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Business Processes and Continuous Improvement

Everything is a process: Doing your laundry, running a nuclear power plant, watching a movie, building software, washing your car. These are all examples of processes. A process is simply a series of steps that have been organized to transform a set of inputs into a set of outputs. Every process also has a customer and a supplier. Customers and suppliers can be individuals or other processes. Figure 1 illustrates two processes, A and B, where process A is the supplier to process B (the output of process A is being "consumed" or used by process B to produce its outputs). Similarly, process B is the customer of process A.

Figure 1. A process with its customers and suppliers.

- **Every** process is defined by a set of resources. These resources define the categories of objects that make up the inputs and outputs of the process, as well as define the process itself:
- **People**, the actual individuals, groups, or teams that comprise the labor required to carry out the work of the process; one of these individuals is called the process owner or process manager and is the person fully responsible for the overall performance of that process
- **Method**, the procedures, business rules, techniques, and know-how that define the work flow of the process itself, i.e., the manner by which the inputs are transformed into the outputs
- **Material**, the constituent elements that are consumed or used by the process to produce the outputs
- **Equipment**, the tools, technologies, information, data bases, systems, etc. that are used by the people to facilitate carrying out the work of the process
- **Environment**, the overall organizational, social, working, and community context within (and upon) which the process operates

All these resources change state as a result of carrying out the process. Some are consumed, some are degraded (lose value), and some are improved (increase value).

For example, Figure 2 illustrates a sample process for washing a car. The method is captured as a flow diagram that describes what each role (the people) does to advance the dirty car (the input) to a car that has been cleaned and optionally waxed (the output). Note that the process input and output includes more than the car. All the resources can be considered inputs and outputs of the process. The materials get consumed, the equipment undergoes wear and tear, and the people doing the work learn and improve and, of course, get dirty, wet, and tired.

In addition, one could also define a more detailed process for any step shown in the figure. The "attract cars" step could itself be a very detailed process (with its own people, method, material, equipment, and environment) specifying signage creation, advertising programs, location selection, etc. In which case there would be a hierarchy of process definitions that are needed to define the complete car washing "enterprise".

