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The Definition of Quality

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Dr. Taguchi says that Quality is having a process that is producing product that is "on target with minimum variation" [Taguchi, 1981] and Dr. Montgomery says Quality is "inversely proportional to variability" [Montgomery, 2001]. I'm going to take the liberty of suggesting that Montgomery is using the word variability to included the variance in the data (i.e., the squared deviation from the mean) and the squared deviation from the target (i.e. $(m - T)^2$). So if we accept Montgomery's broader expected loss definition of variability, then the two definitions are similar but not mathematically equivalent.

Now let me tell you what I think is wrong with these definitions. First, Taguchi's process improvement procedure, which is based on the definition, calls for the practitioner to adjust the variables that affect noise to minimize variation, and then to adjust variables that affect the signal to put the process on target. This is a classic form of two-step optimization and just like one-variable-at-a-time experimentation it is known to be a flawed approach to system optimization [Box, 1978, p. 512].

Montgomery's definition has some problems also. For example, if the improvement process uses this definition, then reductions in the variation from the mean and variation from the target are treated with equal importance. This is acceptable if that is what the practitioner desires but that may not be what is desirable. The solution to this problem is to add weighting factors to the components of the objective function.

Finally, both definitions suffer from a fundamental logical flaw. The problem is that variation reduction efforts may actually reduce revenue and profitability of the process [Flaig, 2002] and a reasonable argument can be made that in a perfectly competitive marketplace long term profitability reflects good production processes and customer satisfaction with the product. Which in turn is an indicator of perceived value or Quality (based on Deming's definition that Quality products are those that meet customer expectations and creates a market (i.e., at an economic price). So under these conditions ill conceived variation reduction might actually reduce perceived Quality. Here the problem is the selection of an inappropriate objective function for optimization. In business the profit generated by a process is equal to revenue minus cost. When we focus our attention on variation reduction to reduce costs and ignore the effect that such process changes might have on revenue we are asking for trouble because, as Dr. Deming often warned, we may optimize a component of the system while sub-optimizing the

system itself. There are good solutions to this problem but they require generating a process and business model and then using multi-response optimization to find conditions that optimize profitability while minimizing profit variation.

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