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Quality Methods Overview

In the first module, we defined statistical thinking as "The philosophy of process learning and action based on the following fundamental principles: All work occurs in a system of interconnected processes, variation exists in all processes, and understanding and reducing variation are keys to success."

Every product, process, and service exhibits some amount of variation.

We generally think of variation as a measure of the spread of a distribution.

Tighter distributions have less variability relative to the mean.

A precise process has little variability relative to specifications.

We can also think of variation as a measure of the centering of the process relative to a target. An accurate process is, on average, on target.

The ideal process is both accurate and precise.

But a process that is accurate can have a lot of variability.

And a precise process can be off target.

A process can also be both off target and highly variable.

Another dimension to consider is time. It is important that the process be consistent and predictable over time.

Uncontrolled processes might stray or drift from their desired settings. The process mean might shift or change over time.

The process variation might change over time. Or both the process mean and variation might change over time.

To study and characterize process variation over time, we use statistical methods to separate the random variation from the uncontrolled or unexpected sources of variation. The random variation is called common cause variation. This is variation that is inherent to the process.

A process that exhibits only common cause variation is said to be stable, or in control. We want our processes to be stable because then future performance is predictable.

Unusual or unexpected shifts or changes in the process are called special causes of variation. These causes are external, or not inherent, to the process.

Because these causes are not predictable, future process performance is not predictable.

A process that exhibits special causes of variation is said to be unstable or out of control.

Why is this all important?

A process that is off target, is too variable, or is out of control can result in delays, rework, defects, or other problems, and usually results in higher costs and unsatisfied customers. Because of this, its important to understand and quantify the sources of variation within a process.

This is at the heart of problem solving: "the management of sources of variation in relation to performance requirements."

Process variation can be due to a number of issues, such as environmental conditions, poorly defined operating standards, and poor measurement systems.

Process variation can also result from operators making unnecessary adjustments to the process, in reaction to common cause variation.

Reducing variability within a process is not always easy.

The purpose of this course is to provide a broad set of tools, and a framework of statistical thinking, that you can use to manage sources of process variation.

Statistical Process Control (or SPC) is a collection of tools to help you understand, control, and reduce process variation SPC tools include control charts, process capability indices, and measurement systems analysis. You learn about these tools in this module.

Other SPC tools such as Pareto charts, process maps, and fishbone diagrams were introduced in the Statistical Thinking and Problem Solving module.

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