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Structured Systems Management:

The Missing Link for Future Quality Practice

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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" (Deming, 1993, pp. 94–118) as a framework for transformation of our organizational work and our entire economy. He said that "[a]n integral part of the system of profound knowledge is appreciation for a system." (Deming, 1993, pg 50). But while Deming's 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. Process science, in turn, has become the mainstay of quality practice, and, in many ways, its sole foundation.

However, there is a matched partner to process science in systems science—the documentation and improvement of systems—and a complete management framework for that practice is now outlined in my book, *Lean System Management for Leaders* (Mallory, 2018). Aside from that book and the system management guidance in the Baldrige Excellence Framework, the quality industry has failed to provide further exploration of systems as freestanding entities in the same manner that it has for processes. Not only is this a major shortcoming, but it has also hobbled the organization and sustained use of well-known quality practices for decades.

The professional discussion of systems is generally limited to the role of managers to align processes and operations, to behaviors that encourage the use of DMAIC, and to their use as control mechanisms for the comprehensive and top-down leadership frameworks of ISO and Baldrige. While any of these systems may have some procedures, milestones, and structure, they are not founded on standard analytic tools, as are processes. And because of the failure to apply analytic tools to our key systems, we have missed the opportunity to document best-known operational practices (or "work-flows"), to standardize those practices, and to build in performance and feedback systems.

It is a great omission of current quality management that there is no framework for defining, analyzing, standardizing, or implementing continuous improvement in areas such as governance, strategic planning, budgeting, or program management. The use of scientific management (or continuous quality improvement) is possible in these areas because they are repetitive and cyclical, and (should) create definable outputs. However, at present, they are often viewed as either isolated activities or sequential decisions that are manageable only through spontaneous or consultative decision making by individual managers. Similar attitudes also exist regarding the management of a program or a program office. This kind of thinking, which could be called *leadership despotism*, leads to the conclusion that the actions of executives are somehow above or isolated from the application of lean and quality science.

It is my 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.

System vs. Process

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." (Deming, 1993, pg. 50). Taking a holistic view of what can be

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." [Resolution of ASQ Government Division Leadership Council, May 3, 2015, World Conference on Quality Improvement.]

Table 1: Initial Definition of System Aim and Purpose

Named System: **Information Technology Network Support**	
Purpose and Outcome: **Reliable and optimized network services – server to user. (Server, switches, routers, printers, and mobile devices)**	
Outcomes and Outputs:	**Possible Measures of Outputs:**
1. Provide software patch updates	
2. Secure IT environment	
3. Safeguard asset management	
4. Monitor servers	
5. Maintain network service	
6. Provide network updates	

found in his works, we can see many of the original quality thinkers looked at a human system as a group of human and other resources (machines, methods, materials, and the like) that has some ability to be controlled by leadership towards a valuable purpose that can be defined as an "aim." It is important here to note that this kind of human system is empowered only by a span of control and a responsibility to produce something of value. The "leader" must construct a "mental model" of a best practice operation on which the quality operation will seek to impose standardization and learning (DMAIC). Doing this *may* involve a key process, but it often extends far beyond a specific process flow in many ways—as we shall see. Indeed the "aim" included in the job description of most managers extends considerably beyond the success of any one process flow.

Not surprisingly, Kaoru Ishikawa (the originator of the Ishikawa/Cause and Effect Diagram) also saw the need to address quality at the system level rather than at a "Lean Six Sigma" process level as we do today. In his seminal book, *What is Total Quality*, Ishikawa presents application of "quality control" (DMAIC) to all work "relating to design, purchasing, sales, personnel, and administration…." (Ishikawa, 1985, p 63). He further states: "Politics, government, and education are all processes. As long as there are causes and effects, or cause factors and characteristics, they can all be processes" (Ishikawa, 1985, p 63).

In short, we can now see that both Deming and Ishikawa saw the initiation of quality science at a point where leaders can describe an "aim" or purpose for a collection of manpower, machines, materials, and methods, where the "aim" is the "effect" of that collection of resources and where "causes" are what makes it successful. Even though they use the word "process," what they describe is clearly *not* what we in the quality industry now define as a "Lean Process" for improvement. It is a much bigger slice of an organization, or in the case of "politics, government, and education," a bigger slice of the world.

Apparently the reaction of our quality industry has been to select that portion of the "whole" that we believe we can control the best, namely process flow, and we have focused almost all of our attention on that[2] but as this author will argue (and show), systems can easily and very beneficially be managed with different analytic tools and methods.

