Understanding Continuous Improvement Strategies

By Ray Harkins

With U.S. annualized inflation rates exceeding 5.0% each month since May of 2021[1] – the longest stretch this century – the need for sustainable cost improvements has rarely been greater. And one source of cost reductions available to nearly every manufacturer is the elimination of waste and quality defects within their own facilities. Understanding the major continuous improvement (CI) strategies may help manufacturing leaders find a path toward lowering their costs and creating healthier margins for their organizations.

The term "Lean Six Sigma," which emerged in the early 2000's as a portmanteau between "Lean Manufacturing" and "Six Sigma," encompasses an extensive collection of CI tools and approaches designed to cut manufacturer's costs and improve their customers' experiences. Lean Manufacturing originated in the early days of automotive manufacturing as Henry Ford sought to standardize components and eliminate the wasted motion of his employees. Six Sigma is a more recently developed methodology. Engineer and quality professional, Bill Smith assembled its major principles while working for Motorola in the 1980's.

The overarching goal of Lean Manufacturing is to identify and eliminate process waste. The various sources of waste are often referred to by the Japanese word *mudas*. And while some *mudas* like defects are obvious, Lean Manufacturing offers tools for minimizing eight major sources of waste. The original seven wastes can be recalled with the mnemonic "MOWED IT." They are:

> **M**otion: Unnecessary movement or motions by workers that lead to inefficiency and wasted energy.
>
> **O**verproduction: Producing more than what is needed at a given time or producing too early leading to wasted resources and excess inventory.
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> **W**aiting: Idle time between production steps or waiting for materials or information resulting in process bottlenecks and reduced efficiency.
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> **E**xcess Processing: Performing unnecessary or redundant steps in the production process resulting in wasted of resources and time.
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> **D**efects: Producing defective products that wastes time and resources.
>
> **I**nventory: Maintaining excess inventory resulting in wasting space and increased net working capital.
>
> **T**ransportation: Unnecessary movement of materials or products, again resulting in wasted time, energy, and resources.

The eighth muda, added in the 1990's after the broader adoption of Lean Manufacturing in North America, is "Unused Talent." This is characterized by an organization failing to tap into the full potential of their employees, leading to wasted knowledge, skills, and innovation capacity.

By identifying and mapping a product's "Value Stream" -- that is, the specific processing steps that the customer is paying for -- organizations can more readily identify their non-value-added wastes along these eight categories and begin working to reduce or eliminate them.

The lower-case Greek letter sigma (σ) is used in statistics as a measure of dispersion within a normally distributed dataset. As the range of values within a dataset increases, so does its σ. And normally distributed datasets are readily found when measuring part features such as a length or width on a batch of manufactured parts.

Traditionally, quality professionals have defined the expected "process range" as +/- 3σ's of dispersion from the average value of a random sample of parts since this will encompass 99.7% of all the values in the population from which that sample was drawn.[2] When the process range is less than the specification range for a given feature, then the process is referred to as "capable."

However, the term Six Sigma was coined to imply the goal of this CI methodology: that +/-6σ's of dispersion found within a process, which equates to 99.9999998% of all parts produced by it, would fall within the specification limits for that feature. In other words, the goal of Six Sigma is to reduce the variation in a process to the point that it is practically impossible for it to create a defect.

Early Six Sigma practitioners identified six major sources of variation present within nearly every process and described them as the "6 M's." They are:

> **M**anpower: This refers to the people involved in the process, including their skills, training, and experience. It is essential to ensure that the right people are in the right roles and that they are adequately trained and supported.
>
> **M**ethods: This refers to the process itself, including the steps taken to complete a task or produce a product. It is important to understand the process flow and identify areas for improvement to eliminate waste and increase efficiency.
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> **M**achines: This refers to the equipment, tools, and technology used to perform the process. It is important to ensure that the machines are reliable and efficient,

and that they are properly maintained and calibrated.

Materials: This refers to the raw materials, supplies, and components used in the process. It is important to ensure that the materials are of high quality and that they meet the necessary specifications.

Measurements: This refers to the data and metrics used to monitor and control the process. It is essential to collect accurate and reliable data to identify trends and patterns, and to measure the success of process improvements.

Mother Nature (Environment): This refers to the external factors that may affect the process, such ambient temperature, dust, vibration or other factors in the physical environment. It is important to identify and control these factors as much as possible to ensure consistent and reliable process performance.

The founder of the modern quality movement, W. Edwards Deming, once said, "Uncontrolled variation is the enemy of quality.[3]" And so, the tools of the Six Sigma methodology center upon identifying and reducing sources of variation in a manufacturing process, and as a result, reducing the variation in products they produce.

Starting points for employing the Lean Six Sigma CI tools include:

- Educating yourself and your organization by taking a Lean Six Sigma White Belt or Green Belt class.
- Touring facilities known for their CI methodologies.
- Discussing with your team the bottlenecks and "pain points" in your manufacturing processes.

By learning the principles and tools of continuous improvement, and then beginning an ongoing practice of employing them throughout one's organization, manufacturing professionals can improve their customers' satisfaction through reduced quality claims and lead times while improving their own profitability margins.

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