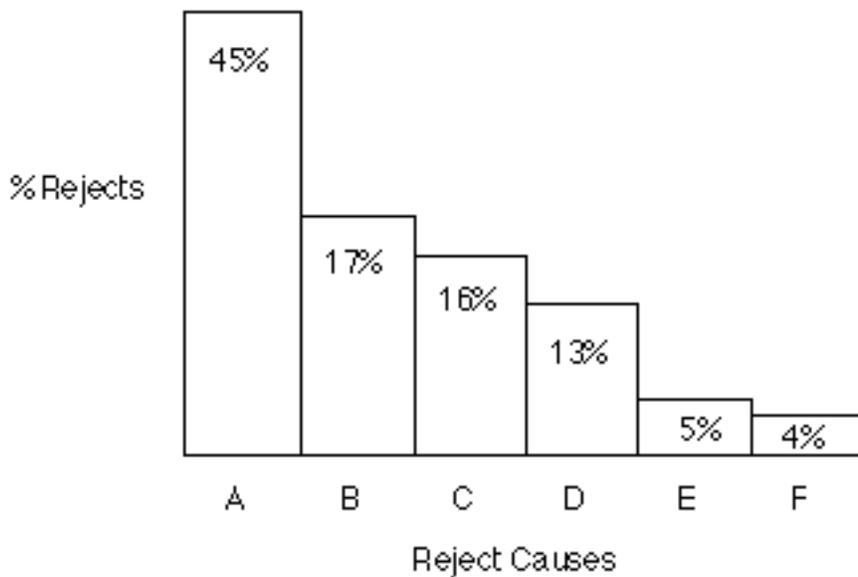


## Classic TQM Tools

Below are brief descriptions of the basic set of Total Quality Management tools: Pareto Principle, Scatter Plots, Control Charts, Flow Charts, Cause and Effect, Fishbone or Ishikawa Diagram, Histogram or Bar Graph, Check Lists and Check Sheets.

### Pareto Principle

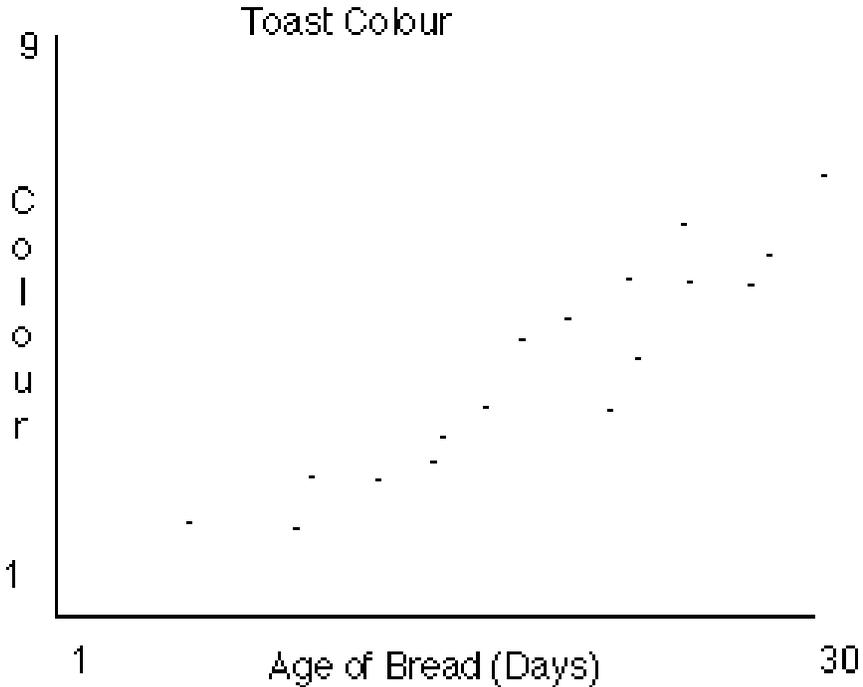
The Pareto principle suggests that most effects come from relatively few causes. In quantitative terms: 80% of the problems come from 20% of the causes (machines, raw materials, operators etc.); 80% of the wealth is owned by 20% of the people etc. Therefore effort aimed at the right 20% can solve 80% of the problems. Double (back to back) Pareto charts can be used to compare 'before and after' situations. General use, is to decide where to apply initial effort for maximum effect.



