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## Water Philosophy and Process Improvement

**Base your process-improvement approach on the  
requirements of your situation, not dogma**

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A highly acclaimed martial-arts exponent once said in an interview that his philosophy of unarmed combat was to “be like water.” The important characteristic of water was that it was formless and took on the shape of whatever container it was poured into, and an effective martial artist likewise had to be able to adapt to his adversary and the environment to prevail in a fight. This, he felt, was the key to being the supreme martial artist.

In martial arts, there are many different styles of combat—karate, judo, kung fu, taekwan-do, jujitsu, aikido, to name a few—with the adherents of each claiming theirs to be the best and most effective means of defeating an adversary in unarmed combat. The first



corollary of the water philosophy is that one should not necessarily follow any one particular style of combat, as they all have their inherent strengths and weaknesses, and there is no single style that is the best in all circumstances. The second corollary is that, to be an effective fighter, one must be prepared to challenge the dogma of the existing styles of combat.

Why and how is this relevant to business process improvement? Just like the effective martial artist, the effective process-improvement exponent must also “be like water” and adapt his approach to the problem at hand. A number of different process-improvement methodologies exist (Lean, Six Sigma, and Theory of Constraints [TOC] being the major ones). I maintain that there is no single best approach that works well under all circumstances, contrary to the claims advanced by the more zealous proponents of each. Why is this?

Each methodology possesses a set of tools that may be unique or general, and is characterized by its goal and a core principle that defines the approach to achieving that goal.

**In the case of Lean**, the goal is to deliver value to the customer in the fastest and most efficient manner, and the way to achieve this goal is to eliminate waste from the production system. In their seminal book, *Lean Thinking*, James Womack and Daniel Jones advise that a Lean implementation should begin with the first step of specifying what constitutes value to the customer. This specification then provides the focus required to restructure the production system to deliver that value smoothly and efficiently. A key element in a lean production system is production scheduling and material movement through flow/pull, which minimizes work in process (WIP or overproduction) and waiting time, two major categories of waste. Kanbans facilitate pull by signaling when material needs to be produced and/or replenished. Operations are reorganized into cells to minimize travel distance and time. Variation is minimized through Standard Work, and the entire production system works to the beat of Takt Time to meet customer demand. Problematic areas with poor quality, long changeovers, and excessive downtime become obstacles to flow/pull, and they are addressed through kaizen events with the appropriate tools—Poka Yoke, Single Minute Exchange of Die (SMED), and Total Productive Maintenance (TPM).

A critical feature of Lean is that the methodology takes a holistic view of the production system, and seeks to optimize the performance of the overall system rather than just individual processes. The tools work as an integrated system to advance the goal of delivering value to the customer efficiently. There is synergy in Lean whereby the whole is greater than the sum of its parts. While some of the tools can certainly be used individually—kaizen being the most prominent example—the net result of doing so is to

obtain a suboptimal solution, where local improvements are realized but the system as a whole may not perform any better.

**Reduction of defects** (improvement of quality) is the goal of Six Sigma, and the way to realize that goal is to reduce variation in all processes within an organization. Six Sigma seeks to apply the rational and data-driven approach of the scientific method to process improvement, with a focus on process variation as the main avenue for improvement.

Problems are formulated as  $Y = f(x_1, x_2, \dots, X_n)$ , where  $Y$  is the output of the process to be improved,  $x_1, \dots, x_n$  are the inputs under the control of the process owner, and the function  $f$  represents the action of the process in transforming the inputs into the output. Any deviation of the output  $Y$  beyond specified limits from a target value is a defect.

The goal then becomes reduction of defects by manipulation of inputs to ensure that the output stays within its specified limits. This is achieved using a rigorous analytical and statistical approach.

Designed experiments reveal the behavior of the process, and pinpoint the input settings required to optimize the output. A myriad of statistical tools help the Six-Sigma Black Belt to achieve this goal by identifying and quantifying sources of variation, analyzing interactions, and correlating variables. Aside from the focus on defects, process variation, and statistical analysis, Six Sigma is also characterized by the Define-Measure-Analyze-Improve-Control (DMAIC) approach to problem solving, which provides a structure for the application of the tools.

**In TOC, the goal is to increase** the throughput of a production system, with throughput being defined as the rate at which the system generates money through sales. This definition of throughput implies that throughput that is not sold but ends up as inventory in the warehouse is not “real” throughput.

The basic premise in TOC is that the throughput of a production system is limited by one, or at most a few, constraints. The approach is to identify the constraint and to work on it to increase throughput—first by maximizing its existing process capacity, and then by making capital improvement and other changes to increase its capacity. These measures are referred to as exploitation and elevation of the constraint, respectively. All other processes in the production system are subordinated to the constraint. Processes upstream of the constraint adjust their throughput to ensure that the constraint never runs out of material, and processes downstream of the constraint adjust their throughput to match the constraint.

When this constraint is eliminated, throughput increases and some other process becomes the new constraint. The new constraint is then exploited and elevated, resulting in yet greater throughput and yet another newer constraint, and so on. A common analogy used to describe TOC is that of a chain. Just as a chain is only as strong as its weakest link, a production system can only produce as much throughput as its constraint process. Likewise, just as strengthening its weakest link increases the strength of a chain,

eliminating its constraint increases the throughput of a production system. In this sense, TOC is similar to Lean in that it takes a holistic view of the production system, and seeks to optimize the performance of the system as a whole as opposed to individual processes.

