W. Edwards Deming had given to Japanese engineers and scientists in 1950.
- At that time, companies that had set about training their workforces in statistical quality control found that the complexity of the subject intimidated the vast majority of their workers and scaled back training to focus primarily on simpler methods which suffice for most quality-related issues.

The Seven Basic Tools of Quality

- The Seven Basic Tools stand in contrast to more advanced statistical methods such as survey sampling, acceptance sampling, statistical hypothesis testing, design of experiments, multivariate analysis, and various methods developed in the field of operations research.
- The Project Management Institute references the Seven Basic Tools in *A Guide to the Project Management Body of Knowledge* as an example of a set of general tools useful for planning or controlling project quality.

Ishikawa Diagrams

- Ishikawa cause-and-effect diagrams are causal diagrams proposed by Kaoru Ishikawa (1968) that show the causes of a specific event.
- Common uses of the Ishikawa diagram are product design and quality defect prevention, to identify potential factors causing an overall effect. Each cause or reason for imperfection is a source of variation.

Ishikawa Diagrams

- Causes are usually grouped into major categories to identify these sources of variation.
- The categories typically include: People, Methods, Machines, Materials, Measurements, Environment.

qualityTools R Package

- This Package contains methods associated with the Define, Measure, Analyze, Improve and Control (i.e. DMAIC) cycle of the Six Sigma Quality Management methodology.
- It covers distribution fitting, normal and non-normal process capability indices, techniques for Measurement Systems Analysis especially gage capability indices and Gage Repeatability (i.e Gage RR) and Reproducibility studies, factorial and fractional factorial designs as well as response surface methods including the use of desirability functions.

qualityTools R Package

- Improvement via Six Sigma is project based strategy that covers 5 phases:

  Define - Pareto Chart;

  Measure - Probability and QQ Plots, Process Capability Indices for various distributions and Gage RR

  Analyze - Pareto Chart, Multi-Vari Chart, Dot Plot;

  Improve - Full and fractional factorial, response surface and mixture designs as well as the desirability approach for simultaneous optimization of more than one response variable. Normal, Pareto and Lenth Plot of effects as well as Interaction Plots;

  Control - Quality Control Charts can be found in the **qcc** package.

- The focus is on teaching the statistical methodology used in the Quality Sciences.

- Six Sigma projects follow two project methodologies inspired by Deming's **Plan-Do-Check-Act** Cycle.
- These methodologies, composed of five phases each, bear the acronyms DMAIC and DMADV.[9]
- DMAIC is used for projects aimed at improving an existing business process. DMAIC is pronounced as "duh-may-ick".
- DMADV is used for projects aimed at creating new product or process designs. DMADV is pronounced as "duh-mad-vee".