Systems Management to Launch the Next Era of Quality

By Richard E. Mallory, MM, PMP

Almost 50 years ago Dr. W. Edwards Deming announced that systems management was fundamental to what we can now call quality science[1], and he introduced a "system of profound knowledge"[2] as a framework for transformation of our organizational work and our entire economy[3]. He said, "An integral part of the system of profound knowledge is appreciation for a system." But while his system of profound knowledge got a lot of discussion at the time, most of its contemporary application has been limited to the "profound knowledge of variation," and to process standardization and process improvement. The most recent frameworks for both are currently described as Lean Six Sigma, kaizen, or 5S, and all represent what can be called forms of process science.

However, there is a matched partner to process science in systems science—the documentation and improvement of systems. The quality profession has failed to provide further exploration of systems as free-standing entities, in the same manner that it has for processes. The professional advancement of systems thinking has been almost entirely relegated to their use as control mechanisms for the comprehensive and top-down leadership frameworks of ISO and Baldrige, and efforts to explore systems as free-standing entities that exist outside of these comprehensive organizational models has been lost. It is the author's position that this is the single biggest oversight of modern quality practice. Also, that a quantum leap in quality practice is now possible by a renewed focus on the identification and improvement of free-standing systems outside of comprehensive organizational focus, with the same independent rigor of professional practice that has been given to process standardization and continuous process improvement.

This renewed focus on systems can be called the development of "systems science," and this article will describe systems, systems science, and the importance of a systems management standard. It will provide a critique of the perceived shortcomings

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[1] A term adopted by the ASQ Government Division with this definition: "The tools and knowledge associated with quality management with its origins in the Toyota Production System of the 1970s, and embracing a broad body of professional knowledge focused on doing work right the first time. Used as the basis of the U.S. Baldrige Performance Excellence Program and the Japanese Deming Award. Embodied in the Body of Knowledge maintained by the American Society for Quality."

[2] Deming, W.E. 1993. *The New Economics.* Massachusetts Institute of Technology, Center for Advanced Engineering, pp. 94-118.

[3] Deming, W.E. 1988. *Out of the Crisis.*

of Baldrige[4] and ISO[5] in creating a dynamic and agile means of achieving the full benefits of systems management.

This discussion must start with a definition of what a system is, and how it differs from a process. Dr. Deming himself defined a system as "a network of interdependent components that work together to try to accomplish the aim of the system." Taking a holistic view of what can be found in his works, we might speculate that he believed that a human system was a group of human and other resources (machines, methods, materials, and the like) that has some ability to be controlled by leadership toward a valuable purpose that can be defined as an "aim."

We can see that a system itself is a thing from which we are trying to obtain a consistent and reliable output and outcome—and specifically, from which we are trying to eliminate variation. So we can postulate that the goal of quality science and that of systems management is the same: Our intent is to manage and improve our processes and systems to achieve a reliable and predictable result. So what is the difference between systems and processes? Are they two words that have almost the same or identical meaning?

Actually, Dr. Deming himself gives us an important clue toward the differences in his reference to a "network of interdependent components." The author does not know for certain, but it seems reasonable to assume that Dr. Deming was influenced by general systems theory. General systems theory is perhaps the oldest science, and it describes the efforts of early humans to decipher the operations of natural systems such as weather, seasons, ocean currents, and the behavior of plants and animals. It is observed that early humans observed and learned about these broad patterns, and initiated structured human strategies—early human systems—to make natural systems work better for the productive good of the group.

Every deliberate effort of early human tribes, and the latter-day efforts of most structured human business enterprise are such systems or sub-systems—attempting to derive value by creating human organizations that can positively influence complex external forces. So we can see that early forms of productive enterprise like agriculture, animal herding, pottery making, and the creation of ships were alternately created by the broad application of "rules of knowledge" (achieved through the application of human systems) and by specific, controlled activity (process). In this scheme the sowing of seed for wheat or barley was a process, while growing and harvesting the crop was part of a human system. The building of a ship was often an early human process, while the navigation of ships was a body of knowledge, or a system! So perhaps the first necessary practice of systems management is to develop a series of strategies and actions—for example, regarding how to obtain and sow seed, cultivate a plowed field, and harvest a crop. Only through development of knowledge with the strategies and actions to deploy that knowledge can we create a human system that will influence larger natural systems and provide a beneficial human result. Once developed, the results of such systems can be tested and improved to reduce their variation over time.

