The New Terminology

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Statistical Process Control has been around for over 70 years. However, there is today considerable confusion about the nature and purpose of SPC. I believe this is because many have sought to reshape SPC according to their own background and experience.

Some hear the words Statistical Process Control and immediately think of classical statistical procedures. They try to fit SPC into this framework of parameters, distributional assumptions, tests of hypotheses, and confidence levels. Of course, when this group tries to share their version of SPC they are met with that same total lack of comprehension which is the fate of classical statistics. But statisticians are accustomed to rejection, so this is nothing new.

Others hear the words Statistical Process Control and think of process control techniques. SPC is thought of as a manual process-control technique to be used to maintain the status quo for a process. It is merely a process monitoring technique, to be used after you have already gotten the process into a satisfactory state. "And, since this is what SPC is about, wouldn't you like to know about some of the neat algorithmic process-control techniques and process modeling techniques that have been developed in the past few years?" This group would be glad to give you a course or sell you some software. But once again, there is a hurdle of truly mathematical proportions to be overcome. The faint of heart need not apply. Those without calculus should not enter in to this door.

A third group uses the word "control" to denote conformance to specifications, and so when they hear the words Statistical Process Control they think about trying to produce product within specifications. Given this perspective, they think of SPC as a complex route to a simple objective, and accordingly they try to simplify SPC. This group tends to want to bypass the computations based on the data and instead use the specifications to set action limits. While this simplicity sells well, it has the unfortunate characteristic of completely misrepresenting what SPC is all about. Those who use these simplified approaches may meet with some limited success, but because their objective falls short of what can be done, because they do not seek to get the most out of their processes, they do not reap the benefits available from SPC. The reality falls short of the promise, and the users return to sorting as a way of life—make enough stuff and some of it is likely to be good.

And then there is the group that is confused by the three groups above. They do not understand the first two interpretations of SPC, but they presume that there must be something to all the mathematics, and so they encumber SPC with all sorts of distributional assumptions, cautions, and requirements. Then, out of this confusion, they superstitiously place restrictions on how and when to use control charts. And then they are suprised when people get tired of standing on one leg, facing east, at sunrise, prior to placing their data on a control chart.

Enough of this nonsense! Statistical Process Control is not about statistics, it is not about process control, and it is not about conformance to specifications. While SPC can be used in all of these ways, it is much more than any one of these narrow interpretations. It is, at its heart, about getting the most from your processes. It is about the continual improvement of processes and outcomes. And, it is, first and

foremost, *a way of thinking* with some tools attached.

While it is easy to focus on the tools, and while it is easy to teach the tools, the tools are secondary to the way of thinking. Learn the tools and you will have nothing. You will not know what to do. You will not know how to use the tools effectively.

Learn and practice the way of thinking that undergirds the tools and you will begin an unending journey of continual improvement. Without major capital expenditures you will discover how to increase both quality and productivity, and thereby to improve your competitive position. This is not a theory. This has been proven time after time. But, of course, the successful companies are reluctant to share this secret with their competitors (even if their competitors could understand it).

And this is where the nomenclature gets in the way. As outlined above, as long as we use the words Statistical Process Control we will stimulate people to think about techniques for maintaining the *status quo*. As long as we talk about "control charts" we will continue to be misunderstood as described above simply because of the many different connotations of the word control. The words "out of control" generally bring to mind the image of a disgruntled worker going crazy and shooting his fellow workers. On the other hand, the words "in control" are used to mean "under my control" and "in specification."

So, to understand just what Shewhart meant when he used the word "control," we return to his own definition:

"A phenomenon will be said to be controlled when,
through the use of past experience,
we can predict, at least within limits,
how the phenomenon will vary in the future."

Here we see that *predictability* is the essence of Shewhart's use of the word control. A phenomenon that is controlled is predictable, and conversely, a phenomenon that is not controlled is unpredictable.

Consider how the sense of Shewhart's definition is unchanged by the following paraphrase:

A *process* will be said to be *predictable* when,
through the use of past experience,
we can *describe*, at least within limits,
how the *process* will *behave* in the future.

The substitution of these four words does not change the thrust of Shewhart's idea, but it does avoid some of the confusion that his original words have engendered.

Thus, the control chart is, in effect, a *process behavior chart*. It examines the data from a process to see if the process is *predictable* or *unpredictable*. When a process is unpredictable it will display the *excessive variation* that is the result of assignable causes. When a process is predictable it will display the *routine variation* that is characteristic of common causes.

Therefore, in order to better win the hearts and minds of others, and to encourage them to enjoy the benefits of Shewhart's creation, I propose that we begin to use the following terminology:

Instead of **Statistical Process Control**,
we talk about **Continual Improvement**.

This has the advantage of focusing attention on the job of making things better by getting the most out of our current systems and processes as opposed to merely monitoring the process to maintain the *status quo*.

Instead of **control charts**
we talk about **process behavior charts**.

This has the advantages of avoiding the baggage associated with the word "control" and correctly describing how to use the chart to get the most out of an existing process.

Instead of an **in-control process** we talk about a **predictable process**.

Instead of an **out-of-control process** we talk about an **unpredictable process**.

All too often the words in-control are used to describe a situation where all of the product falls within the specification limits. The words "predictable" and "unpredictable" do not carry the same connotations. It is easy to make a distinction between a "predictable process" and "acceptable product."

Instead of an **out-of-control point** we talk about a **point outside the limits**.

Instead of an **in-control point** we talk about a **point inside the limits**.

This simply replaces emotionally loaded terms with a descriptive phrases.

Instead of **control limits for individual values**
we talk about **natural process limits**.

Instead of **control limits for averages**
we talk about **limits for averages**
(Upper Average Limit, Lower Average Limit).

Instead of **control limits for ranges**
we talk about **limits for ranges**
(Upper Range Limit, Lower Range Limit).

These changes are not as hard to get used to as they might seem at first, and they avoid the red-herring of "control limits."

Finally, I must acknowledge that the idea of a better terminology is not mine alone. Process behavior charts came from Dr. Sophronia Ward. Natural process limits came from Professor David S. Chambers. Predictable and unpredictable was the suggestion of Mike Kazeef. After years of working for a better understanding using the traditional terminology, I have finally come to the point were I am convinced that a new terminology is necessary to clearly and effectively communicate the purpose and use of the powerful techniques of Continual Improvement.

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