Variation: Common and Special Causes

Processes exist to meet the needs of the customer. Processes not only produce the product or service, but they also produce data. Statistical process control (SPC) techniques are tools that allow us to use these data to improve processes. To be able to understand and successfully apply SPC techniques and philosophy, one must understand the information contained in variation. Why isn't our product within specifications all the time? Why doesn't the computer reflect what is actually in inventory, each and every time? Why does the time to close the books at the end of the month vary? Why isn't our on-time delivery the same each month? This module introduces common and special causes of variation.

Purpose

The purpose of this module is to introduce the concept of variation. It begins by defining quality. If we want to produce quality products and services, we must understand what a process is and why it is important that we focus on the process – not the end product or service. Variation is then defined. To reduce variation, it must be traced back to its source. In the past, variation has been handled through specifications. While specifications are important, they don't really help improve a process. To improve a process, one must understand what common and special causes of variation are. Statistical control is introduced.

"Understanding variation is the key to success in quality and business."
- Dr. W. Edwards Deming

Quality: What is It?

"Are you in favor of quality?" Dr. W. Edwards Deming used to ask people this. Of course, everyone is in favor of quality. But what is this thing called quality? People often eat out now. Think about the last time you went to a restaurant that you thought was very good – a quality restaurant. What made you think that way? Probably the food was excellent, the service great. It was clean. You enjoyed the experience and felt it was a good value for the money you spent. And what is the impact on your future behavior? You will be back of course.

Now, think about the last time you went to a restaurant that you thought was not very good – poor quality. What made you think that way? Most likely, it is the opposites of the items above. The food was poor, the service poor. It was dirty. And what is the impact on your future behavior? You probably won't be back, at least for a long time.

Customers think this way about the products and services they receive. Does it meet their needs? Does it provide value for the money spent? Yet, customers are different. Have you ever gone to a restaurant with a group of people and some of you thought it was great while others didn't like it? Customers define quality in different ways. Dr. Deming said that the customer's definition of quality is the only one that matters.

There are many ways customer may define quality. They may look at quality in terms of specifications – the product being within specifications all the time. They view quality in terms of time – getting the product to them when they need it. They may look at quality in terms of reliability – now long the

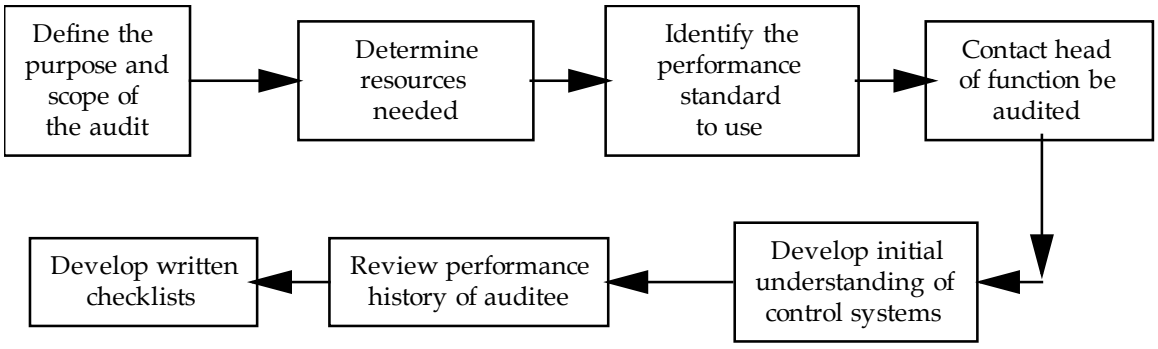
product lasts and does what it is intended to do. Or, it may be a combination of these. The difficulty is that customers view quality differently. One customer's view of on-time delivery will be different from another customer's view. The point is that customers view quality from their own perspective. And, to understand this perspective, you must stay close to the customer and continually ask questions about his needs. The customer perspective is often subjective. In his last book (*The New Economics for Industry, Government Education*), Dr. Deming said that quality is subjective and must have commercial value. "A product or service possesses quality if it helps somebody and enjoys a good and sustainable market." In the end, it is impossible to develop a universal definition of quality. But you don't need to define quality to produce it. As a customer you know quality when you see it or perceive it to be there.

Processes and Quality

Part of quality, of course, is satisfying the customer – meeting and, perhaps, exceeding customer expectations. This must be done continuously. There is always competition for the customer's business. So, you must also be constantly improving to keep the customer's future business. This continuous improvement is key component of quality. But, you don't continuously improve by focusing on the final product or service. The key to continuous improvement comes from focusing on the process – the steps that produce the final product or service to the customer.

A process is what we do – the steps we take to produce a product or service. Some examples of processes include making a chemical product, making an overnight delivery, entering a backorder, and processing an order. Processes can have just a few steps or many steps. A process flow diagram is a quality improvement tool that can be used to lay out the steps of a process. An example of a process flow diagram is given below.

Figure 1: Process Flow Diagram for Preparing for an Audit



It is helpful to divide a process into six major elements: measurements, machines, methods, materials, people, and the environment. These six major elements, the 4 M's, a P and an E, combine to produce the process output. Figure 2 shows these six major elements as part of a root cause analysis tool called a cause and effect diagram.

Individuals Control Charts

Shrink, shrink variation to reduce the loss.

-Dr. W. Edwards Deming

SPC FOR EXCEL

X-mR Charts

- Simplest of control charts
- Most used in non-manufacturing
- Infrequent data
- No subgroups

Widely Used

Widely Used

Simplest

Single Data Points