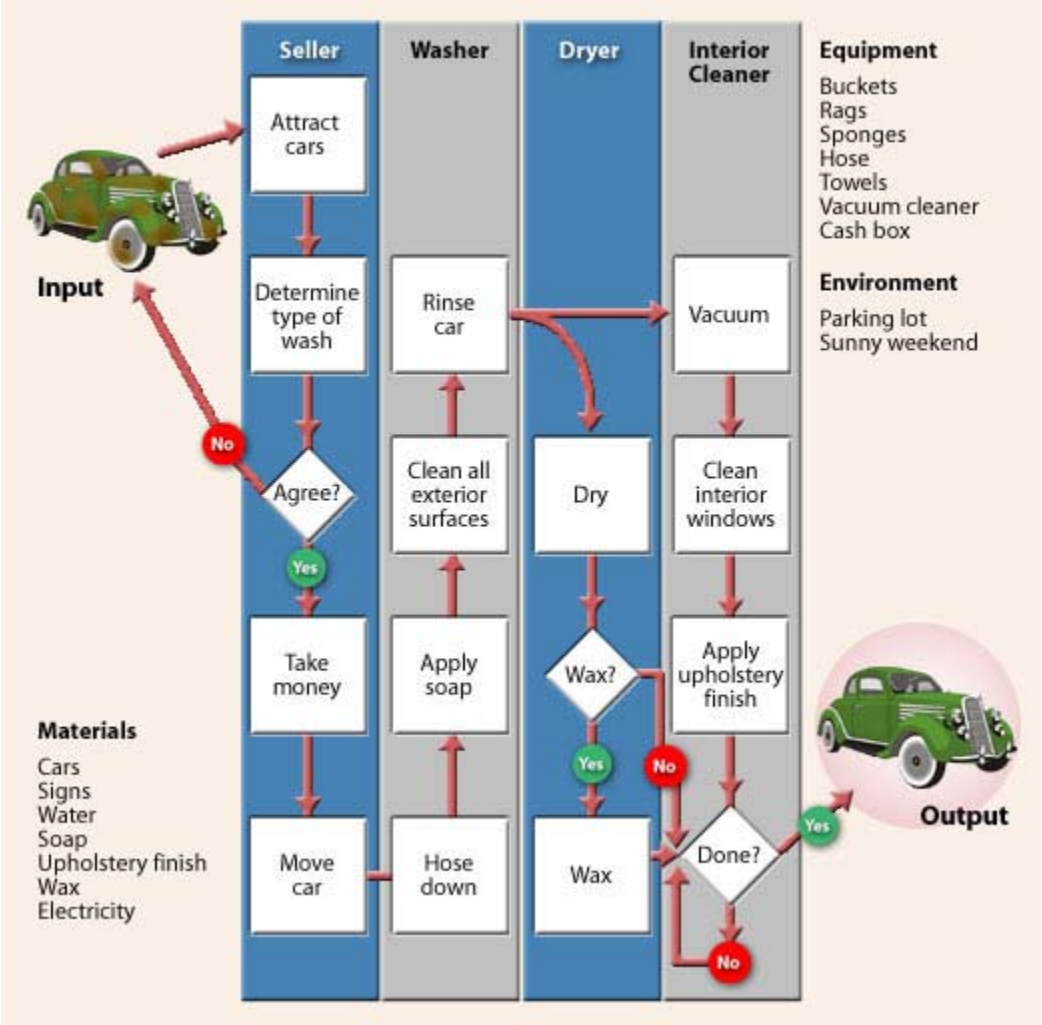

Figure 2. A car washing process.

Two vital sources of communication inform each process owner on its performance: the voice of the customer, and the voice of the process.

The voice of the customer communicates to the process owner the requirements, needs, specifications, expectations, desires, objectives, targets, etc. that define success to that customer. And, of course, since a process can have many customers, there can be many such voices.

The voice of the process comes directly from the outputs of the process itself and communicates the nature of the results of that process. This voice, like the voice of the customer, must be translated by the process owner to be useful. The method of translation (as with all translations) dramatically affects the type of information that is gained from the voice. In addition, even when using the same translation method repeatedly, the voice will likely change over time.

The process owner's mission is to match the voice of the process with the voice of the customer.

Both of these voices can be described by a probability distribution. In other words, customer needs and requirements may not necessarily be fully defined by any single number or target. An acceptable range may be useful. In addition, over time, the nature of success in the customer's mind may shift. In a similar way, the voice of the process changes due to the natural variation inherent in any process as well as due to the nature of the translation methods, which introduce their own uncertainties.

Shewhart introduced the idea of using control charts (Figure 3) for capturing and analyzing the data that represent these two voices. The control chart is simply a tool for arraying the results of a process (based on a selected process or outcome metric—one metric per chart) so that its behavior can be examined and understood. Typically a control chart consists of a time series of values for the chosen metric and a set of process limits that bracket the centerline. The centerline represents the average value. The upper and lower process limits are statistically derived based on the degree of variation in the process and taken together define the natural process limits of that process.

This is the voice of the process.

These limits are established so that in a stable process, any variation outside that limit is a signal to take action. Variations around the centerline but within the natural process limits are noise. Any attempt to respond to these variations as signals to take action is doomed to failure.

