VARIATION REDUCTION

Avoiding the Process Improvement Paradox

by Timothy Young

The engineered wood products industry is an important economic sector of the U.S. economy, but it has struggled to be profitable since the 2008 economic recession and related housing market crash. Even though process improvement increases business competitiveness, many manufacturers struggle with lasting and sustainable process improvements. Most process improvement efforts face a paradox that inevitability leads to stagnation or failure. Given the plethora of process improvement marques (e.g., continuous improvement, Six-Sigma Quality, Lean Six-Sigma, etc.), a brief historical perspective is important.

Mass production started in the U.S. at the turn of the 20th century when Henry Ford built the first production line. In 1911 Frederick Taylor published the *Principles of Scientific Management* and 25 years after its printing "Taylorism" thrived with a focus on "manufacturing efficiency." In 1931, Walter A. Shewhart published *Economic Control of Quality of Manufactured Product* while working at Bell Laboratories. This publication was the genesis of modern quality and was the first publication to introduce the use of statistical methods for improving manufacturing processes.

In 1947 W. Edward Deming, a Shewhart disciple, started his lectures in Japan to the Japanese Union of Scientists and Engineers (JUSE) on continuous improvement and statistical process control (SPC). Many believe that the Toyoda family of Japan listened carefully to Deming and merged the concepts of mass production, Taylorism and SPC in the development of the Toyota Production System (TPS).

Following years of market share loss to Japanese imports, the U.S. automotive industry found itself in crisis in the late 1970s. As a result of this crisis, the U.S. government in 1984 funded a five-year study at MIT on analyzing the Japanese and European automotive industries. A significant outcome of this study was the book by Womack et al: *The Machine that Changed the World—The Story of Lean Production*. This book represented the birth of lean manufacturing in the U.S. as it relabeled and defined the TPS. In the 1990s Mikel Harry worked with Motorola and GE, and the publishing of his training manuals was the birth of Six-Sigma Quality. Today the concept of Six-Sigma Quality has merged with lean manufacturing and is currently known as Lean Six-Sigma.

This historical perspective is important because fundamental to all of the aforementioned philosophies is the concept of "variation reduction." Variation reduction results in improved business competitiveness from reduced operating targets, improved efficiency, lower manufacturing costs and greater customer value. Firms that have received quality awards and been successful in process improvement have also been documented as having higher profitability and return on investment than their competitors. However, why do so many process improvement efforts in the engineered wood products industry struggle or fail? Many organizations face a paradox throughout the process improvement cycle. The paradox arises from a misunderstanding of the basic premises of process improvement.

Seven Premises

Initiation. The first premise of process improvement is properly defining it. Process improvement is defined as "variation reduction" throughout all processes, products and services of the organization. If this is not a core belief of the organization and developed as fundamental to the vision, process improvement will not be initiated.

The second premise during initiation is that the culture of the organization supports process improvement and allows it to happen.

Implementation. A third premise during implementation of process improvement is consistency of message by executives and management throughout the organization. Executive management is responsible for creating the vision and effectively communicating it throughout the organization. Management responsible for operating the manufacturing facilities must communicate this vision and act accordingly within the plants. Proper hiring and training of support management, engineers, maintenance and operations personnel is essential. If management does not support the vision with action, process improvement will not be implemented.

The fourth premise is defining the key business and process metrics that will be used to measure improvement. These key business and process metrics will be strongly aligned with internal and external customer values. Costs for these business and process metrics will also need to be accurately quantified and tracked (e.g., Taguchi Loss Function).

The fifth premise for successful implementation of process improvement is the ability to accurately measure the key business and process metrics. Many companies collect large volumes of electronic data, but are "data rich and knowledge poor" because meaningful relational databases are not constructed from the data warehouses. Implementation also struggles because the error in measurement systems cannot be quantified and properly monitored.

The sixth premise during implementation of process improvement is accurately quantifying variation of the key business and process metrics. As with the fifth premise, this premise is impossible without the use of statistical methods.

Sustainability. The seventh premise, sustaining process improvement, can be difficult. "Low hanging fruit" will be harvested early and variation inherent to processes is not static; it will increase given process and feedstock dynamics. Management must avoid pushing standards or targets too aggressively after initial successes. Sources of variation may be different at the next stage of improvement. To sustain process improvement, proper statistical-based software systems need to be developed and implemented throughout the organization. Management at this stage must be careful not to delegate full responsibility for the process improvement to operations personnel. Production superintendents, supervisors and operators may not have the proper training or willingness to take responsibility for the process improvement efforts.

A key to this seventh premise is validating that the statistical-based software systems are correct before implementation. Presenting software tools that give false signals and direction lose creditability with operations personnel very quickly and the effort will stall. Proper training in the use and understanding of the statistics from these software tools systems is essential.

Applying these seven premises will avoid paradoxes of successful process improvement that lead to stagnation or failure. Executives and management have complete responsibility for the process improvement effort and must establish systems that will support and monitor the process improvement effort. All process improvement efforts will struggle at some point. It is essential, therefore, that an understanding of these premises is gained to avoid the paradox.

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