### Scatter Plots

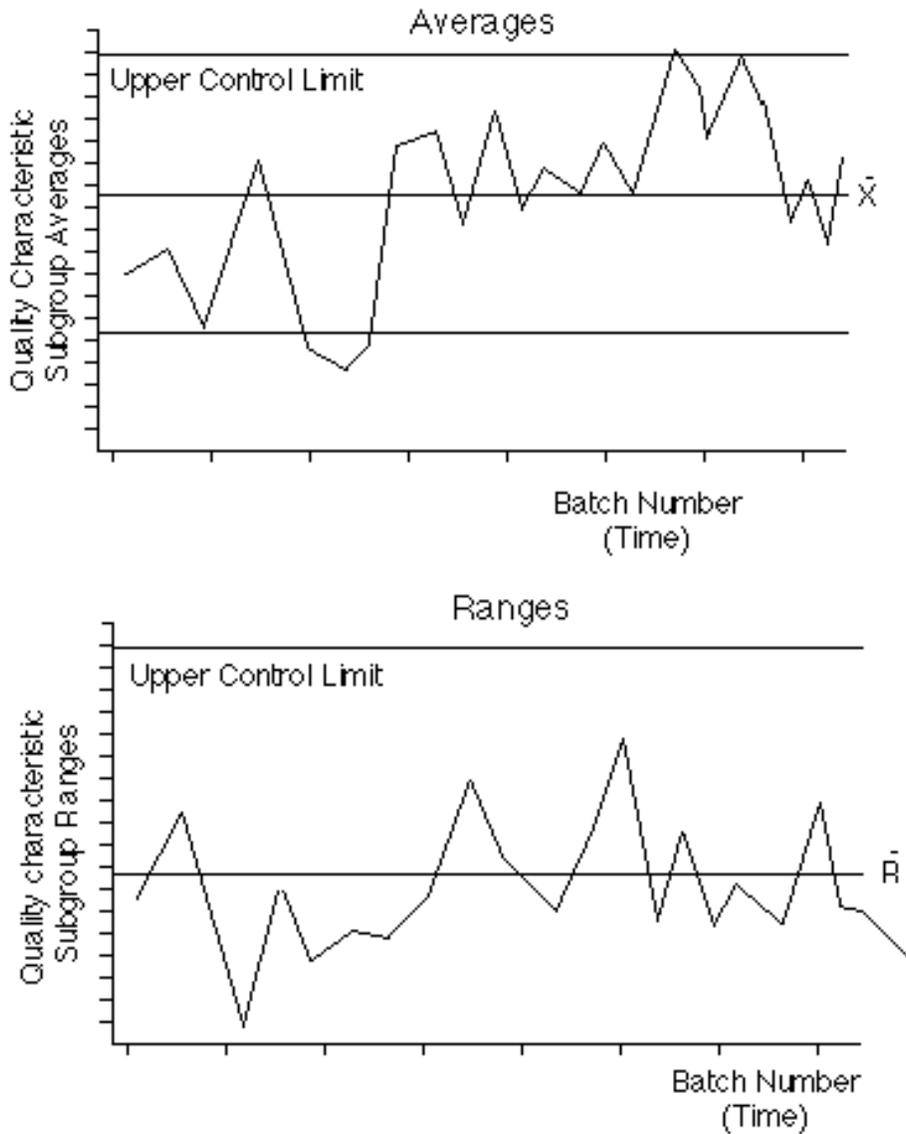
A scatter plot is effectively a line graph with no line - i.e. the point intersections between the two data sets are plotted but no attempt is made to physically draw a line. The Y axis is conventionally used for the characteristic whose behavior we would like to predict. Use, is to define the area of relationship between two variables.