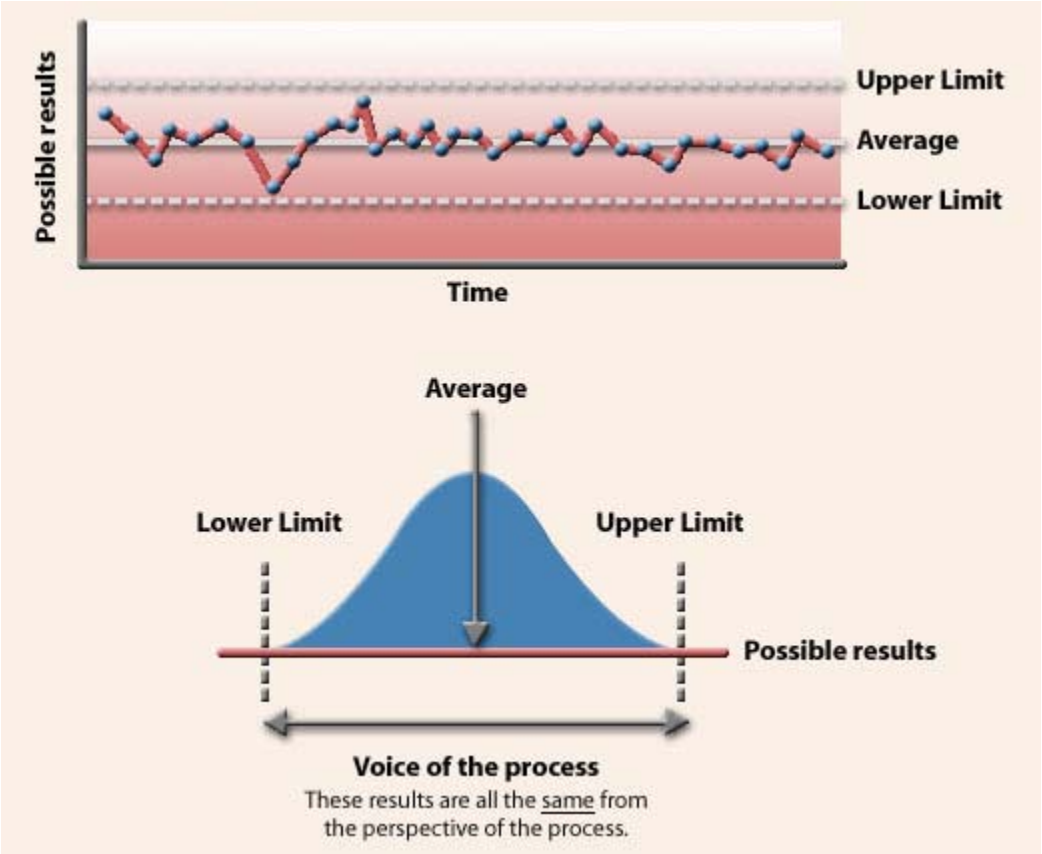

Figure 3. The voice of the process.

Consequently, before a process owner can meaningfully take steps to match the two voices, these voices must be stabilized. In other words, a stable voice of the customer and a stable voice of the process are essential prerequisites for obtaining any reliable knowledge on the process' operation. And, reliable knowledge is an absolute requirement for sound process improvement. Making changes to an unstable process is meddling, and has unpredictable effects.

Process stability is always a matter of judgment. Typically, a process can be considered reasonably stable when the values rarely exceed the natural process limits and when there is no obvious trend or clustering on one side of the centerline. Unstable processes are inherently unpredictable, so that any actions based on an unstable voice lead to increased costs, delays, and reduced quality.

The gap between a stable voice of the process and a stable voice of the customer is sometimes referred to as the capability of that process. If either voice is unstable, there is no capability of the process. In order to stabilize a voice (and thus be able to improve its capability), one must first understand the causes of variation (Figure 4) in that voice. There are two causes of variation:

- **Common causes**. Causes of variation that are inherent in the process itself and can only be removed by changing the process. These are typically management issues. Overwhelmingly, these are the dominant causes of variation.
- **Special causes**. Causes of variation sometimes referred to as assignable causes that are not common to all resources in the process and are typically due to forces outside the process, or to other "hidden" processes.

