

Bringing Quality Management to Life: Variation and Sustainability in the Writings of W. Edwards Deming and Gregory Bateson ©

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Abstract

The writings of both W. Edwards Deming and Gregory Bateson suggest that management thinking and practice should be guided by an appreciation of human organizations as natural living systems, not mechanical systems. This is evident in what both men had to say about the subjects of variation and sustainability. Their ideas on those two subjects are amplified and reinforced by late-twentieth-century findings of modern scientists in the subjects of evolutionary cosmology and biology. These findings suggest important new avenues for research in the field of quality management.

W. Edwards Deming (1900-1993) and Gregory Bateson (1904-1980) stand among the foremost systems thinkers of the twentieth century. Both were trained in science: Deming in mathematical physics and statistics and Bateson in biology and anthropology. They regarded human organizations and human society as natural systems to be viewed from a relational and evolutionary perspective, not as mechanical systems to be viewed from the absolutist and static perspective of classical Newtonian science. There is no evidence that either man knew the other or was influenced by his writings. Though brief, the following commentary suggests that important new insights into modern management issues will emerge from comparative studies of Deming's and Bateson's works. Indeed, Deming and Bateson rank among those great thinkers whose ideas build fractally upon a few fundamental themes, so that any of the parts reveals the pattern in the whole --just as the branching pattern of creeks and brooks that flow from a small mountain stream reveals the pattern in the system of tributaries and river arteries that comprise an entire watershed.

One theme that recurs in Deming's and Bateson's works is the deleterious impact on quality of life caused by human efforts to pursue quantitative goals. Both men eschewed

efforts to drive people with quantitative targets without regard for how those efforts affected the relationships of people to each other and to the rest of nature. Both saw quality as an abiding feature of the natural system that humans inevitably are part of, but separate themselves from by their efforts to pursue quantitative goals and thereby diminish the quality of their lives. This definition of quality views features of organizational processes, products, and services in a broad framework that encompasses the ability of Earth's ecosystem to combine the sun's energy with zero marginal material input in a process that perpetually generates increasing variety, diversity, and richness of output. That process began just over four billion years ago with dancing water-borne chains of self-replicating carbon molecules and has culminated most recently in the production of springtime floral bouquets on grassy plains, dolphins leaping in the sunset, and an intelligent primate species that is capable of contemplating whether its collective economic pursuits threaten its survival as a species in this creative dance we call life. In short, life is quality, and anything that threatens Earth's natural life processes is non-quality. By that definition, some organizations that have won national quality awards around the world in recent years are among the most voracious destroyers of quality on Earth. One can demonstrate how this view of quality was central to both Deming's and Bateson's thinking by considering what each man said about two topics--variation and sustainability.

1. Variation.

Both Deming and Bateson said much about the subject of variation, and both viewed variation as a deeply ingrained and essential aspect of all natural systems. Their ideas presaged the view espoused in the 1980s by the physicist Fritjof Capra (1982) that management science and the study of organizations would never be on the right track until they abandoned their long-standing commitment to Newtonian thinking and started to view human organizations through the lens of modern science, especially quantum physics and evolutionary biology. Bateson had expressed the same belief much earlier

when he attributed the major problems of the world to “the difference between the way nature works and the way man thinks” (Johnson and Broms, 2000, p. 193). Deming also emphasized the relational and probabilistic way that nature works, a view that he shared with his mentor Walter Shewhart who had couched his early explanation of statistical process control in terms of the way nature works.

Indeed, the opening chapter of Shewhart’s path-breaking work on statistical process control (Shewhart, 1931) grounds the discussion of variation in the ideas of early-20th century scientists concerning the probabilistic nature of reality in the universe. He quotes from journals such as *Nature*, one of the oldest and most respected outlets for state-of-the-art scientific research, and he cites passages from then recent works by physicists Arthur Eddington and Percy Bridgman. Having received a Ph.D in mathematical physics in 1917, Shewhart probably had more than passing familiarity with new relativistic thinking and with ideas that were leading to what later would be known as quantum physics. When he referred to “modern” science he obviously meant recent 20th-century science, and he unmistakably differentiates that science from the Newtonian varieties that had prevailed until that time.