Components of System Mapping

Our beginning point is the understanding that all systems are defined by an "aim" or objective: what they are intended to accomplish. This is something that should be easy and natural for every executive position and program office to document. The first step is therefore one of defining its intended outputs (measurable work products) and outcomes (the impact of those products on the larger world). A shorthand way of doing so is to insert the name of a program or executive function as the heading or "title" of a first-system map. In other words, we could insert "budget development and management," or you can list a specific program office such as "Information Technology Network Support." Using that as a foundation, a mapping exercise should list the specific outputs that are created or expected to be provided by the office.

In doing so, we can begin creating the needed structure by creating an initial system graphic as shown in Table 1 above. This table can show a program office name (a system name), a purpose (or outcome), and some specific outputs that are measurable.

It is apparent that this table repeats and slightly overlaps its key terms in order to reflect the fact that beginners at this process will be fuzzy about how a purpose or outcome differs from an outcome and output and how measures

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2. So, for example, in the book Advanced Lean in Health Care, Albanese, Aaby, and Platchek argue that "…continuous improvement efforts must focus on optimizing the most controllable processes and minimizing input variation. The system can then better manage (any) unexpected event…" (Albanese, Aaby & Platchek, 2014, p. 34).

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factor in. Instead of being over-analytic, it lays out thoughts in a progression that jumps first from purpose to outcome and then to outputs as an intermediate "cause." Such a slow progression will help everyone to envision the workflow of the system. Later efforts to establish measures for both outputs and outcomes will aid in discussion and understanding. It will also provide a basis for our workflow (or "system") requirements so that evaluation and learning can occur[3].

The process starts us on the path of defining an overall purpose of *all* key system designs (through mapping) matched with a best-known practice for that workflow and with a notation of requirements. This in turn mirrors the ADLI (Approach, Deployment, Learning, and Integration/Innovation) model presented in the Baldrige Excellence Framework (p. 31), which is perhaps the best-known established model for system mapping.

The workflow, in a manner similar to process mapping, is generally shown as inputs leading to the defined principal activity groups of the office, leading to outputs, as follows (Figure 1).

Jumping ahead, we can see that the next steps will lead you to inventory your current management efforts and the current repetitive practices you use (standard operating practices, guidelines, procedures, and similar) to create the desired outputs and outcomes that you are seeking to obtain. This is similar to the documentation of the components of a quality management system. As you document, you will also be able to identify actions and activities that will strengthen what is being done.

This analysis will also help identify the points of control and corresponding indicators and metrics of excellent management practice. Mapping will lead to a number of ways to test the overall management structure, assist in the identification of any risks or gaps, and identify the most important operational and performance measures (Mallory, 2018). However, it is my experience that best results come from proceeding progressively through each step and involving team members, stakeholders, and partners in this discussion. In this way, the knowledge and commitment that are developed will be broadly shared among those who will be responsible for implementing the best practice design created.

Despite the similar look of the Figure 1 diagram to a process flow chart, keep in mind the important differences in a system and a process that requires a different management approach. For one, your system is not and cannot be defined in a predictable sequence of steps, as is a process, and it is subject to intervening variables and occurrences that sometimes require adaptive response. Also, the personnel performing system work are often not under your own span of control and, sometimes, outside the span of control of the organization. As a result, many of the strategies for managing a system will be in the form of guidance and recommendations and not mandated and defined steps like a process. Those dealing with intervening variables will be best managed through scenario analysis. This does not mean, however, that controlling systems is outside the realm of science or resistant to learning any more than the practice of medicine is outside the realm of science of learning.