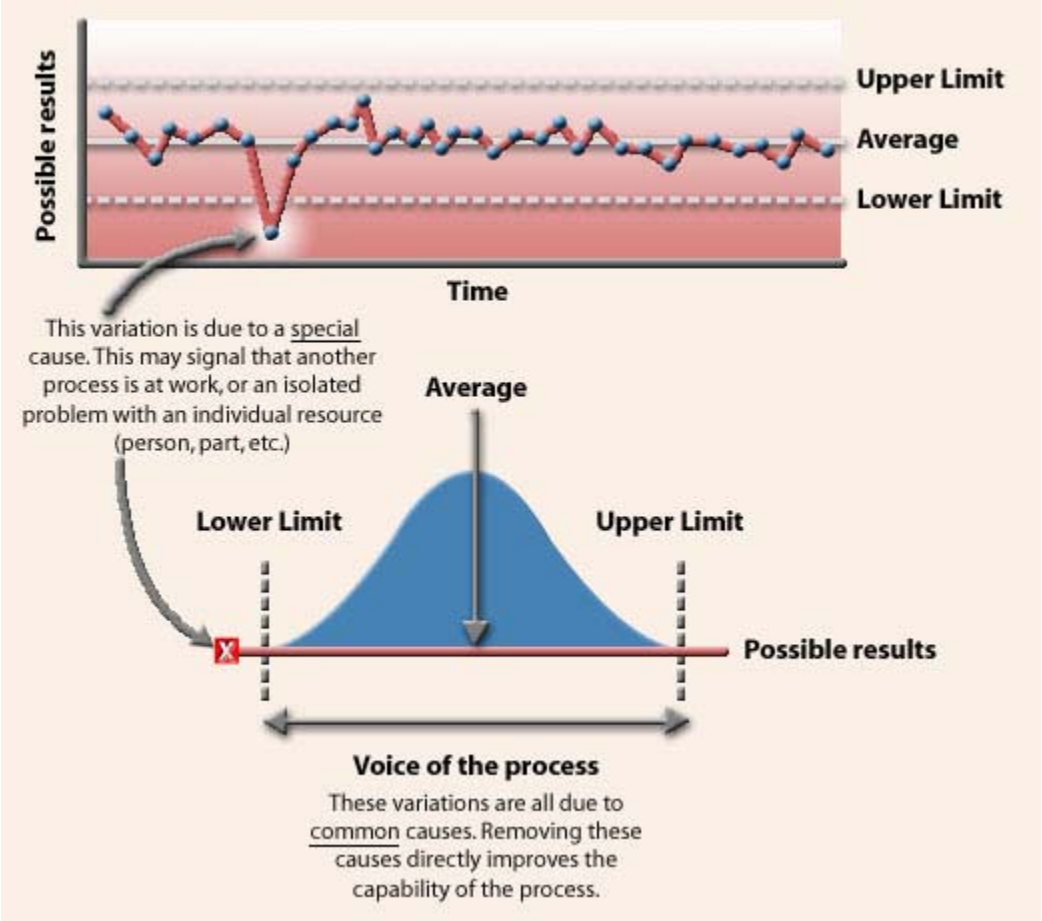

Figure 4. Causes of variation.

The overwhelming majority of business problems are due to a lack of understanding of these two causes of variation. If a process owner treats every cause as a special cause (which is the typical mistake that most managers make), then the process incurs the substantially higher costs of tampering and of actually increasing the instability of the process rather than decreasing it. On the other hand, if a process owner treats every cause as a common cause, then the process misses the opportunity for quick and easy fixes when they are available.

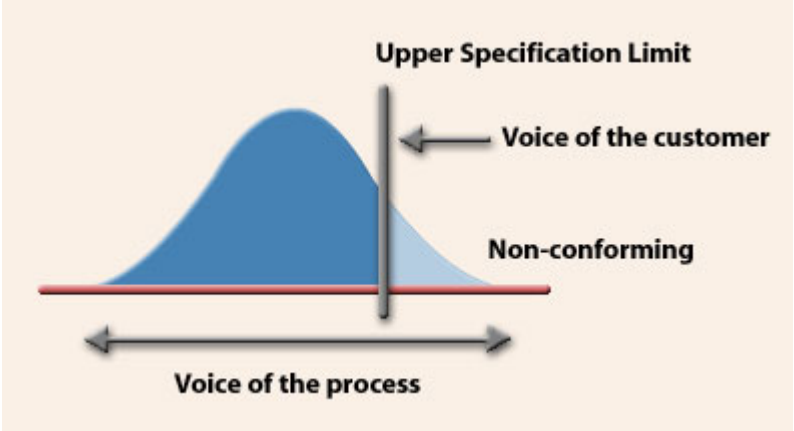

Figure 5. The two voices are not aligned.