We can see that systems science must also provide knowledge and experience that allows for a broader range of possible actions to respond to the intervening factors ("common cause" variation) that come from our larger natural systems. In other words, the successful exploitation of agriculture had to respond to natural variation in factors like the supply of seed, early and later spring-time, flood and drought, insect infestations, labor shortages and similar challenges. These systems included much greater year-to-year variation than their simpler process counterparts, like plowing a field. So we see that systems science grapples with a more uncertain environment and more apparently uncontrollable intervening factors than does process science, and with a less certain knowledge of best practices defined by steps where "a" follows "b" and goes before "c." Looking to more modern general systems theory, we can see that this brand of science provided first steps for embracing "… the concept of order and man's general need for imaging (or establishing) his world as an orderly cosmos within an unordered chaos."[6] The concept of an orderly cosmos is to systems management what "error free work" is to process management.

One key principle of systems science theories is confirmed by Dr. Deming's statement that a system is "a network of interdependent components that work together …" It is immediately apparent from the preceding discussion that early human systems and most modern business enterprise operate in an environment where it does not control all the

[4] Criteria for Performance Excellence of the Malcolm Baldrige National Quality Award, jointly maintained by the Department of Commerce National Institute for Standards and Technology and ASQ.

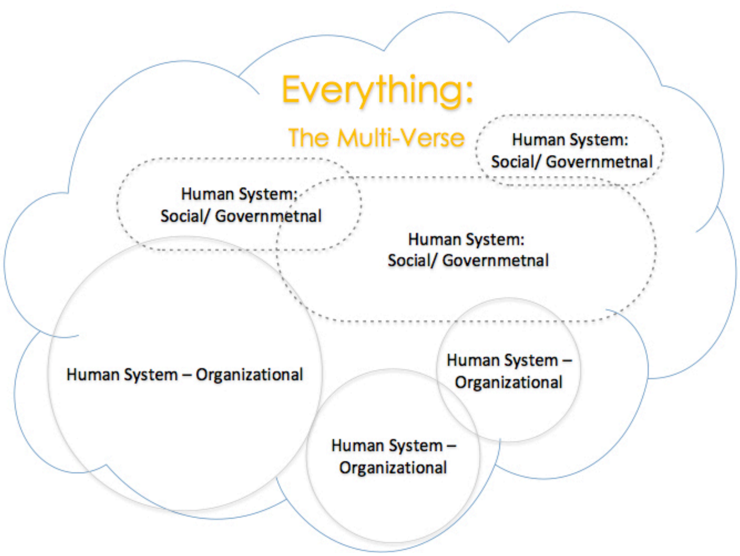
[5] International Organizational for Standardization (ISO), and its 9000 Series standards for Quality Management in Organizations.

[6] Skyttner, Lars, 2005. General Systems Theory: World Scientific Publishing, p. 51.

essential components, and it must often be responsive to a variety of changing conditions rather than controlling a fixed environment. One of the distinguishing characteristics of systems management is that it must create a mixture of **value-creating actions** that can be clearly defined and fixed, with **responsive actions** that evaluate and respond to changing conditions. A systems flowchart will be possible, but it will have to include both explicit action steps (like those in process maps) with categorical action steps (unique to systems maps). Both types of "steps" will need to seek to analyze and respond to intervening conditions to create a more reliable result.

Dr. Deming's statements also imply another of the differences in the notation that the system components "work together." This, combined with the concept of components that are "interdependent," implies that human systems depend on leadership and on structure to influence the component parts to work together at all, and effectively. In addition, there is a need to link systems, with macro systems linking to natural systems, and successive sub-systems defining the enterprise of men (organizations), linking down to its sub-systems and processes. We can then see that the principle of "alignment" has profound meaning, and that the linking of processes and systems reflects the rich network of activity that must exist in the highest performing organizations.

This is illustrated below:



Another key area of exploration comes from an understanding that there can be strong or weak systems in each organization's network. A strong system must benefit from leadership and commitment of its human resources, which is in part motivated by its purpose, and its ability to build its resource base to protect its continuation and survival. Indeed, this is the difference between entrepreneurial organizations and volunteer organizations, or between formally commissioned organizational structures and informal organizational structure—the ability of leadership to reward, incentivize, or discourage participation.

