How to interpret Control Charts?

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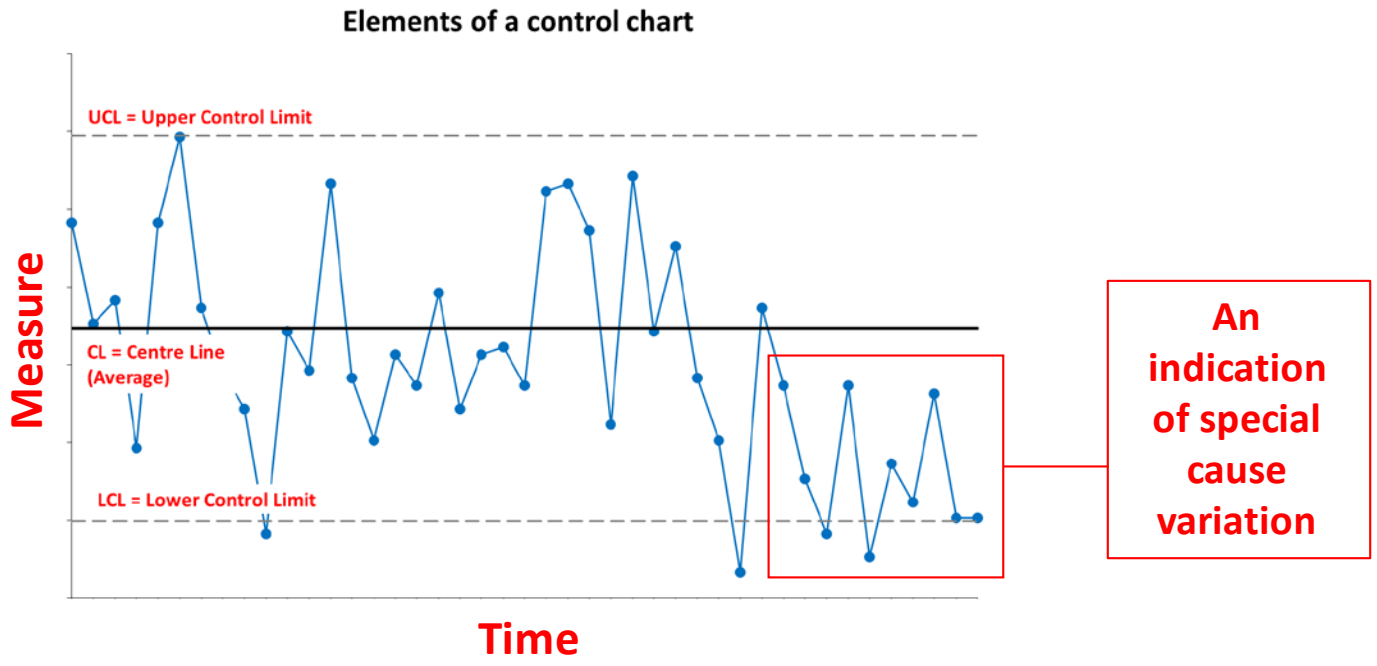
What is a control chart?

- A control chart (also known as a Shewhart chart) is a graph used to study how a system or process changes over time
- Data is plotted in time order
- A control chart always has a mean as the centre line, an upper control limit and a lower control limit which show where we would expect future data to lie within



Why do we use control charts?

- The centre line, upper control limit and lower control limit help us when interpreting the variation that exists in the process
- By comparing current data to these lines, we can identify whether the process is stable and predictable (common cause variation) or unstable and needs investigation (special cause variation).

A control chart allows us to:

1) Monitor process performance (and react to special cause if it occurs)

2) Predict how the process will perform in the future

3) Spot improvement and monitor sustainability of improvements

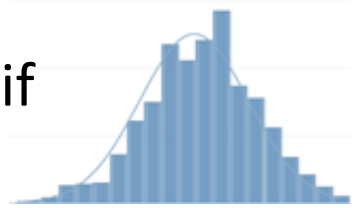
What is special cause variation?

- The table below outlines the difference between common cause and special cause variation.

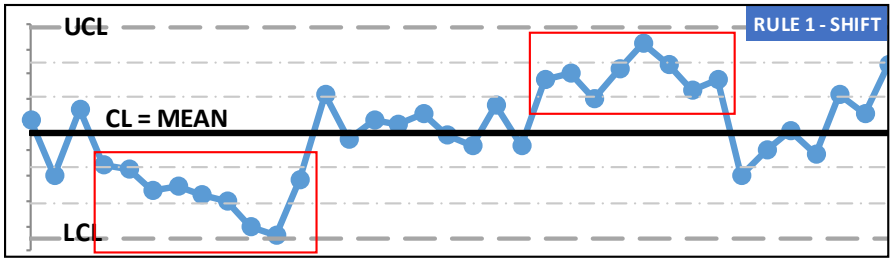
Common cause variation	Special cause variation
Is inherent in the design of the process	Is due to irregular or unnatural causes that are not inherent in the design of the process
Is due to regular, natural or ordinary causes	Affect some, but not necessarily all aspects of the process
Affects all the outcomes of a process	Results in an "unstable" process that is not predictable
Results in a "stable" process that is predictable	Also known as non-random or assignable variation
Also known as random or unassignable variation	

