Continuous Improvement - CI Foundations

By Sam Ciccone, Senior Reliability Consultant

The Journey to Security, Resiliency and Reliability

"A person and an organization must have goals, take actions to achieve those goals, gather evidence of achievement, study and reflect on the data and from that take actions again. Thus, they are in a continuous feedback spiral toward continuous improvement." - W. Edwards Deming

In the early 2000s, I was working for Schneider Electric in Lexington, KY. Since I worked for a disconnect switch manufacturer with products used in other manufacturing plants, we were able to tour another plant just a few miles down the road in Georgetown, KY. This plant was Toyota Motor Manufacturing Kentucky (TMMK).

Although our company was mostly mature in its processes, I had never seen anything like this well-oiled machine called TMMK. On that plant tour, I noticed production lines that provided space to work safely and efficiently and people (i.e., supervisors, line workers, and senior management) talking to each other. They were not just talking about the weather; they were collaborating and learning from each other to produce the highest quality automobiles.

Toyota had not only cemented itself as one of the top automobile manufacturers in the world, but it had become a role model for Continuous Improvement (CI). To read more about Toyota's CI Culture, a book I believe is a must-read is "The Toyota Engagement Equation"[1] written by former employees in the early U.S. plant days.

To build on Lew Folkerth's recent Lighthouse articles on the foundations of CIP Compliance, this article will provide some origins of CI, plus its foundations and principles. It will also delve into the foundations of the ReliabilityFirst Maturity Model assessment used to drive CI.

CI Origins, Principles and Methodologies

Continuous Improvement is a buzzword phrase, and most companies have practiced some variation of it since the 1800s. W. Edwards Deming, Walter A. Shewhart[2], and the founders of the Toyoda Automatic Loom Works Company (Sakichi Toyoda) and the Toyota Motor Company (Kiichiro Toyoda) are some of the founding fathers of CI.

Shewhart developed the Do-Check-Act (PDCA) cycle while working for the Western Electric Company. When Deming met Shewhart, he adopted and championed his methods. Deming later believed that PDCA was not sufficient and evolved it into Plan-Do-Study-Act (PDSA) in the 1990s. He argued that it is not enough to "check" that it happened to specs, but that it is important to "study" and learn from the outcome to share lessons learned throughout the organization. Both PDCA and PDSA are known as the "Deming Wheel."

Kiichiro Toyoda took many of the practices his father, Sakichi Toyoda, developed in his Loom factory and went on to hire Taiichi Ohnon who developed the Toyota Production Systems (TPS). This led to Kaoru Ishikawa combining the works of Ohnon and Shewhart/Deming into the TQM described below.

Here are a few methodologies that have evolved over the years. You may have heard or used a few of them under the umbrella of CI:

Kaizen – This is the Japanese word for CI. It is not a coincidence this philosophy originated in Japan where Toyota began. Principles include improve continuously, put an end to the "we've always done it this way" attitudes, and empower employees to solve problems. Kaizen is the Japanese term for "Change is Good" (Kai = Change, Zen = Good). Organizations use "Kaizen Events" to solve problems and improve processes by gathering folks from all aspects of the organization to work together toward CI.

TQM – Total Quality Management is a set of management practices utilized to consistently improve the end goal. As I shared from my observations at the Toyota plant, the core of TQM is

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[1]   The Toyota Engagement Equation: How to Understand and Implement Continuous Improvement Thinking in Any Organization

[2]   Beyond The Phoenix Project: The Origins and Evolution Of DevOps (Official Transcript of The Audio Series)

the concept of CI — not just process improvements, but interaction among all levels of personnel and a basic CI culture and mindset.

Lean Manufacturing – Lean focuses on streamlining processes by eliminating waste in those processes.

Six Sigma – Developed in the 1980s, Six Sigma is a set of strategies, techniques and tools for process improvement that can be traced to an engineer who worked for Motorola. It means that through process improvement and consistency, you have achieved 3.4 defects in 1,000,000 opportunities.

DevOps[3] – DevOps, developed by Gene Kim, Kevin Behr and George Spafford, is a framework that stands on the shoulders of all these methodologies. It encourages Software Development Teams and IT Operations to work together to instill agility, reliability, resiliency and security within an organization.

RF Maturity Model

RF's Grid Reliability Improvement Maturity Model was developed using existing assessment models, such as CMMI (Capability Maturity Model Integration), CERT RMM (Resilience Management Model), and ES-C2M2 (Cybersecurity Capability Maturity Model). CMMI has been used by organizations such as NASA, Lockheed Martin, Microsoft and Motorola. RF adapted these models to develop the Maturity Model for the Electric Utility Industry.

This model contains Management Practices (groupings of internal controls) used to assess the maturity of the power grid. An assessment of these practices provides an organization with a snapshot of the current state of their processes in compliance, risk mitigation, and organizational maturity in Cyber Security, Operations, and Planning. It also provides a roadmap for improvement and is akin to performing the "plan" portion of PDSA.

Much like Lew explained in his recent Lighthouse articles on the foundations of CIP, these are the foundations of the RF Maturity roadmap to CI. The [Assessments and the RF Maturity Model](#) are located in the Internal Controls Knowledge Center on RF's website.

Many of the 16 management practices and their activities in the RF Maturity Model tie directly to Cyber and Physical Security. The following diagram provides a high-level view of some of these practices and relevant activities:

The CI theme presented here is PDSA, and Deming's quote in the beginning of this article alludes to the concept: "A person and an organization must have goals (**Plan**), take actions to achieve those goals (**Do**), gather evidence of achievement, study and reflect on the data (**Study**) and from that take actions again (**Act**)."

Utilities should strive for CI that will guide them on their road to Security, Resiliency and Reliability. I believe the first step (a.k.a. the first step in PDSA) is to assess where you are today because only then can you develop a plan to take the appropriate road to impactful improvement. For more information on how RF can guide you to CI excellence through the RF Assessment Process, please [contact RF's Entity Engagement Department](#).

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[3] [The Phoenix Project: A Novel about IT, DevOps, and Helping Your Business Win](#)