

Understanding Variation is Essential - Part 2

COSTLY EFFECTS OF DEMING'S MISTAKE 2

Dr. W. Edwards Deming worded the second component of his system of profound knowledge as follows: “Some knowledge of the theory of variation.” In other words, one need not be eminent; one need not have a Ph.D in statistics. All that’s required is some knowledge of the theory of variation – with great emphasis placed upon understanding and differentiating between common cause variation and special cause variation.

Common cause variation comes from within processes or systems and produces outcomes that are different, but not significantly different. Special cause variation is not a part of the system. It comes from outside processes and produces outcomes that are not different; they’re significantly different.

Understanding variation is essential.

Dr. Deming insisted that failure to understand and differentiate between these two very different types of variation is a source of staggering waste throughout American industry. As reported in an earlier blog on this topic, Deming commented on the rising costs of malpractice insurance and lawsuits. He wrote,

Every suit for malpractice in medicine, or in engineering or accounting, implicates the event to a special cause - somebody was at fault. Study with the aid of a bit of knowledge of variation leads to a different conclusion: the event could have come from the process itself. It could have been built in, guaranteed.¹

Deming documented two costly mistakes people will make if they lack knowledge of theory of variation.

Mistake 1. To treat as a special cause any failure, problem, accident, complaint, breakdown, etc., that in fact was the result of common causes from within the process. This leads to tampering, not process improvement. The costs of Mistake 1 were addressed in an earlier blog posted on this web site.²

Mistake 2. To attribute to common causes of variation from within the process any problem, failure, breakdown, accident, complaint, etc., that was in fact due to some special cause from outside the process.

High Costs of Mistake 2

Suppose a manufacturer experiences a significant increase in product defects. The actual source of the defects was an abnormally high level of contaminants in a supplier's material; a special cause of variation from outside the manufacturer's and supplier's standard processes. The manufacturer, however, reacts to the defects as though they were generated by its own process, and invests capital in new processing equipment.

Failing to understand the variation and its true source, the manufacturer will have made a very costly mistake. The special cause of the defects from the supplier's out-of-control inputs will come screaming in without warning – unpredictable by its very nature – and produce defects on the new capital equipment just as it did on the old machines. The manufacturer will have flushed its capital investment right down the toilet!

The cost of such waste in capital investment is both staggering and rampant throughout American industry. Imagine how much more competitive we might be in the face of the low labor rates in China and India if we weren't throwing billions of dollars in capital down the toilet every year! This waste occurred and continues because America's business schools fail to teach decision-making techniques guided by some knowledge of theory of variation. They provide skills, not knowledge; they provide examples and case studies but provide no knowledge.

Even Higher Costs

In an education setting, mistakes committed due to lack of knowledge are even more costly than in a business setting. Schools are dealing with something much more precious than mere capital, yield losses, or defective products; they affect raw human potential.

Years ago, the superintendent of a California school district attended one of my seminars on the application of the analytic statistical methods to teaching, learning and administrative processes. The day he returned to his office, the report of his first graders' reading test results landed on his desk.

The report listed, by student, school and classroom, the number of words that first grade students read correctly in each of the district's twelve first-grade classrooms. The scores ranged from 0-100 words read correctly. Students who scored below a certain number of

words were identified for Chapter 1 remedial help and connected with reading specialists to receive that special help.³

The intermediate statistics – guided by some knowledge of theory of variation – indicated that most of the first graders in the district fell into a group that constituted a system. In other words, their test scores were different, but they weren't significantly different. They rolled the reading program's dice and all of them rolled between a 2 and a 12.

No students scored significantly high, but in each of the schools some students' scores fell statistically significantly low in comparison to all of the test scores. These students rolled the reading program and test dice, but rolled a negative number!

The first graders whose scores fell significantly low were in need of special help like that provided by Chapter 1, Reading Recovery or similar remedial initiatives. Such special help would not be provided by the district's standard reading program. But three out of every four students in need of special help did not receive it! The arbitrary standard for Chapter 1 services had been placed at a score lower than theirs.

Norm-referenced standards are derived from national or state scores. The norm-referenced standard dictated what students would receive or be denied special help. But this district leader was not the superintendent of schools for the United States of America or for the State of California. He was the superintendent of schools in his own town.

Only when he applied the intermediate statistics to his own first graders' scores was the superintendent able to remove the barrier imposed by the standard. Only then was he able to gain knowledge from the variation in his own district's scores and understand the needs of his own first graders.

Costly mistakes are the fault of the system – not just the people.

In the absence of knowledge, tragically three out of every four students who needed special help would have remained in the standard reading program – in need of special help, but not getting it. When the superintendent called me to report his findings, he said that he felt physical pain as a result of what he'd learned.

He realized that for years his first graders in need of special help were left sitting in their regular classrooms, falling farther and farther behind in their language development; not understanding why they couldn't keep up, why they were failures. What struck the superintendent the hardest was the realization that, at the tender age of a first grader, within a few years they'd be lost. He said, "It's devastating to realize that I have spent most of my career hurting children."

He hadn't meant to hurt children. He hadn't meant to fail to provide special help to students in need of special help. But because he lacked knowledge of theory of variation, he indeed ended up spending most of his career hurting kids.

Now this problem is not a people problem; it is not the fault of the superintendent. It's not his fault that he graduated from the University of California at Berkeley not understanding variation. It's not his fault that he received bachelor's, master's and doctoral degrees without learning theory of variation. It is a fault of the system, and the costs are devastating. The costs are incalculable, unknown and unknowable, because they affect our children and their futures.

If students in schools of business and education aren't learning about rational theory of variation, they emerge with the power to destroy organizations and people. And today, managers and educators are wielding that power without mercy – because they wield that power without knowledge.

As Dr. Deming was fond of saying, *"It's about time for American management to wake up!"*

Notes

¹ W. E. Deming, *The New Economics for Industry, Government, Education*, The MIT Press, Cambridge, MA (1994), p. 193.

² J. F. Leonard, "Understanding Variation is Essential – Part 1," www.jimleonardpi.com (Feb 26, 2016).

³ J. F. Leonard, *The New Philosophy for K-12 Education: A Deming Framework for Transforming America's Schools*, ASQ Quality Press, Milwaukee, WI (1996), pp. 111-113.