The key distinction Shewhart focuses on is the contrast between the Newtonian scientists’ belief in certainty and the modern scientists’ recognition that nature’s processes seem to be probabilistic. Whereas scientists of the Newtonian persuasion believe that outcomes of natural processes can be predicted with pinpoint accuracy, if only we know all the underlying forces at work, Shewhart clearly understood that natural processes are inherently variable. More importantly, he also recognized that natural process always seem to vary within limits. Thus, he believed that the outcome of a natural process can be predicted, but only within a range, not with the accuracy of a bullet hitting a target.

Most remarkably, he then makes a leap and asserts that business processes, especially in manufacturing settings, should be viewed in the same new light with which modern scientists view natural processes. To back up this claim, he cites evidence gathered from

several manufacturing processes at Western Electric, his employer in the 1920s, showing that variation in a well-run process is to expected, but is confined within statistically definable limits. In this way, the science of statistical process control is born out of Shewhart's conviction that commerce not only mirrors nature, but commerce must run according to the same pattern that scientists observe in natural systems if it is to operate properly. If the scientific world has transcended Newton's explanation of natural processes, then the business world, according to Shewhart, must make the same transition in thought or else it presumably risks being irrelevant, at best, or possibly dangerous, at worst.

The 1990s saw a virtual flood of books by organizational scientists and management authorities who recently discovered the world of quantum physics, complexity theory, and modern biology. Usually following the lead of Fritjof Capra (1982), who began articulating this message in the late 1970s, they advocate grounding our view of organizational life in the so-called "new science" as if the idea were being enunciated for the first time. In fact, Walter Shewhart was already there with the same message in the 1920s, and so were Deming and Bateson some 20 to 30 years later. It is unfortunate that Shewhart's early "natural systemic" perspective on organizational life seems to go unrecognized in the management literature.

W. Edwards Deming, who of course was deeply influenced by his early association with Walter Shewhart, himself must have had more than passing familiarity with the latest scientific thinking. His doctoral program at Yale, completed in the late 1920s, focused on mathematical physics and his dissertation dealt with a study of Brownian motion, a phenomenon that cannot be understood using the categories of Newtonian thinking. Deming spoke in unmistakably quantum terms when he referred to "the crisis" in our organizational lives as a crisis of perception. The crisis would not be resolved, in his view, with mere tools and techniques--only with new thinking. He made it quite clear that the way "out of the crisis" was only through a deep transformation in the way we

think about ourselves, about other humans, and about our relationships to the natural world we inhabit. Just as Bateson said when he attributed human problems to the difference between the way man thinks and the way nature works, Deming was telling people to think about variation in human systems in the same way as we observe it occurring in nature. Rather than telling people it is necessary to eliminate all variation, Deming, like Shewhart, portrayed variation as a window through which to understand how processes work--both natural and human processes. A human process that emulates nature is more robust to the extent that its variation manifests a unique voice that blends, resonates, and harmonizes with the voices of other interrelated processes.

It seems surprising that quality management consultants and corporate quality administrators seldom consider why variation exists. Often defining the concept of continuous improvement as relentlessly driving variation toward zero, they seem to assume that all variation in products or processes is inherently bad. This assumption does not distinguish, however, between human goal-oriented mechanical processes, where reducing variation to zero might be appropriate, and natural processes where variation seems essential to survival. Efforts to continuously reduce variation in natural systems are probably never warranted, while efforts to continuously reduce variation in goal-oriented human processes must not be allowed to threaten the larger systems' well-being. In any case, one must always ask: if variation is so bad, then why is it so pervasive in nature?

