

Variation

By Sanjaya Kumar Saxena

Variation is everywhere. It probably touches our lives more consistently than any other thing! In fact, it is the degree of variation, more than its presence, that varies.

Common examples of variation we all experience include:

- Traffic conditions on roads vary from day to day and hour to hour.
- In a shopping mall, the number of visitors changes daily.
- Response times in telebanking vary throughout the day.

In business and industry, variation is present in the output(s) of every process. In the automotive parts industry, for example, every cylinder produced has a different diameter, usually within tolerance limits around a nominal diameter. Any variation beyond the tolerance limit becomes a defect.

Variation even drives quantum physics. In the words of the living legend of physics, Stephen Hawking, “Quantum mechanics does not predict a single definite result for an observation. Instead, it predicts a number of different possible outcomes and tells us how likely each of these is. Quantum mechanics therefore introduces an unavoidable element of unpredictability or randomness into science.”

Variation and Its Causes

Understanding variation is fundamental to business excellence. As quality guru W. E. Deming has said, “If I had to reduce my message for management to just a few words, I’d say it all had to do with reducing variation.”

Variation can be classified in two categories based on its causes:

- Common cause, or natural, variation always occurs and can not be traced to a specific cause. It is random within a predictable range. In other words, it follows a distribution pattern. Natural variation reduction requires fundamental change in the process.
- Special cause, or assignable, variation occurs due to an assignable cause outside natural variation. It can easily be traced to a specific cause, usually relating to the six key process elements—people, environment, material, method, machinery, and measurement. Once detected, its removal is a relatively simple exercise.

An Example

What time do we reach work in the morning? In a nine to five office environment, do we arrive at 9:00 AM on the dot every day? Some days it may take a little longer, and we arrive at 9:10 AM, whereas other days we arrive at 8:50 AM.

In general, we know that we get to the office between 8:50 AM and 9:10 AM, so there is a variation of 20 minutes. This variation may occur due to traffic signals and traffic conditions. But we know that the variation is contained within 20 minutes and seems “natural” or “common.” A closer look reveals that this variation does not have a specific reason and is random within a 20-minute range.

Now imagine that we begin to have flat tires often. This results in a further delay of 20 to 25 minutes every day, leading to an increase in overall variation. We finally discover that it is happening due to worn-out tires. Upon changing the tires, we are back to our natural variation of 20 minutes because we have removed the “special” or “assignable” cause of variation.

The only way to reduce natural variation is to change or improve our process of traveling to the office. Possibilities include choosing a different route with more predictable traffic conditions, or switching to a two-wheeler or bicycle to nullify heavy and unpredictable traffic conditions.

This short introduction to the concept of variation is meant to be a starting point. As a next step, see the example of the pizza delivery shop in the Six Sigma Forum beginner article “Delight Your Customers the Six Sigma Way,” which discusses the role of variation within a broader context of Six Sigma analysis and improvement.

About the Author

Sanjaya Kumar Saxena has more than twenty-two years of experience in the software industry, including extensive experience with business process management and information security. He holds a bachelor’s of technology in electrical engineering, has served as guest faculty at premier Indian management institutes, and authors *Discover Six Sigma*, a blog to support the application of Six Sigma in different business environments. A member of IEEE, Sanjaya works for Pre-emptive Systems (P) Limited.