Lars Skyttner[7] states: "A system is distinguished from its parts by its organization. Thus a random assembly of elements constitutes only a structure-less mass unable to accomplish anything. … To qualify for the name system, two conditions apart from organization have to be present: continuity of identity and goal directedness. Something that is not able to preserve its structure amid change is never recognized as a system. … Reduced to everyday language we can express it as any structure that exhibits order, pattern and purpose."[8]

These differences are more fully explained by the unifying theory of work management,[9] that is new to quality science, and that asserts that all work has some repetitive factors and common resources, and that managers have the ability to learn from past experience and constructively apply that learning to the future so that better results, or improvement, can take place.[10] The specific means of testing, standardizing, and using this knowledge varies depending on the work structure available to implement it, however, and quality science is primarily focused on implementation of explicit forms of value creation that are deployed through processes and systems.[11]

It is the factors of a common, known environment, and shared and established resources that allow managers to standardize best practices for creation of standard outputs, and the existence of "common-" and "standard-cause" factors in working environments that create variation in outputs.

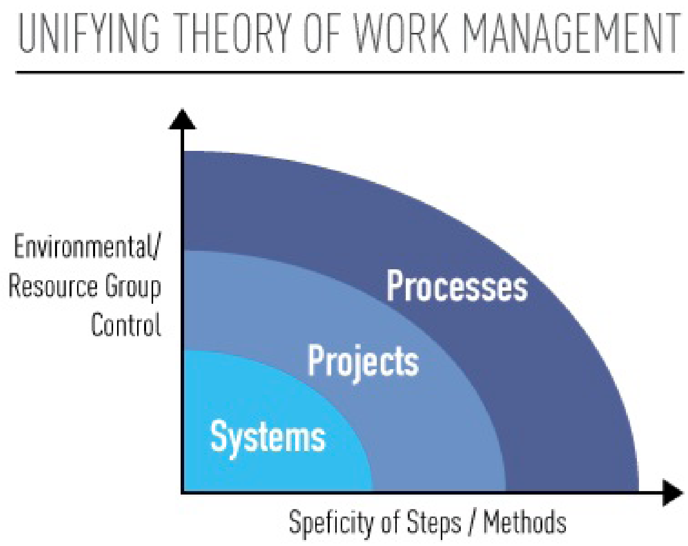
[7] Ibid, General Systems Theory.

[8] General Systems Theory, ibid, p. 57

[9] Mallory, Richard E., 2014. *Quality Standards for Highly Effective Government.* Trafford Publishing. PP. 14-15, 38-39.

[10] It is the author's belief that this what Dr. Deming was referencing in his "theory of knowledge" as one part of the system of profound knowledge. Specifically that all process control and systems control is an expression of human learning and continuous improvement.

[11] Learning theory notes that knowledge can also be applied to work through cognitive and tacit actions of individuals that are shaped by experience and training.



Given that projects, systems, and processes are the only means we have of creating work in an organization, we can easily understand that all have some level of specificity of steps and methods, and some level of control of their environment and resource group. So ALL THREE are subject to the standardization of best practices—the subject of quality science. And upon reflection, we can see that projects themselves are also a form of human system—only with a few specific characteristics. So projects and systems must be subject to the same kind of quality improvement—including methods and tools—that processes are, with the sole variation being the specificity of best practice steps that can be defined, the ability to control the environment and the productive apparatus, the ability to structure a focused group of workers and methods, and the uniformity of control that can be imposed by leadership. Indeed, there is now a fundamental and logical basis to the assertion that scientific systems management is the greatest missed opportunity in quality practice.

One of the most important systems recognitions that exists in modern quality science is the understanding that leadership is a system, and that quality management and process quality control are also systems. Indeed, most of the process science such as it now exists, is defined in both the ISO and the Baldrige standards, as described in the following:

ISO 9001 requires systems including:

- Establishment of customer requirements
- Control of production
- Verification
- Configuration management
- Risk management

Baldrige requires organization-wide systems for:

- Leadership and management
- Strategy development and implementation
- Business systems (that incorporate customer requirements)
- Organizational learning
- Information and knowledge

The only problem that may exist with implementation of these larger framework systems is that they presuppose that these suggested and over-arching systems are necessary in all situations.[12] They impose an organizational review from the top down that involves all managers in trying to create and align with these specific macro-systems. Given that we know all efforts of this type take the time and attention of everyone in the organization, they could remove discretionary time from any other improvement efforts in favor of the creation and maintenance of these suggested systems. And while these suggested systems are believed to be essential in most organizations most times, where such frameworks are implemented they will replace a focus on a more localized and bottom-up approach that could be much more agile and important to the survival of the organization. The top-down effort will most certainly discourage a bottom-up systems management strategy.

