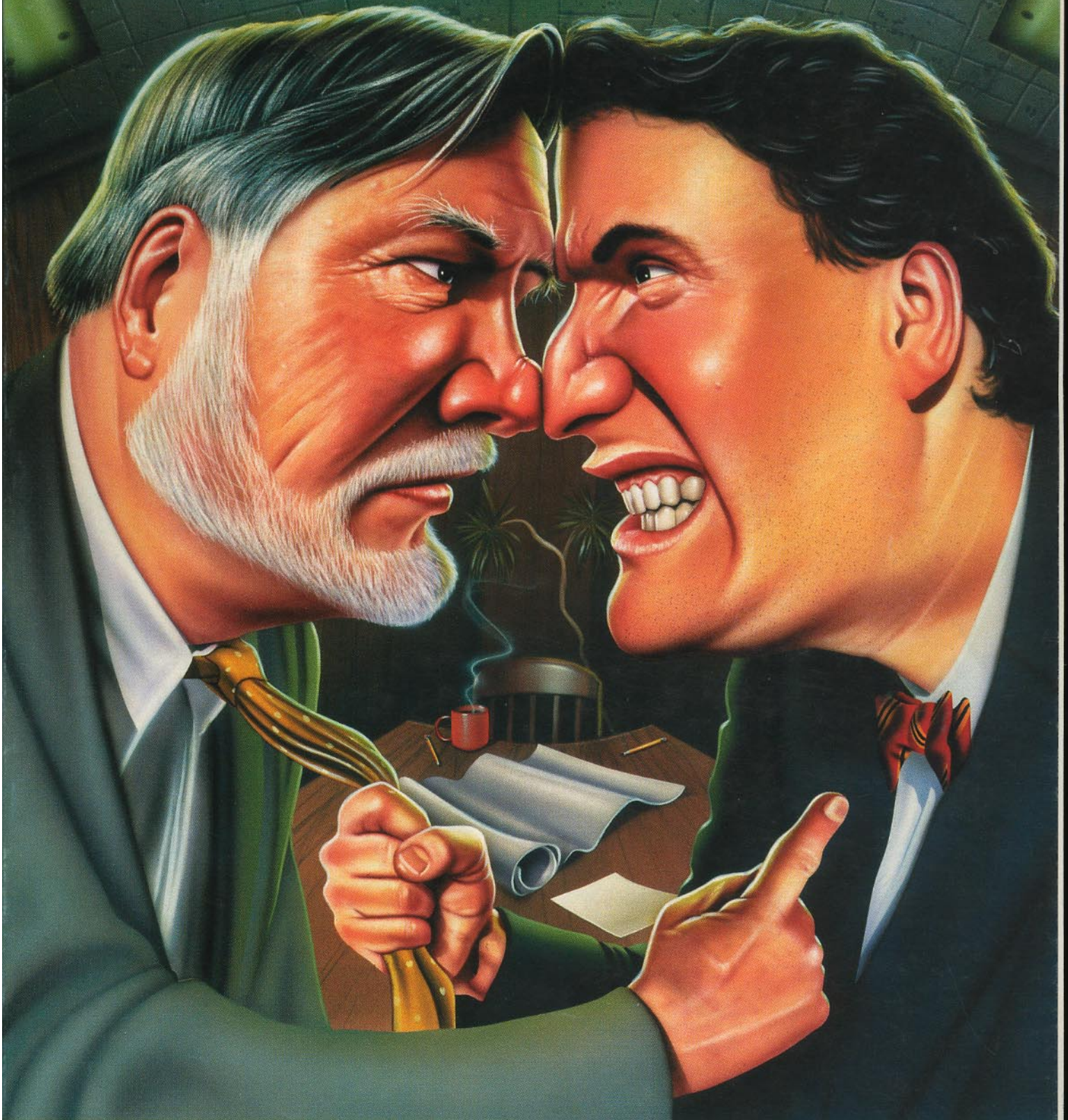


MAY 1998

A S Q

# Quality Progress



**CONFLICT AT WORK:**

*How to improve our interpersonal skills*

# Six Sigma: A Breakthrough Strategy for Profitability

**A**N AGGRESSIVE CAMPAIGN TO BOOST profitability, increase market share, and improve customer satisfaction has been launched by a select group of leaders in American industry.