Warning: There may appear to be a relationship on the plot when in reality there is none, or both variables actually relate independently to a third variable. Statistical analysis, such as regression, may be required to truly understand the causal relationship.



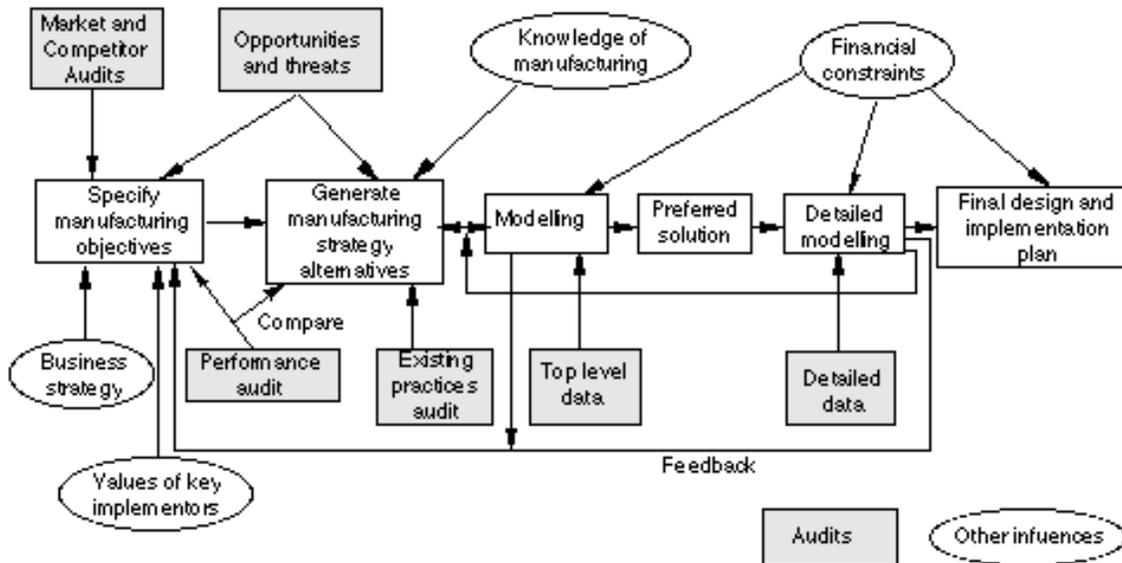
## Control Charts

Control charts are a method of Statistical Process Control, SPC. (Control system for production processes). They enable the control of distribution of variation rather than attempting to control each individual variation. Upper and lower control and tolerance limits are calculated for a process and sampled measures are regularly plotted about a central line between the two sets of limits. The plotted line corresponds to the stability/trend of the process. Action can be taken based on trend rather than on individual variation. This prevents over-correction/compensation for random variation, which would lead to many errors.



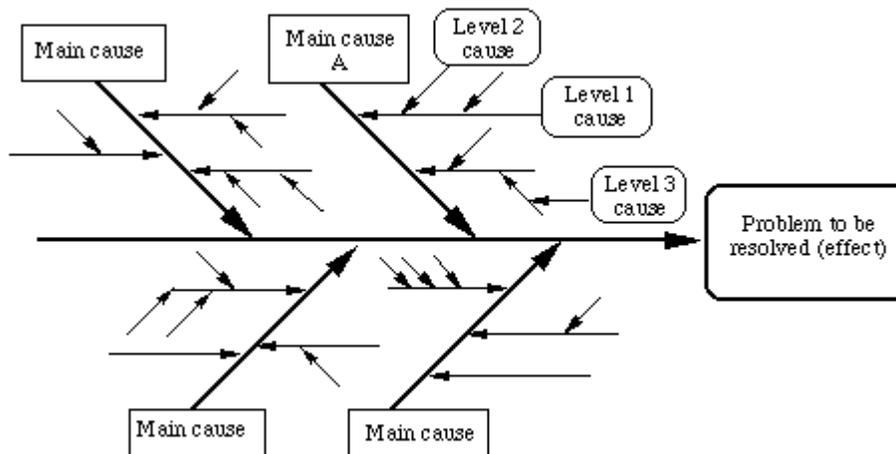
## Flow Charts

Pictures, symbols or text coupled with lines, arrows on lines show direction of flow. Flowcharting enables modeling of processes; problems/opportunities and decision points etc. It develops a common understanding of a process by those involved.



