Understanding Variation

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Let’s face it. Variation exists. A certain amount of variation in the business process is normal. Reacting to normal variations as if all variations were exceptions, however, will add cost and could actually increase the amount of variation. Understanding and managing variation effectively is a basic concept that many manufacturing managers have been slow to grasp.

Of course, as managers, it's our job to spot and respond to anything that varies from specified procedures or output, and then try and adjust it, correct it, control it. The problem is that we often over-react and end up over-controlling the process in a way that actually increases, rather than reduces, the variability.

For example, let's imagine that your management team is gathered together in a conference room. Someone is too cold. The thermostat is turned up, a bit more than usual, to warm them up quickly. You guessed it, now even more people get too hot, prompting another faster, even greater adjustment of the thermostat.

What went wrong? Simply, an unwillingness to accept and understand normal variation, which eventually led to increased variability. By focusing on the exception (trying to warm up the one cold person), a manager turned up the thermostat, over compensating for the natural variation in temperature, and, in the end, increased variability (resulting in more than one person being uncomfortable), and through repetition of the process the effort to respond, then control, got out of control.

What would have happened if this manager just left the room temperature alone (and accepted variability)? At worst, he would have had one cold colleague. On the other hand, over time, this colleague's body temperature may have adjusted to the room temperature by itself. We need to realize that variation is a natural occurrence and by "over-controlling" we become our own source of increased variability and increased cost.

Variability Explained

Let's take a closer look at variability. Variability is an unavoidable difference among individual inputs and outputs of a process. Variation is a natural element of any process, and it is everywhere.

There are two types of variability, and it may help to understand the difference. First, we have "common" causes of variability. These are random and have random impact. If you were to graph the occurrences (measurements, for example) over time, the result would be what statisticians call a “normal" frequency distribution. Over time, this frequency distribution will form a stable or constant pattern, which is predictable and is permanent unless action is taken to change the process. Typically, this "normal" type of variation is associated with 85 percent of process concerns.

The second category is "special" causes of variation. These are typically associated with one or a few major and readily identifiable sources. The frequency distribution for the process may remain normal, but might change in size, spread, or location. The result of "special" causes of variation, however, is unpredictable. Special causes of variation can be identified and corrective action taken to return the process to its former, more normal, behavior.

These "abnormal" variations are generally associated with 15 percent of process concerns.

Truly understanding variability requires a shift to process thinking, something we Americans have never found easy to do. First, you must be familiar with the process's "normal" pattern of variation. Only then can a change in that process be identified. Understanding the current variation is also the key to process improvement, any effort to better control a process should result in a narrowing of the frequency distribution, bringing more of the measurements closer to the target or center reading. This reflects a decrease in variation; reduced likelihood that a measurement will stray away from the center. Process adjustments (as compared to increased control) will move the existing frequency distribution without changing its size or shape.

Time and Money

Process measurement and process improvement/control apply to any process, not only machines out in the plant. In this next example we'll see how time and money can come into play in a non-production example. Let's say you have 20 major customers. Sure, you have a standard order entry procedure, but each customer is different, they’re special, so their orders are treated differently. Before long, you have 20 different order entry procedures. If the orders get filled and get filled on time, so what? Where's the problem?

Well here it is: You now have more than one process. Each order is different; each process is different. In a sense, you have re-invented the wheel every time. How much time and effort went into the development of all of these processes? How does a new employee learn to take an order? Doesn't this increase training time and lead to greater uncertainty? Are there now more opportunities to make mistakes. Which order entry process do you use for new customers? Do you have to invent a new process each time? If not, how do you find the one existing process

that fits the new customer's needs? And what if those needs change? Are you using the correct one for each customer/order that comes in? All this leads to increased opportunity for errors.

The successful manager will recognize that, naturally, all his customers are different. But that doesn't mean their orders can't be taken in a single format. And, yes, there will be exceptions on some orders that can't be handled with the generic process. But let's take as much of the order as possible in a standardized form, then decide how to handle the (relatively few) real exceptions that remain.

The 80/20 rule applies here: 80% of the variation falls within 20% of the range. Build your processes to handle that 80% or 90% that can be easily accommodated and don't try to automate the relatively small percent of the requirements that go beyond the "norm."

We, as managers, would do well to learn to understand and accept the natural variation in our processes and not react unnecessarily. We must begin to recognize that problems in variability arise when we seek to change the process when it is already in control, albeit with normal variations, as illustrated in the room temperature and customer order examples.

Successful managers develop business systems that minimize variation. Successful managers also understand that variation is a normal part of the world in which we live, that they must understand the amount of variation that is inherent in a process, and know when and how to react to variation.

Let's stop chasing normal variations as if they were exceptions. By accepting normal variations in business we'll be able to work smarter and reap the rewards.