**Let's revisit the question** of why there is no one single "best" process-improvement methodology that works for all cases. Note that all the methodologies make an assumption about the reason why an organization underperforms, and what is the best avenue for improvement. This assumption manifests itself as the goal of that particular methodology. Hence, the inherent assumptions contained in the Lean, Six Sigma, and TOC methodologies are that organizations underperform because, respectively, they do not deliver value efficiently, have poor quality, and do not produce sufficient throughput. These assumptions then act as the logical basis for the development of the rest of the methodology.

In the real world, organizations underperform for many different reasons, and the validity of these assumptions will vary from one organization to the next. Which methodology is best for a particular organization depends on the validity of the assumption that the methodology makes about the reason for organizational underperformance, i.e., the fit between the methodology's goal and what the organization needs to do to improve performance (the first corollary of the "water" philosophy).

But isn't the ultimate goal of all process-improvement efforts to deliver financial results? Yes, but this then raises the question: What is the best avenue to achieve those financial results: value delivery, defect reduction, throughput increase, or something else? Again, the answer varies depending on the organization and its circumstances.

What about the Lean goal of value delivery? Isn't that sufficiently generic to apply to all organizations? While all organizations should indeed be interested in delivering value to their customers, it isn't necessarily the focus of all process-improvement efforts, heretical as that may sound. Frequently, organizations are more focused on improving some specific internal performance metric, such as profit, cost, throughput, lead time, or quality, rather than value delivery. This is the reason that many Lean implementations lose their focus on flow/pull, and instead transform into a series of loosely coordinated kaizens aimed at improving a particular metric, rather than achieving a truly lean production system.

There will also be instances when organizational and cultural factors require a modification to the pure approach of a particular methodology (the second corollary of the "water" philosophy).

A common difficulty in many Lean implementations is that many of the wastes that Lean seeks to eliminate are not readily quantifiable by the standard cost-accounting systems that most organizations use. An example would be the category of waste identified as overproduction. Lean thinking argues that overproduction results in excess WIP and inventory, which must be stored, counted, and moved, and are also subject to obsolescence, all of which is nonvalue-added and costs money. Many of these costs,

however, would come under the category of inventory carrying costs, which do not appear explicitly in the Profit and Loss statement. As a result, if Lean is implemented following the pure methodology, and WIP and inventory are reduced, the organization's costs may not necessarily show any benefit. This raises the Zen-like question: "If an improvement occurs but is not measurable in the cost-accounting system, then is it real?"

**Lean proponents have recognized** this difficulty, and have advocated as its solution the adoption of a new accounting concept, Lean Accounting, in which costs are categorized by value stream as opposed to departments. A similar situation exists for TOC, whose proponents have likewise advocated the concept known as Throughput Accounting as the solution to a proper quantification of benefits. Whether or not these concepts are adopted, the situations call for a modified process-improvement approach.

Another reason why it is necessary to challenge the dogma of the established process-improvement methodologies is that sometimes dogmatic application of a methodology's rules is just not appropriate to the situation or problem at hand.

An example would be the Six Sigma tenet that decisions and actions must be based on data. On the face of it, this is a good way to approach process improvement. After all, data, provided they are correctly used, make the methodology objective, rational, and scientific. However, accurate data are not always free or easy to get. What does one do if the required data are prohibitively expensive and/or time consuming to obtain? It might then be necessary to weigh the benefits, costs, and risks of proceeding with full/accurate data, versus proceeding with partial/approximate data, versus proceeding with no data, versus not proceeding at all before deciding on a course of action. Additionally, not all problems require data to solve. Problems encompass an entire spectrum of data requirements, and some problems simply do not require much data to solve. An example is a quality problem that can be addressed through a simple visual aid or a Poka Yoke device.



Yet another reason why it is not advisable to dogmatically pursue any one particular methodology is that it negates the potential for exploiting the synergy between the different methodologies. The methodologies are complementary to a degree. Six Sigma uses the analytical approach to obtain the optimum solution, while Lean has the "just do it" mentality. Six Sigma focuses on improving individual processes, while both Lean and TOC aim for overall systemic improvement. If you are seeking to increase the throughput of a production system, TOC would be the logical

methodology to apply, for example. Having identified the system constraint in accordance with TOC, however, there's no reason why Six Sigma tools and/or a kaizen event cannot be brought to bear to eliminate the constraint.

Similarly, in a Lean implementation, if production cannot flow smoothly because a particular process has poor quality, the Lean Poka Yoke tool can be augmented with Six Sigma tools and the DMAIC problem-solving structure to improve quality and remove the obstacle to flow. Applying the different methodologies and their tools collectively and synergistically becomes more powerful than applying any single methodology.

**There is no one-size-fits-all** process-improvement methodology that delivers the best results in all cases. Which methodology is the best varies from one organization to the next, and depends on the fit between the process-improvement goals of the organization and the methodology. The rational approach would be to analyze the underlying reasons for organizational underperformance from first principles, then synthesize or select an appropriate methodology that addresses those reasons and, finally, develop a coherent plan to implement that methodology.

The effective process-improvement exponent is one who:

- Masters all the methodologies and tools rigorously,
- Is not bound by dogma and adapts his approach as needed,
- Exploits synergies between the different methodologies, and
- Accounts for cultural factors in implementation.

If this sounds very much like common sense, it is. Unfortunately, common sense is sometimes clouded in the fog of confusion arising from the hype surrounding the different process-improvement methodologies, and the competing claims of their respective proponents.