Likewise, where such top-down frameworks are later abandoned by a change in top leadership, it is likely that none of the subordinate efforts will be incentivized to maintain a localized systems management effort. In short, there is a primary need and benefit to have localized systems management throughout an organization, whether or not it exists at the highest level. It only makes sense that such a scheme will be consistently and immediately

[12] The author is aware that neither Baldrige nor ISO is prescriptive, and that organizations can tailor and scale their systems implementation of these frameworks. This does not, however, remove the criticism that these top-down efforts do not emphasize a localized systems management focus in each work unit, and that they may eliminate the necessary discretionary time and leadership focus necessary to implement alternate systems management strategies.

supportive of quality practices that can adapt and change to a changing environment. It will be much more agile.

We can now see that there must be a vast number of systems that exist in organizations just as there are a vast number of processes, and that not all exist throughout the organization or capture senior leadership attention. Organizational management tells us that we depend on IT systems management, human resource systems, project management systems, budget systems, research and development systems, and many others. Even knowledge management is a system, because each organization must have methods and means associated with learning, recording its knowledge, and making it available to those who need it. We can see that each of these systems exists in organizations now, formally and informally, and with varying degrees of order, pattern, and purpose. The challenge then of systems management is to get organizations to recognize the formal and informal systems on which they now depend, and which are key to their progress, and to increase their reliable and positive results (quality)!

The present-day reliance on only the suggested and defined systems of ISO and Baldrige forecloses an affirmative responsibility of all executives and managers to manage their unique local systems, and through upward alignment, to create an overall better support system for all organizational processes. The existing focus on any set of mandated macro system implies that systems management should be practiced only top down, and certainly not bottom up! There is no realization that some important systems management may be done only in localized business units and with no connection to higher systems in any way.

The idea of auditable quality standards[13] enters from this perspective: That process management and systems management should be an affirmative responsibility of all executives, managers, and supervisors, and the only pre-eminent role of senior managers should be in aligning the systems that lower levels define, and in filling gaps to more fully support front-line processes. This perspective is the only one that ensures that organizations are agile and able to dynamically respond to change, with or without senior executive leadership. Indeed, the "flat" or self-directed organizations of the future that have been lauded by books like *Holocracy*[14] depend on a leadership structure of some kind, and the practice of process management combined with free-standing systems management is the only quality framework that holds this potential.

Auditable quality standards build on this framework, and present the premise that process maturity standards, systems maturity standards, and the strength and achievability of the leadership structure (or "aligned systems objectives") are the primary and only forces that create the strength of all human systems.[15] Put bluntly, it is argued that process management, with systems management, are the most fundamental and basic elements of quality science. They open a window where quality implementation can arise and be deployed through the independent actions of many managers and supervisors. They can therefore drive the agility, reliability, and predictability (or "quality") of all human systems.

These three standards are definable and measurable through auditable quality standards, as have recently been adopted by the ASQ Government Division[16] and thus create the ability to completely reinvent quality practice. For the first time, there is the ability to access a uniform and empirical measure of quality in organizations, and the basis of an easy-to-use and uniform scorecard.

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[13] Mallory, R. E. 2014. Auditable Quality Standards for Highly Effective Government. Trafford Publications. A summary is also available at: https://www.youtube.com/watch?v=NoZqSa-MXE4

[14] Robertson, B.J. 2015. Holocracy: The New Management System for a Rapidly Changing World: Henry Holt and Company.

[15] Ibid, Mallory.

[16] They are available as "QSG Summary 9-15-15" on the Government Division web page at asq.org/gov.

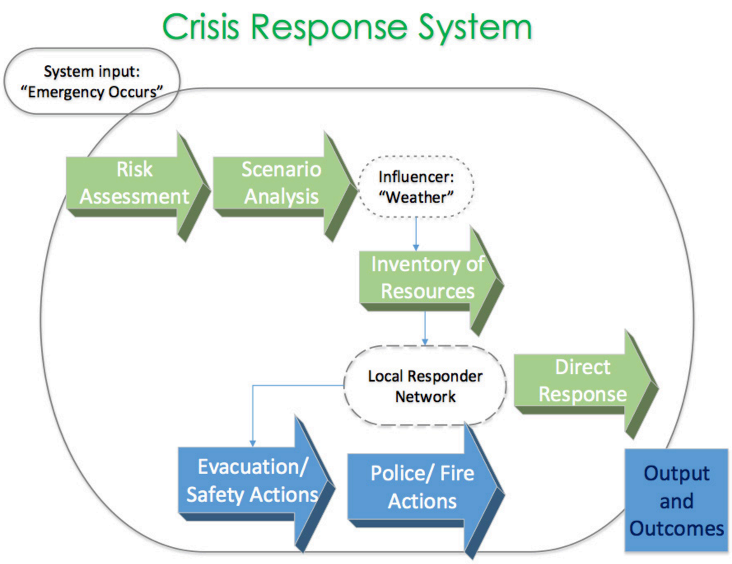
The systems management standard depends on measured evaluation of three measurable aspects of systems including:

