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What Leaders Can Learn from Science

By Drew Locher

Applying scientific principles to the practice of management has intrigued me for nearly 30 years now.

In 1990, I had already studied mechanical, electrical and computer engineering. I was about to return to school to study business management, more specifically organizational and behavioral science. I had realized after seven or so years at General Electric that I was insufficiently equipped to deal with the challenges that I had encountered there.

I eagerly embraced the concepts of quality management and world-class (the terminology of the time). They struck a logical chord with me. I attempted to apply them in every position that I held and to whatever inefficient or ineffective processes I encountered: manufacturing processes in high volume and low volume environments, engineering processes, even office processes.

I quickly learned that there are very few bad people, but there is an abundance of bad processes. However, time and time again, I encountered people who did not share my enthusiasm for the concepts. Why could they not see what I did? I realized that change (which is what process improvement represents in its most basic sense) and people's attitudes to it were very real obstacles.

So, learning about what makes people and organizations tick was a necessary step for my personal development.

A Body at Rest …

Shortly after I began my studies in organizational and behavioral science, it dawned on me that several of the key concepts that I learned from the engineering sciences certainly did apply.

Let's start with Newton's first law of motion. The first law, also referred to as the law of inertia, can be summarized as, "An object at rest stays at rest, and an object in motion stays in motion with the same speed unless acted upon by an unbalanced force."

The concept of organizational inertia is defined as the tendency of a mature organization to continue on its current trajectory. It's made up of two components—resource rigidity and routine rigidity (what I refer to as force of habit). To overcome this rigidity and initiate motion, an organization must apply a force. Leaders must provide an inspirational purpose and the physical means to initiate change.

Organizations cannot make change happen through sheer will. I have seen organizations in which people are expected to make improvements in their spare time. First, most people tell me that they do not have spare time. Second, if improvement was not a part of associates' previous routines, then it probably won't happen. Organizations must invest in improvement. They must invest time and resources to make change happen.

I learned from colleagues in the mid-1990s about the power of rapid improvement, or kaizen events. These multi-day events involve teams of people dedicating time to fulfill a predefined objective. It was a great approach to rapidly apply cellular/flow concepts, 5S, quick changeover and other concepts.

Equally important was the impact it had on the people involved and the overall organization. The energy level throughout the event was truly impressive. People learned that change can happen quickly and need not drag out. However, I also noticed that the buzz would subside in a few weeks if leadership and support personnel attention turned elsewhere. It also concerned me that lack of continual attention often led to a diminishing of the changes that were made and the results that they achieved.

This leads us to the next scientific theorem.

Without Work, Disorder

The second law of thermodynamics states, "In all energy exchanges, if no energy enters or leaves the system, the potential energy of the state will always be less than that of the initial state." This is also commonly referred to as entropy, or disorder in a closed system. Without work, entropy can never become smaller.

It can be said that without work, everything slowly goes to disorder. This is true of organizational systems, as well. Take 5S, for example. Many organizations lament their inability to sustain the high level of workplace organization achieved through the application of 5S concepts. A closer examination of the causes often reveals the discontinuation of periodic assessments. Other times, process changes were made, but associates were not given the opportunity to re-organize the area to reflect those changes.

The result? Greater disorder.

Leaders must continually work to prevent disorder. Most of the activities that leaders are expected to perform as part of a lean management system can serve this important purpose. Daily management with supporting tiered management systems, "going to the gemba" and rapid response to ANDON signals are just a few examples of how leaders can continually supply order to the system.

Closing the Loop

As part of my electrical engineering education, I studied open and closed systems.

Closed-loop systems are designed to automatically achieve and maintain the desired output condition by comparing it with the actual condition. Truth be told, I began to consider the applicability of such systems to organizations in the late 1980s, when I was first introduced to W. Edwards Deming's model for organizations.

It was a closed-loop system that used market research, voice-of-the-

customer information and other inputs to trigger consideration of a re-design of the organizational system. It was a holistic model that included suppliers, product and service design and delivery, and distribution.