Once the process has been stabilized, the process owner is in a position to match the voice of the process with the voice of the customer. When the two voices do not match (Figure 5) the process owner has two choices:

- Change the voice of the customer (i.e., change the “spec”), this can sometimes be a cost-effective and appropriate step for the customer, and should always be given careful consideration

- Change the voice of the process (i.e., improve the process), note that a stable process can produce both conforming and non-conforming outputs, in other words, conformance to a specification is an external attribute that has nothing to do with the natural capability of that process—a process will perform within its natural process limits regardless of the customer's needs or expectations

Figure 6 illustrates these two choices. If the voice of the customer is changed (see the rightmost vertical dotted line in the figure), then the existing process can remain in place, since now its original voice matches the newly modified voice of the customer. If the voice of the process must be altered, then the process itself (i.e., some or all of its resources) must undergo change so that a new stable voice of the process can be achieved (see pink curve illustrating distribution of improved process that now produces only conforming outputs).

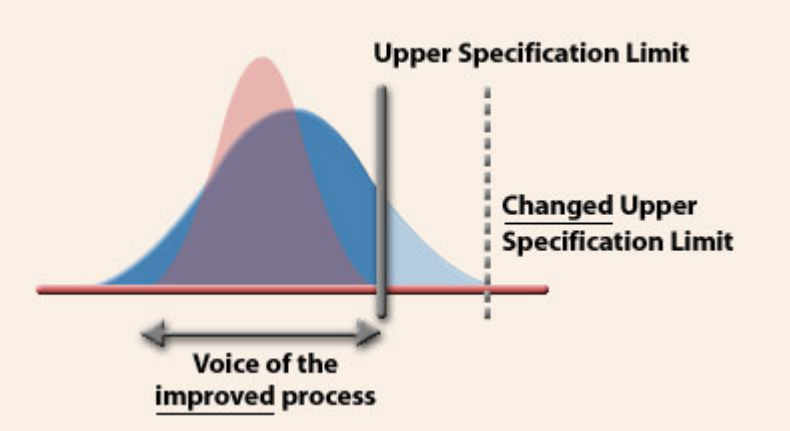

Figure 6. Aligning the voices.

If the process is to be changed, then the most effective method for changing the process is via the continuous improvement cycle (Figure 7). The continuous improvement cycle (also known as the Shewhart cycle, or the Deming cycle) is essentially the scientific method that has been operationalized for use in process improvement. It comprises the following four stages:

- Plan. The key to process improvement is not arbitrary change, but rather change that is planned so that learning can take place and true knowledge gained. Only when armed with true knowledge of the performance of a process and the causes of its variation are meaningful changes possible. This starts with a plan where the desired process improvement outcomes have been specified in detail. The differences between the actual results of the process and the predicted or targeted outcomes form the primary fact base for learning and understanding. Typically this stage consists of the following series of actions:
  - Identify the opportunity for improvement either via a gap analysis or root cause analysis
  - Specify the current process (i.e., its resources: people, method, material, equipment, and environment)
  - Design the improved process (i.e., via an updated process definition)
  - Define the process improvement approach, scope, schedule, and actions
  - Predict results of improved process (expected values of key metrics)
- Do. The second stage in the cycle is to execute or carry out the plan that was defined in the first step. Usually this is piloted on a small scale where the number of variables can be controlled and learning is more focused. Also, it is important that, to the extent possible, the pilot be carried out with customers.
- Check, or Study. This stage focuses on gathering the results of the execution of the plan to capture the knowledge gained from the gap between actual and predicted results.
- Act. Finally, the process is fully modified or reengineered based on the knowledge gained during the cycle. The modified process is then the subject (as needed) of the planning step of future continuous improvement cycles.

This cycle is repeated continuously as a natural consequence of owning that process. In other words, the continuous improvement cycle is not a technique applied to a process by people external to the process, which can potentially, at best, bring only momentary value, but rather must be an integral part of the job of managing and operating that process. It must be embedded in the method of every process.