## Cause and Effect, Fishbone, Ishikawa Diagram

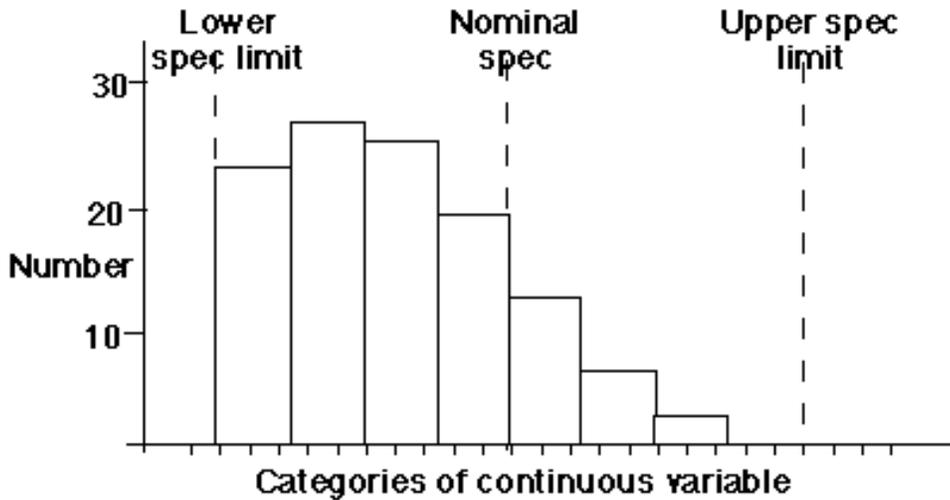
The cause-and-effect diagram is a method for analyzing process dispersion. The diagram's purpose is to relate causes and effects. Three basic types: Dispersion analysis, Process classification and cause enumeration. Effect = problem to be resolved, opportunity to be grasped, result to be achieved. This tool is excellent for capturing team brainstorming output and for filling in from the 'wide picture'. Helps organize and relate factors, providing a sequential view. This diagram deals with time direction but not quantity. It can become very complex and can be difficult to identify or demonstrate interrelationships.



## Histogram or Bar Graph

A Histogram is a graphic summary of variation in a set of data. It enables us to see patterns that are difficult to see in a simple table of numbers. This can be analyzed to draw conclusions about the data set.

A histogram is a graph in which the continuous variable is clustered into categories and the value of each cluster is plotted to give a series of bars as above. The above example reveals the skewed distribution of a set of product measurements that remain nevertheless within specified limits. Without using some form of graphic this kind of problem can be difficult to analyze, recognize or identify.



## Check Sheets

A Check Sheet is a data recording form that has been designed to readily interpret results from the form itself. It needs to be designed for the specific data it is to gather. Used for the collection of quantitative or qualitative repetitive data. It is adaptable to different data gathering situations. Minimal interpretation of results required. These are easy and quick to use. No control for various forms of bias - exclusion, interaction, perception, operational, non-response, estimation.

## Check Lists

A Checklist contains items that are important or relevant to a specific issue or situation. Checklists are used under operational conditions to ensure that all important steps or actions have been taken. Their primary purpose is for guiding operations, not for collecting data. Check Lists are generally used to check that all aspects of a situation have been taken into account before action or decision making. They are simple, effective.

Adapted from: <http://www.ifm.eng.cam.ac.uk/dstools/represent/tqm.html>