1. Known, comprehensive, and logical systems management

2. Effective use and feedback

3. Evaluation and improvement

The first criteria regarding the known, comprehensive and logical systems is responsive to the ideas of order, pattern and purpose as noted by Skyttner. It argues that a structured and focused leadership structure should exist, with a clear established purpose, and with some kind of a documented systems process flow that includes explicit action steps with categorical actions, and both of those with steps that will analyze and respond to intervening conditions. So for example, a state government may have an emergency response system that looks like this:



The second criteria, regarding "effective use and feedback" suggests that some kind of systematic deployment takes place, and that structure exists to ensure that the standardized portions of the system operation can reliably be replicated. It also suggests that metrics are in place regarding system outputs and outcomes, and that there is evidence that the system creates its intended value.

The third criteria suggest that there is evidence of periodic review and improvement of both means and methods of system delivery, and that there is data to support its improvement cycles.

About 10 years ago the Baldrige Criteria for Performance Excellence were amended to include the concept of ADLI, which is itself a systems evaluation structure. ADLI stands for approach, deployment, learning, and improvement, and this gives systems science another tool set for evaluating whether systems in organizations have been standardized, whether requirements have been established, whether it has metrics to define its success, and whether successive cycles of improvement ("learning") have taken place, and can be demonstrated.

These terms must sound very familiar to those involved in process science, and correctly implies that many of the tools of process science also can apply to systems. In other words, the efficiency and effectiveness of these systems can be controlled through standardization, and improved through continuous improvement! The scientific management of systems, with the same focus and attention as the scientific management of processes, has been the greatest missed opportunity in quality practice, and that a rededication to structured systems management has the potential to reinvent quality practice.

Hierarchy of Systems

The systems management standard is based on the concept of hierarchy of systems. This is the realization that all systems are defined within higher systems above, and sub-systems below, and that the concept of productive control begins with a definition of boundaries in which quality control can be exercised. So the leadership structure in human systems is an essential beginning point.

Christena Shepherd states that "accomplishment of the agency's mission in terms of its mission realization lifecycle," is the beginning point of organizational management, and that "this top level need or expectation must then be broken down ('decomposed') into its constituent parts and processes."[17] In effect then, we can see a hierarchy of systems within each organization, in which each executive manager has a role to identify,

[17] Shepherd, Christena C., "A Framework for Government Agency Quality Management Systems". ASQ Government Division News. Winter 2015.

standardize (to the extent possible), and improve the systems they manage and that are essential to the value creation proposition of their span of control. This can be done either broadly and interpretively through a systems management framework, or empirically and uniformly through a systems management standard.

Management of Systems

So we can see that one important rule in our study of systems is that systems must have a broader and less well-defined specific outcomes—both overall and at each specific step. If we are looking at complex, high-level systems such as government, we can establish generalized outcomes of "justice," "equality," and "rules of law," but we see at the outset that it will be difficult to carefully define the "categorical action steps" and corresponding measures showing the relative achievement of each. It will be possible, however, to define the desired outcome of each, some known and applicable principles of knowledge (or "best practices"), and even to test the relative achievement of each to some extent through scientific testing. Perhaps we can do mapping of our government systems, but their "flow" will be a series of systems maps that show activities such as elections, creation of legislation, and judicial review of laws.

These same principles will hold true for the mapping of systems and sub-systems within organizations, in that alignment between the systems will be necessary, and that the highest-level systems maps will need to align with lower-level systems, and eventually with processes. As systems give way to sub-systems, the relative level of environmental control will be greater and reliable performance will be more predictable. And since the mapping of systems must be limited to higher-level activities (e.g., "hold an election") rather than the more specific "tasks" of process science, then the primary tools of problem solving will be different. The author finds that the tools of root cause analysis, force field analysis, and inter-relationship diagraphs are more conducive to discovering the areas of improvement for systems "activities," and are the best tools for their improvement.

Overall, it is believed that a focus by quality processionals on systems science and systems mapping has enormous potential to reinvent quality practice in the 21st century, especially when combined with the uniform and empirical tools provided by the process management standard and the systems management standard. These improvements taken together provide enormous potential for the improvement of all human enterprise.

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