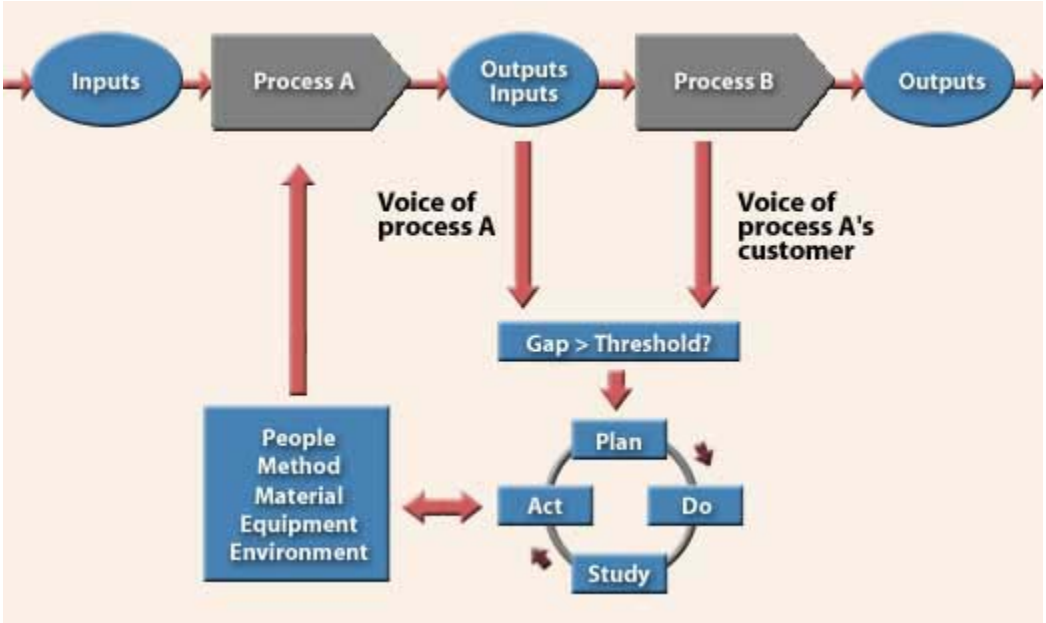

Figure 7. The continuous improvement cycle.

In particular, because measurement is so central to process improvement, measurement must also be a routine part of owning and using any process (via suitable control charts or their equivalent). The only purpose of measurement is to help the workers understand and improve their processes.

The process measurement discipline consists of the following steps:

- Establish with your customers the relevant and meaningful measures that estimate the capability of the process
- Define the voice of the customer (VoC), that is, determine the required levels of performance for each measure
- Define the voice of the process (VoP) for each measure, that is, the baseline performance
- Measure current capability (the gap between the two voices) for each measure
- Perform business process
- Continuously measure process performance and its capability
- If gap for any measure exceeds its allowable threshold, close the gap between the VoC and VoP by improving the process using the continuous improvement cycle

Some examples of typical process measures are outlined below:

- Service
  - Quality (defects/unit, defects made/opportunities to make defects)
  - Cycle time (elapsed time/unit produced, elapsed time between request and response)
  - Time to market (elapsed time between product conceptualization and first customer shipment)
  - Customer satisfaction (indexes based on surveys, focus groups, or behavior)
- Value
  - Net profit
  - Shareholder value
  - Economic value added (EVA or other measures based on discounted cash flow models)

- Investment
  - R&D return
  - ROI
  - Time to profitability (elapsed time between product launch and profitability)
- Cost
  - Expense ratio (operating expense/revenue)
  - Productivity (units/applied labor, units/cost)
  - Unit cost rate (cost/unit)
  - Cost of quality (failure costs, appraisal costs, prevention costs)

These sample measures represent the types of tools that a process owner can use in conjunction with the customer to establish meaningful windows into the true capability of that process, and its performance.

For more information, please contact us at (630) 365-1606, or visit www.itestqp.com.