The answer, it would seem, is that natural processes somehow depend on variation. Indeed, they depend on variation to survive, as Gregory Bateson often observed (e.g., Bateson, 1972, pp. 494-505). The relationship between variation and survival is evident on at least two levels, one short-term and the other long-term. In the short term, living systems demonstrate enormous capacities for adapting to change, and surviving, by engineering myriad forms of variation in their parts. The human body, for example, adapts to changes in outside temperature, at least within limits, by inducing shivering,

perspiration, and a change in metabolic rate. In this way, by constantly varying internal conditions, the body increases its chances of survival by maintaining a more or less constant temperature over wide changes in outside temperature. Similarly, the human blood system is capable of adjusting the red cell count to accommodate large changes in altitude that could overtax the respiratory system and starve the system of oxygen (say when climbing a very high mountain, or when traveling from San Diego or London to Mexico City or Johannesburg). These homeostatic processes exist in all life forms, down to the simplest forms of bacteria. In all cases these life system processes seem to reflect a capacity for insuring survival by using variation to adapt to any short-term change that threatens the constancy of some condition that is vital for the system's survival (Bateson, 1979, pp. 165-171).

Whether writers about quality have ever touched on this idea or not, it does seem that the idea has not had much influence on quality management, given how often practitioners say that variation is an evil to be eliminated as much as is economically feasible. If natural processes had manifest that viewpoint, it is likely that life systems on Earth would not have lasted very long--certainly not the four and one-half billion years they have existed so far. As Gregory Bateson often said, the survival of life systems suggests the presence of a force that contradicts the oft-quoted French saying that "the more things change, the more they stay the same." Bateson suggested that modern biologic science tells us, instead, that the more a thing stays the same--i.e. the more it demonstrates a capacity to survive--the more it must and does change. In other words, variation and survival go hand in hand in natural systems (Bateson, 1972, pp. 426-439).

Of course, variation in natural systems occurs within limits. But the point is that the flexibility, adaptability, and survivability of any smoothly functioning complex natural system depends on having the state of all the parts constantly varying, at least to some degree. Indeed, Bateson went on to point out that if only one part of a complex system stops varying enough, or if it begins to vary too much in one direction--say the growth of

human population in the Earth's ecosystem--then undue pressure is put on all the other parts of the system, causing systemic stress and, eventually, breakdown. Ecologists are now quite familiar with this concept, but quality professionals seldom talk about increasing the variability in some parts of a system, in order to relieve stress in other parts.

Indeed, one never hears management experts advocate the need for increased variability in the bottom-line financial performance of large corporations. One hears only that the market demands constant rates of growth in profit. Nevertheless, constant increase in profitability or constant decrease in costs would seem to be a surefire recipe for systemic breakdown in any natural system. Although that idea is not likely to be popular among management consultants today, such consultants should ask themselves how likely it is that present-day business organizations stand a better chance than non-human natural systems have to survive the pursuit of "continuous improvement" defined in such terms.

2. Sustainability

Long-term change--also necessary for the survival of natural systems--is manifest in the process we call evolution. Evolution is a remarkable homeostatic process that has for four and one-half billion years preserved Earth's mother-of-all life systems, the ecosystem. Gregory Bateson believed that the first person ever to perceive evolution as a cybernetic, homeostatic process that works to sustain the existence of the evolving ecosystem was Alfred Russell Wallace (Bateson, 1972, pp. 428-429). A contemporary of Charles Darwin, Wallace is the man whom many scholars argue was the first to use the concept of natural selection to explain the evolution of life forms on Earth, even though Darwin was the first to "go to press" with the idea. But as Bateson showed, Darwin's and Wallace's interpretations of natural selection were quite different. Darwin saw it in terms of a competitive struggle that pitted species against an external environment, a struggle

that was described by Darwin's followers with phrases such as "survival of the fittest" and "red in tooth and claw." ¹

Wallace, on the other hand, explained evolution not in terms of competitive struggles between species and the environment, but in terms of the governor that regulates the speed of a steam engine by maintaining constancy in the angular velocity of a flywheel. As Bateson puts it, building on Wallace's idea, the job of evolution is to maintain the constancy of something--specifically, the survival of the entire system comprised of all species and the environment. Darwin, according to Bateson, focused on the wrong subject--the individual species--when in fact the real subject of evolution is the species plus environment. In fact, the species and the environment co-evolve, to use a term that is popular among biologists today. Moreover, if you add the remarkable findings reached in the past thirty years by biologist Lynn Margulis, this process of co-evolution sustains the total system through cooperative symbiotic relationships, not competitive knock-outs.