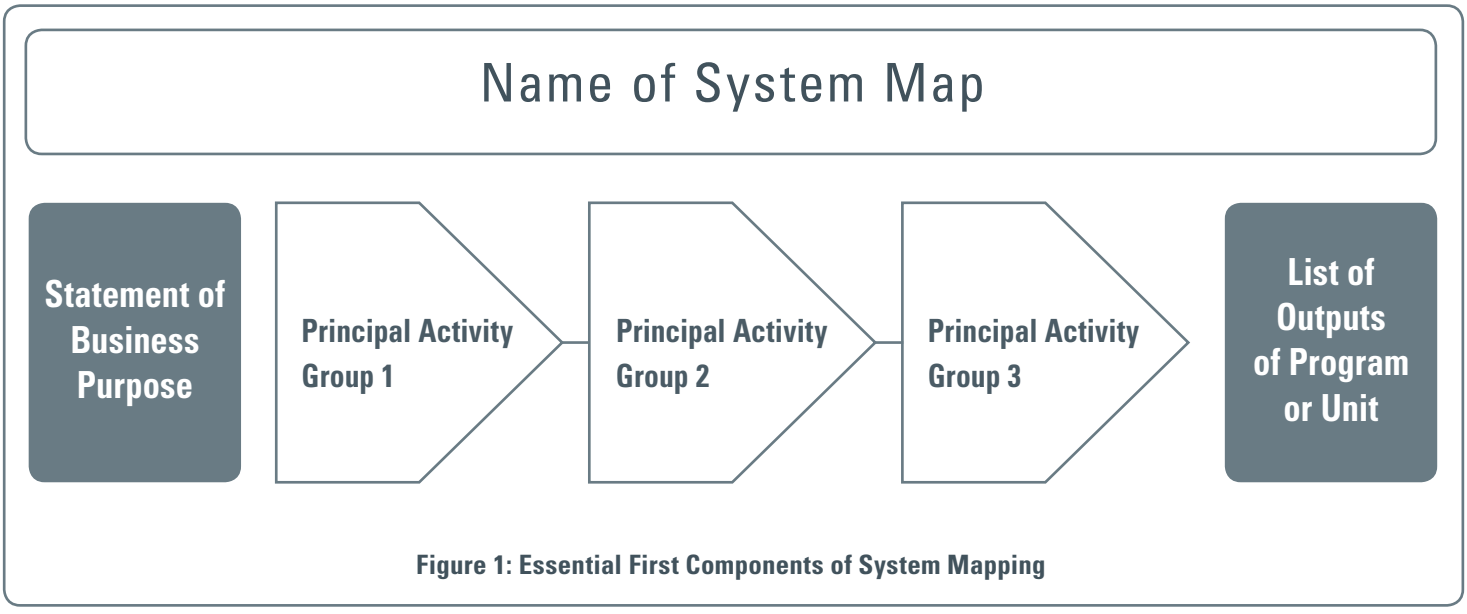

Figure 1: Essential First Components of System Mapping

3. Also note that we only want to apply measures to outputs – not to outcomes – because outcomes are furthest out of control of those who operate a program office, and including them generally becomes an unnecessary and unwelcome distraction from the main benefits to be achieved.

Defining Principal Activity Groups and Influencing Factors

Structured system mapping depends on an ability to define principal activity groups that represent milestones or specific value-add activities necessary to achieve the purpose of the identified system. As in the earlier diagram, the author uses the base plate symbol to represent principal activity groups. The symbol was chosen both to distinguish it from the "tasks" of a process map and to emphasize that each is an important step or building block in completion of the best quality output of the system.

The names chosen for each principal activity group should describe a coherent grouping of tasks necessary to achieve the system aim. It could also be thought of as a milestone. The most important aspect of their selection is that each principal activity group must have specific and measurable outputs, or "requirements," associated with its successful performance. Not only does this assist in defining the best practice for that group of activities, but it also provides the basis for evaluation and for possible future improvement. The establishment of requirements for principal aspects of a system allows for application of DMAIC and lean practices, which includes alignment of system requirements with process requirements throughout an entire organization (Mallory, 2018, Chapter 8).

The application of basic cause and effect methods, as referenced in the earlier quotes from Ishikawa, is the next and final system mapping method described in this article. The author uses the term "influencing factors" instead of causes, but indeed we are looking for "causes" of each principal activity group, which is an "effect."

