



Developing a Continuous Improvement System

Scott S. Haraburda ■ Lara E. Zilafro

No one should disagree that continuous improvement is critical to an organization's success, since conducting business using a status quo philosophy will not work. Advocates for successful change methodologies generally tout their particular improvement program as the "silver bullet" process to solve all problems. So how does one know which improvement program to implement? And, how does one avoid falling into the "flavor of the month" trap of changing their processes every time they discover a flaw in the process?

At Crane Army Ammunition Activity (CAAA), we took a different approach by implementing a systematic fully-integrated Continuous Improvement System (CIS) instead of just one or a few non-linked processes. This CIS is a system of the following six parts, all interwoven throughout the organization: organizational process standardization, employee participation, employee development, continuous improvement process, improvement programs, and organizational improvement analyses.

Haraburda is the CAAA manufacturing and engineering director. He holds a doctorate in chemical engineering and was a Baldrige examiner in 2007 and 2009. **Zilafro** is the CAAA continuous improvement director. She holds a bachelor's degree in chemical engineering and is a Lean Six Sigma master black belt.



CAAA employee working on the 30mm projectile recovery production line.

Organizational Process Standardization

Many companies demanded that their customers standardize their organizational processes. There have been several studies conducted that demonstrated that certified organizations using quality standards produce better products or services than non-certified ones. Advantages for implementing one of these processes include: better operational efficiency, increased customer satisfaction, improved employee morale, increased productivity and reduced waste. Problems with this involve the continual costs of maintaining the processes and the lack of linking the product quality to process quality.

There are several organizational process standards available. But the most popular one is ISO 9001, which is the internationally recognized series of standards for an effective quality conformance system, with over a million certified organizations worldwide. Other variations include QS-9000 for the automotive industry, TL-9000 for the telecommunications industry and AS-9000 for the aerospace industry. Periodic third-party certification is used as independent confirmation that the organization meets the requirements of these standards.

Since 1998, ISO-9001 has been used at CAAA. Even though there is a recurring cost to maintain this system, CAAA has seen significant improvements throughout its organization as a result. It has helped reduce process variation, institutionalized a systemic problem resolution, and increased employee participation throughout all of its organizational processes.

Employee Participation

Many times, it is the employees physically working on the line, the ones dealing with problems directly, who have ideas. Thus, employee suggestions can yield some of the best innovations and cost-saving measures. Since the organization can benefit from these suggestions, it is a good idea to share those ben-

efits, such as compensation, with the employee in exchange for those ideas.

Unfortunately, the pitfalls of a hastily implemented, undefined, and ill-conceived employee suggestion program can discourage employees and generate cynicism throughout the organization. Yet, these pitfalls can be avoided. An employee suggestion program that is clearly constructed has organizational commitment, and continual communication can positively improve the bottom-line, along with employee motivation.

The employee suggestion program at CAAA uses the Army Suggestion Program. This program institutionalizes a process for submitting ideas, which are then evaluated for implementation, usually by one of the organization's engineers. Then, this packet is reviewed by the awards board and forwarded to the commander for approval. If approved, the employee receives cash for tangible benefits (typically about 10 percent of its first year's savings). If the benefits are intangible, the employee would receive either a non-monetary award, such as a jacket, or cash based upon its value of benefit and its extent of application.

There were two recent highly successful examples of significant ideas submitted at CAAA. First, a production machinery mechanic developed a 30mm case extraction tool that eliminated the need for long-term storage of Armor Piercing Incinerating rounds, as well as the cost involved to demilitarize High Explosive Incinerating rounds. The annual cost savings of this effort was more than \$0.6 million. Second, an explosives handler developed a new procedure for filling aircraft flare payload assemblies at a lower angle and with less epoxy, which resulted in less air pockets and a stronger product. This suggestion eliminated a 6 percent rejection rate and CAAA realized more than \$0.5 million in first year savings. These employees were respectively recognized as the Army's Civilian "Suggester of the Year" for 2009 and for 2010.

