



## TenStep Supplemental Paper

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### The Control Aspect of Six Sigma

Six Sigma, which has been popularized in the United States by companies like GE and Motorola, has been getting a lot of attention in the past few years. In fact, companies in many countries are touting the benefits of this concept. Companies operating at Six Sigma levels are working at 3.4 defects for every million opportunities, meaning that they are experiencing almost no defects.

There are various stages that must be completed in Six Sigma implementation. These stages are *Recognize, Define, Measure, Analyze, Improve, Control, Standardize, and Integrate*. Each of these phases is important. Unfortunately, many companies seem to stumble when they get to the crucial *Control* stage.

Control plays a very important role in any manufacturing improvement process. No matter what the degree and nature of the improvements made, failing to control and sustain these improvements can lead to a reversion to the original state.

#### Some Basics about Control

A typical control process can be explained as follows:

- A particular product or process is designed to meet a certain standard of performance.
- During operation, the product or process is linked to a sensor that measures the actual performance output.
- The sensor forwards this measurement to an evaluator.
- The evaluator compares the actual performance of the product or process to the appropriate standards.
- If the actual performance deviates from the standard, the evaluator sends a message to the correcting mechanism.
- The correcting mechanism triggers the measures required for correction.
- The product /process responds by performing according to the set standards.

This is how a general control system operates. The different roles of this control mechanism can be played by human beings or be managed by automated systems, such as programmable controllers. In Six Sigma, a project team takes vital inputs from the operators and managers of the product/process to design the control system. They work on defining the standards, measuring performance, making decisions based on the deviation, and taking corrective measures.

#### Controlling Vital Inputs

While conducting a Six Sigma project, certain vital information is gathered concerning how the different inputs and operating factors influence performance. Although organizations usually inspect the final output to check for conformance to standards, Six



## TenStep Supplemental Paper

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Sigma advocates controlling input parameters to ensure the conformance of the output. Therefore, the focus is on developing control mechanisms for the input parameters as well as for the output.

A range of input parameters and operating conditions influence the performance of the product process. However, not all of them exert the same degree of influence. Those that are most influential are known as dominant influencers. Identifying these influencers and their effects on performance is a crucial part of Six Sigma implementation.

The several different types of dominant influencers include:

**Set Up:** Certain process outputs are most influenced by the kind of set up in which they operate. For instance, stamping and printing operations can be fairly dependent on the set up of dies and tools. Therefore, set up is a dominant influencer in this case.

**Time:** The quality of certain processes can be time dependent. Quality can degenerate over time due to factors such as heating, fatigue, and wear and tear. It is therefore important to recognize factors that are time dependent, monitor their influence, and then provide for appropriate corrective measures.

**Material:** Raw materials, processing equipment, and related components are examples of inputs that affect the quality of the outputs. It has been a standard practice to control the quality of the incoming material through quality assurance testing. However, companies are now moving beyond by not only blocking poor quality material from entering the process system, but also by collaborating with suppliers to form better relations and to gain greater control over the supply chain and processing.

**Personnel:** The experience, aptitude, and skills of the workforce certainly affect the quality of output. Companies can control the quality of worker output by properly screening applicants, providing training, creating the right work environment, setting up procedures, eliminating circumstances that cause personnel to commit errors, etc.

**Information:** The output of certain processes is dependent on the availability of timely and accurate information. Organizations should therefore develop proper systems to ensure the availability of timely, accurate, and relevant information.

Having identified the inputs that have a predominant influence on the output of the process, and having taken the steps to improve their quality, the next step is to set up proper controls. These controls will ensure that the organization does not return to its original state.

For instance, consider the costs incurred by a ready-made home construction company. Ready-made homes require that the flooring and the floor covering be laid in the initial stages of the construction process. Unfortunately, this was leading to certain problems. The flooring tended to get damaged during the construction process, resulting in large amounts of replacements and related rework.

The Six Sigma team set up to improve the quality of the construction process identified a solution. The solution was to wrap a protective sheet on the floor covering, which would be torn off after the home was installed.



## **TenStep Supplemental Paper**

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The company, however, found that it was continuing to incur large expenses in floor covering replacement and related rework. Further investigation revealed that the workers were not always adhering to the solution identified by the Six Sigma team. The company had failed in the control aspect.

Companies generally progress smoothly through their Six Sigma implementation until the control stage, which is where organizations have to put in their most disciplined efforts. However, when the control step is neglected, Six Sigma actually loses its power. The organization may end up returning to the status quo and not receiving any tangible benefits if the Six Sigma solution is not adhered to.