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Any sort of process which produces output that can be measured periodically can be thought of as generating a flow of potential information into which a statistician can tap. Classical Shewhart methods can often help a statistician to identify local problems within the process associated with particular times, localities, people, etc.; or to spot system problems resulting in extreme variability or in discrepancies in central tendency from specifications. Other statistical techniques can identify trends over time, correlations, etc.; and surveys can be used to accomplish a variety of goals, including supplying information about consumer preferences. Despite these techniques and the latently rich source of information which together provide the potential for producing never-ending improvement in the process generating the information, results usually are disappointing.

Experience has shown that perhaps 15 or 20 percent of the potential for improving a process lies in elimination of local problems, some of which can be accomplished by those working in the process. But the bulk of the improvement can be made only by management in improving the system that generates the process. If we are talking about a survey, improving the system might mean improving the survey instrument and/or improving the overall training of those who administer the survey. Such improvements can initiate a shift in the process mean and a decrease in variability.

There are two sorts of reasons why such improvements in the system fail to occur, and both involve top-level management. In the situation in which the process is in control, management does not take responsibility to bring about changes that statistical evidence implies are needed. When the process is not in control and, in fact, is in such a state of chaos that little can be learned about what is needed from using statistical methods, it is also up to management to clean up the chaos so that process control can be initiated.

In the latter situation, the system generates so much noise that it is difficult to detect the signal. Instead of a normal distribution or a binomial distribution being generated by the measured output, one sees a mixture of several distributions, or perhaps some other distribution

characteristic of certain out-of-control processes.

For this situation there are barriers to productivity that need to be taken care of before the process can be brought under control, and even before statistical methods can be very helpful in bringing it under control. In a manufacturing process, these barriers might be uneven quality of materials, inherited defects, poor maintenance of machinery, defective tools or fuzzy operational job definitions. For a survey, there may be analogous sorts of barriers. For example, because of lack of integration of training, the expertise of those taking the survey, regarding the phrasing of certain critical questions, might be very uneven, or methods of dealing with nonrespondents may vary. If a control chart demonstrates other than a unimodal distribution with no more than a very few outliers, then one can safely infer not only that the process is out of control, but also that consideration should be given to the possibility of the existence of barriers of this type.

Different sorts of situations in which local problems involving particular times, localities, individuals, etc. have been eliminated and the process has been brought under control, are like the states of chaos, in that it is impossible to make improvements in output without changing the overall system. Changing the system in this case requires a particular type of consciousness on the part of management. First, management needs some knowledge of what statistical analyses are telling them; and second, they need to feel a commitment to fine-tuning their system. Given these, of course, they need to take action or set activity into motion to enhance the workings of the process. Consumer research or investigation of the internal mechanisms of the system may tell them how to go about doing this.

With the system under control, they usually will be able to make changes and measure responses to these changes without difficulty. After making such changes, statistical techniques can let them know if new local problems are appearing. If so, they can bring the system back into control and then continue to improve it. In order for this kind of process to begin, there must be a strong commitment on the part of top-level management.