Deming also referred to the need for a control plan as part of the "Act" of Plan-Do-Check-Act. Without a control plan, the changes made to a process likely will not be sustained over time. Using statistical process control (SPC) charts was one way to do this. Periodic review of established standardized work represented another. Simply updating procedures and training people was insufficient to "act to make standard." This was perfectly aligned with closed-loop system design.

The concept of plan versus actual is prevalent throughout lean thinking. It is applied to process management, project management, even 5S. Planned or standard conditions are defined so that non-standard conditions or abnormalities can be quickly and easily identified.

Unfortunately, nothing is automatic when it comes to organizations, in contrast to what can be designed in electrical and electronic systems. Leaders must deliberately respond (there's that work again). And each response represents a learning opportunity. It was in 1990, as I began my organizational and behavioral studies, Peter Senge published The Fifth Discipline: The Art and Practice of the Learning Organization. It was a must-read, and probably 20 years ahead of its time. It has been better understood and appreciated in recent years.

The Learning Organization

The idea of an organization that creates and retains knowledge for future use is an extension of a topic that was making substantial progress by the late 1980s —artificial intelligence.

I was introduced to AI concepts as part of my computer engineering studies. Within AI, the concept of knowledge-based management consisted of two important components: inference engines and heuristics. An inference engine is a component of a system that applies logical rules to the knowledge base to deduce new information. Heuristics are simple rules that people often use to form judgments and make decisions.

Plan-Do-Check-Act (PDCA) has commonly been referred to as a learning cycle. Deming emphasized that "Do" was an experiment that must be assessed as part of "Check" (or "Study," as some people say). Only process changes that have proven effective should be fully deployed, standardized and sustained as part of "Act." Practitioners should use what was learned from conducting an experiment—with learning being the real objective of any experiment—to plan for the next experiment, or the next PDCA cycle.

Now, most of what I learned in computer engineering in the 1980s is obsolete. But the concept of knowledge-based management lives on. And it can be applied to organizations in various ways, including product design, troubleshooting process or product issues, equipment maintenance and equipment operator training, to name just a few. I have witnessed the significant benefits organizations can realize by the application of knowledge-based management concepts.

I have also experienced the challenges. For example, the development of standardized work for knowledge workers is always a challenge. First, it often takes the form of a decision tree. Identifying how people make decisions is necessary, but difficult—especially because the ones making decisions are often unaware of their thought processes.

Further, there can be wide variation between people performing the same work. Identifying key points (how to perform a step of a process where it matters) only occurs through close process observation and robust dialogue with the people performing the process. Once you obtain this knowledge, you can reuse it to provide important benefits to the organization. Typical learning curves for knowledge workers can be reduced by up to 75 percent.

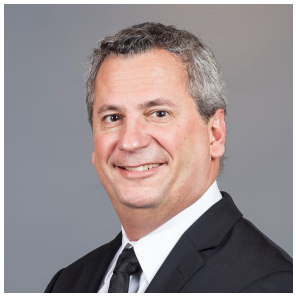
The creation of standardized work, instructing others using job instruction (part of training-within-industries), predictive maintenance (part of total productive maintenance) and creating and archiving A3 storyboards for problem-solving and process improvement efforts are examples of how an organization can indeed learn and reuse that learning.

Of course, leaders must provide the means to perform these important activities. There's that pesky work idea again.

Can managers can learn from science? Absolutely. After all, W. Edwards Deming was initially educated as an electrical engineer and later specialized in mathematical physics. Deming went on to develop a set of management principles that, presently, organizations in all industries are working to apply. Whether it be the first law of motion, the second law of thermodynamics, closed-loop systems, artificial intelligence or myriad other theorems and concepts, much can be gained in applying scientific concepts to the challenges that organizations face.

True, applying these concepts requires deliberate effort on the part of managers. As previously mentioned, the various activities that make up the lean management system, supported by comprehensive visual management systems, help leaders apply the concepts, in some form.

And if a leader questions the importance of these activities, he or she can seek validation in scientific principles, some of which date back hundreds of years. Leaders can draw confidence knowing that the principles of lean and enterprise excellence are grounded in science, the science of management.



Drew Locher is founder and managing director at Change Management Associates and has 33 years of lean and continuous improvement experience. Reach Drew at www.cma4results.com