This new thinking about evolution, presaged 40 to 50 years ago in Gregory Bateson's writings, lends powerful support to certain ideas that were central to W. Edwards Deming's work. Indeed, Bateson's prescient views on evolution might have put to rest criticisms of Deming's ideas coming from modern management thinkers who are steeped in the analytic Newtonian/Enlightenment mode of rationalism. For example, when Deming spoke of win/win cooperation, of replacing fear with trust, of putting aside competitive performance criteria, of finding fault in the system--not in the person --the reaction all too often is "that sounds nice, but it just isn't the way the real world works." Bateson's views on evolution, now strongly validated in recent writings by leading-edge physicists in the field of evolutionary cosmology, indicate just how perceptive and how correct Deming's view of reality was!

How the world we perceive works depends on how we think. The world we perceive is a world we bring forth through our thinking. As management professor Karl Weick puts it, "believing is seeing." Which brings us back again to Deming's central message in

Out of the Crisis and to Bateson's remark that most of our problems arise because of the difference between the way we think and the way nature works. If we think like an 18th-century Enlightenment rationalist, steeped in a Newtonian view of reality, then, of course, it is easy to believe that humans are independent objects in the universe, moved only by external force or impact and subject to external laws of motion. Perhaps there is no better example of this type of thinking than the laws of economic behavior that have been formulated by those quintessential modern-day descendants of 18th-century Enlightenment thinking, the grand masters of neoclassical economic thought at institutions such as the University of Chicago. It is natural for those who believe in such a world to argue that the person, not the system, makes the difference, and that order arises from the efforts of powerful individuals to impose control on a naturally entropic environment. For such persons, Dr. Deming's ideas are nice to talk about, but as an agenda for action they border on lunacy (as many present-day economists say when you mention Deming's ideas to them).

Deming's writings, and those of many of his followers, do rather successfully answer such criticisms. The most comprehensive of these answers is provided, of course, in the theory of profound knowledge that began to take shape in the last few years of his life (Deming, 1993). However, the impact of these writings could be made even more forceful were they to incorporate explicitly some of Gregory Bateson's key insights. In *Profit Beyond Measure* (Johnson and Broms, 2000) I attempt to integrate both Deming's and Bateson's lines of thought by showing how the subject of management might be addressed if we start from the premise that a business organization is a life system, not a mechanical system. In short, the book discusses the difference between how most humans think about business and how nature works. To explain how nature works I draw not only on Gregory Bateson's writings, but also on writings by modern physicists on the subject of evolutionary cosmology. In contrast to the practice of managing by results--a practice that Deming abhorred passionately and that Bateson associated with mankind's

fatal pursuit of “conscious purpose” – the book offers new insights into the operations of one of the world's most robust and successful companies, Toyota, where one observes management practices exemplifying the way nature works, not management by results.

The need for businesses to abandon time-honored management-by-results practices is reinforced by messages found in both Deming's and Bateson's writings. In particular, both men entreat us to reject mechanistic modes of thought--especially the idea that we humans impose order on the world--and to transcend to a mode of thought that sees pattern and order immanent in the world, a gift that is ours for the taking if only we will surrender our illusions of control. The artist Henry Miller once expressed this idea beautifully when he said, "the world is not to be put in order, the world is order incarnate. It is for us to put ourselves in unison with this order" (Johnson and Broms, 2000, p. 199). The same idea is, of course, close at hand in the opening chapters of Walter Shewhart's 1931 book. Dr. Deming expressed the idea succinctly and humorously when he took the classic shop foreman's outburst "don't just sit there; do something!" and transposed it into "don't just do something; sit there!" (Johnson and Broms, 2000, p. 178). It is hard to imagine a more forceful way he might have expressed his injunction against tampering.