Known as "six sigma," the strategy provides companies with a series of interventions and statistical tools that can lead to breakthrough profitability and quantum gains in quality, whether a company's products are durable goods or services.

Taken from a letter in the Greek alphabet, the term "sigma" is used in statistics as a measure of variation. The six sigma strategy measures the degree to which any business process deviates from its goal. The average product, regardless of how simple or complex, has a quality performance value of four sigma, for example. This is where most American companies cluster.

The best products, however, are valued at six sigma, a level of excellence in performance that is truly world class.

## Six sigma 101

The philosophy of six sigma recognizes that there is a direct correlation between the number of product defects, wasted operating costs, and the level of customer satisfaction. The six sigma statistic measures the capability of the process to perform defect-free work. For example, if the wall-to-wall carpet in a 1,500-square-foot home were cleaned to the three-sigma level, about four square feet of carpet (the carpet area under a typical recliner chair) would still be soiled. If that same carpet were cleaned to the six-sigma level, only an area the size of a pinhead would still be soiled.

With six sigma, the common measurement index is defects per unit and can include anything from a component, piece of material, or line of code, to an administrative form, time frame, or distance. The sigma value indicates how often defects are likely to occur. The higher the sigma value, the less likely a process will produce defects.

Consequently, as sigma increases, product reliability improves, the need for testing and inspection diminishes, work in progress declines, costs go down, cycle time goes down, and customer satisfaction goes up.

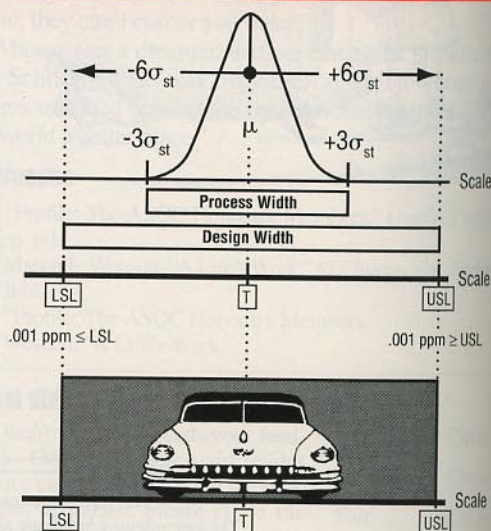
Figure 1 displays the short-term understanding of six sigma for a single critical-to-quality (CTQ) characteristic; in other words, when the process is centered. Figure 2 illustrates the long-term perspective after the influence of process factors, which tend to process centering. From these figures, one can readily see that the short-term definition will produce 0.002 parts per million (ppm) defective. However, the long-term perspective reveals a defect rate of 3.4 ppm.

(This degradation in the short-term performance of the process is largely due to the adverse effect of long-term influences such as tool wear, material change, and machine setup, just to mention a few. It is these types of factors that tend to upset process centering over many cycles of manufacturing. In fact, research has shown that a typical process is likely to deviate from its natural centering condition by approximately 1.5 standard deviations at

Making strides along the road to defect-free work

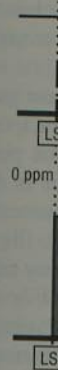
by Mikel J. Harry

**Figure 1. Graphical Definition of Short-Term Performance for a Single Characteristic**



(Source: The Vision of Six Sigma: A Roadmap for Breakthrough, Fifth Edition)

**Figure**



(Source: The Vision of Six Sigma: A Roadmap for Breakthrough, Fifth Edition)

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**Table 1.**

| Sigma   |
|---------|
| 6 sigma |
| 5 sigma |
| 4 sigma |
| 3 sigma |
| 2 sigma |
| 1 sigma |