When we see special cause variation, take the following steps:

1) Investigate what caused it? Was it due to internal (i.e. change in process) or external factors (i.e. cyber attack)?
2) Determine is any action is needed
3) Revise control limits (calculate new CL, UCL and LCL) if appropriate

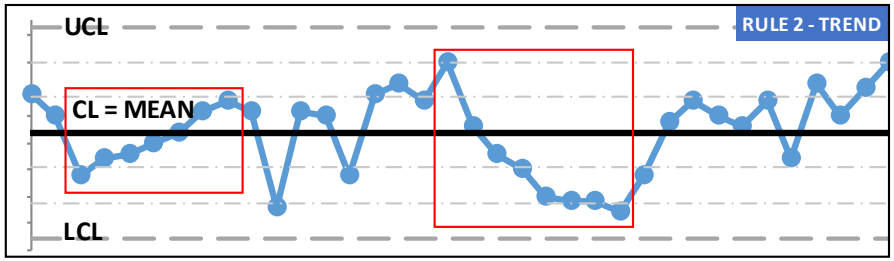


Control Chart Rules for identifying special cause



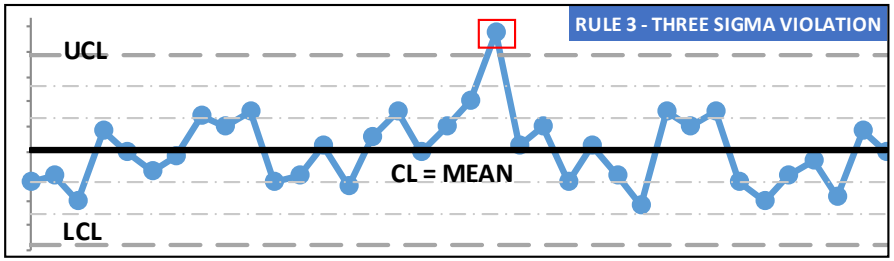
Rule 1 – Shift

Eight or more consecutive points either all above or all below the centre line (CL). Values that fall on the CL do not add to nor break a shift. Skip values that fall on the mean and continue counting



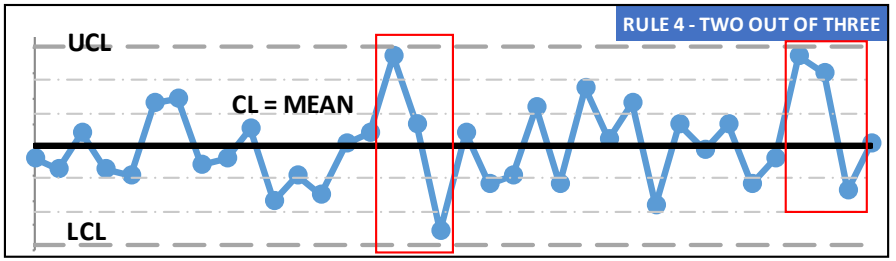
Rule 2 – Trend

Six or more consecutive points all going up or all going down. If the value of two or more successive points is the same (repeats), ignore the like points when counting.



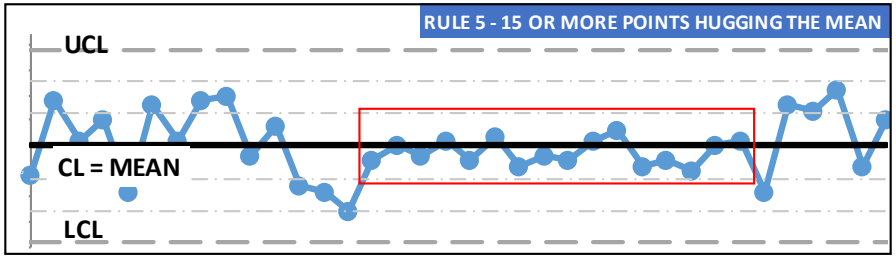
Rule 3 – Three Sigma Violation

When you have a data point that exceeds the UCL/LCL.



Rule 4 – Two out of three

When you get two out of three consecutive points in the outer one-third of chart.



Rule 5 – 15 or more data points hugging the mean

15 or more data points hugging the centre line (inner one-third of the chart). In a normal distribution, you should have around 68% of the data near the mean of the distribution (+/- 1 standard deviation). When you get a pattern like this, you're exceeding the 68%.

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