What if that injunction were paramount on the mind of every business and political leader in today's world? Our manage-by-results culture, as it is now in business and in governmental economic policy making, drives activities that clash with the way nature works at almost every turn. In particular, driving people to mindlessly achieve targets--especially quantitative, financial targets--promotes relentless consumption of natural resources in order to grow and accumulate man-made stuff, all at the expense of nature's ability to continually generate increasingly rich diversity -- a process of “take, make, waste.” The alternative to this might be to concentrate attention on nature's restorative, cyclical means, not on aggressively linear human ends. We might consider how, by pursuing conscious purpose with high technology in our business and economic organizations, we have compromised a system that seems not to pursue goals or

purposes, but only to pursue the continual unfolding of a few basic patterns through which the constant and unchanging supply of matter in Earth's ecosystem is transformed over time into a richer array of more diverse, and hence more robust, "results."

It might help to promote the cause of sustainability more than we realize if we were to apply the word quality only to organizations that truly act according to the way nature works. Perhaps it is time to stop using the word quality to describe organizations that systematically compromise the natural systems that sustain life. This is the message one comes to, surely, when one draws out the full implications of what Walter Shewhart said about variation in nature over 70 years ago, what Gregory Bateson said about the consequences of pursuing conscious human purpose with high technology, and what Edwards Deming said about respecting the voice of the system and not tampering with the system in a futile effort to manage results. Failure to heed these messages has brought us to a point where our business and economic activities are systematically causing what poet Gary Snyder calls the "death of birth" (Johnson and Broms, 2000, p. 208). By reversing evolution and reducing life's diversity, human economic pursuits are destroying the only source of real quality that exists on Earth.

Wrap-up

A core message from Deming's and Bateson's writings is that just as natural systems seem never to grow without limit, so human systems should not attempt to grow without limit. Nature seems to link reinforcing processes, which have the potential to grow relentlessly, with negative feedback processes, to produce ubiquitous variation that is bounded. Nature's recursive communication processes are inherently self-regulating and self-identifying. Life is a self-identifying cybernetic system *par excellance*. The greatest challenge and the greatest opportunity managers face today is to infuse human organizational processes with the spirit of natural living systems.

Few people today seem to recognize that our economic system--driven by the narrow Newtonian focus of neoclassical economic theory--relentlessly squeezes life out of our

social and natural environment. Modern economic theory applies only to systems that move toward stable equilibrium. Such systems, by definition, are mechanical, entropic, and non-living. By contrast, living systems dissipate entropy and sustain order in conditions far from equilibrium. Modern economic theory, by attaching itself parasitically to living human organizations in the realm of trade and commerce in the past fifty years or so, has transformed the human economic system from a potentially cyclical and self-balancing part of Earth's ecosystem into a linear and destructive instrument that threatens, if not all of nature, then at least mankind's place in nature's system.

This transformation is no more evident than it is in the relentless drive toward homogenization and mass uniformity manifest in today's global economic culture. Mistakenly, we view our time in human history as an era of unprecedented change. Nothing could be farther from the truth! Like an insidious cloud of invisible gas, our current economic system is snuffing out change--the flame of life. In the name of economic growth and financial wealth maximization it is destroying in our social, cultural, and natural systems the variation and the diversity that sustain life. To repeat the phrase by Gary Snyder, our economic system, by reversing evolution, is causing "the death of birth."

We truly honor the legacy of Edwards Deming and Gregory Bateson if we begin to recognize that our business and economic organizations should be viewed as life systems, not mechanical systems, and begin to act accordingly. It is time to see these organizations as more than mechanical systems that serve only as instruments of conscious human purpose that we can describe with metaphors from life systems--they are in fact life systems and must be dealt with accordingly if our economic activities are to be sustainable. To come to that point of view is quality--anything less is a destructive sham.

Notes

This paper draws from the keynote talk presented by the author to The Deming Institute Fall 1997 Meeting in Washington, D.C. on October 11, 1997. The author can be reached by voicemail at 503-725-4771 or by email at tomj@sba.pdx.edu.

1. Darwin, related both directly and by marriage to the Wedgewood family, had a personal financial stake in and a great admiration for the rising British industrial order. It may not be coincidental that he interpreted evolution in terms that reinforced the biases of contemporary captains of industry; terms that continue to be used by a broad spectrum of the business community today to rationalize ideas such as win/lose competition, be #1 or #2 or be dead, kill or be killed etc. Henri Bortoft, a British historian of science, once said that "Darwin was adroit at putting his mouth where his money was" (1996, p. 406, n. 314).

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