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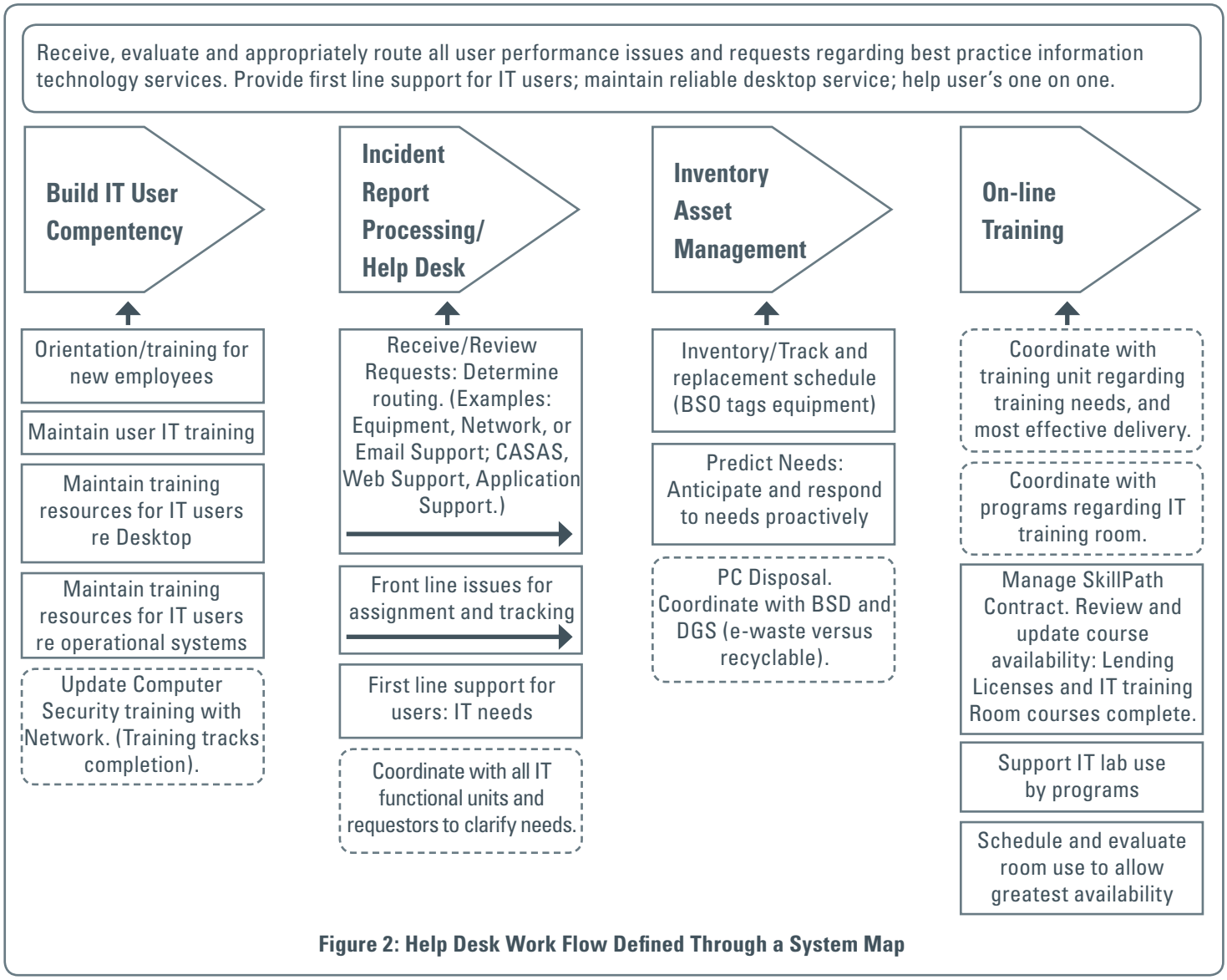

Figure 2: Help Desk Work Flow Defined Through a System Map

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Influencing factors should represent the planned actions that will positively influence best outputs within each principal activity group and that are the "causes" of its success. For most quality professionals, this will require a bit of "different thinking" because most of us have reverted to the near exclusive use of cause-and-effect for the determination of error causes, and in system mapping we are using cause-and-effect for the causes of "success." Those who are familiar with the work of Ishikawa will recognize this in his presentation of cause-and-effect as the search for the causes of a perfect cup of tea.

In any event, influencing factors within any system may indeed identify a key process, and that is to be expected. The importance of defining the influencing factors is that these better document the required precedents of system success (our best known operational best practice) and can also show us the leading measures (really indicators) of our future success.

An example of a system map designed for an IT Help Desk is provided in Figure 2.

Note that this map documents the system aim at the top, has established four principal activity groups, and has identified two key processes (with the arrow symbol) that are subordinate to the overall system management. In addition, note that the influencing factors in the boxes with dashed lines indicate those activities that are co-dependent on other business systems.

Conclusion

In an ASQ white paper on the subject, Christena Shepherd states that "accomplishment of the agency's mission in terms of its mission realization lifecycle" is the beginning point of quality organizational management, and "this top-level need or expectation must then be broken down ('decomposed') into its constituent parts and processes" (Shepherd, 2015, pp 1-2). In effect then, we can see a hierarchy of systems within each organization, in which each executive manager has a role to identify, 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. Such goals can be objectively completed only through a systems management framework using documented empirical standards. Structured system mapping is the missing link for quality practice in the 21st century, and it holds the keys to broad new organizational benefits.

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