Employee Development

The mission of an organization begins and ends, including sinks or swims, with its people. These missions cannot be accomplished without solid employee support. So, development of employees is paramount to the success of any continuous improvement effort. CAAA uses individual development plans (IDPs) to ensure that its employees enhance their knowledge, skills and experiences. These improved competencies help them achieve personal and career goals both inside of and external to the organization. Furthermore, the organization benefits by developing improved employee capabilities.

The IDPs must be able to answer three questions for the employees: "Where am I now?" "Where do I want to be?"

and “How will I get there?” Examples of developmental opportunities include: classroom training, distance learning, computer-based training, on-the-job-training, job shadowing, seminars, and developmental assignments. Although simple to do, developing good IDPs is often met with resistance. Excuses include: “I’m developing all the time; why do I need to write it down?” or “I don’t have time to do that” or “That’s just some worthless form HQ makes us fill out,” and on and on. There is definitely some truth to these excuses. There was no substance, little buy-in, and filling out an IDP was really just extra work.

The managers at CAAA use the IDP system within the Army’s Career Acquisition Personnel and Position Management Information System. This system allows the employee to plan, coordinate, and manage their continuing acquisition-based education and training over a 5-year period. It also facilitates the employee’s communication with their supervisor to discuss, plan and gain approval for their development, such as approval to register for a DAU class, as well as other training classes.

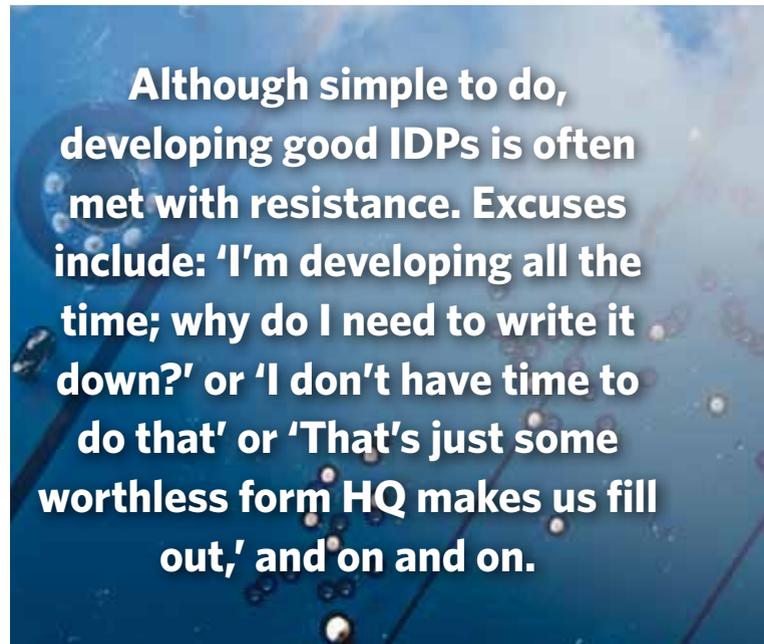
Furthermore, the senior leaders within CAAA recognized that organizational leadership development was a critical factor to the success of this CIS. Instead of just relying upon traditional management techniques, CAAA began to focus upon its leadership capabilities. In addition to using management skills to track progress, real cultural change necessary for sustainment of improvements required using leadership skills to influence its employees to change. Most of its supervisors possessed strong technical skills but lacked critical soft skills necessary for effective leadership. So, CAAA included the development of the soft leadership skills for its supervisors with training in communication, conflict resolution, effective appraisals, coaching, delegation, and mentorship.

Continuous Improvement Process

Many organizations today use some type of continuous improvement process, such as Total Quality Management. Since 2006, along with many other military organizations, CAAA began using Lean Six Sigma (LSS), which is a combination of two different quality programs. Six Sigma, which began in the 1980s with Motorola, involves the elimination of defects. Lean, which developed from Toyota, involves the elimination of waste. LSS uses a variety of tools to map processes, assess customer needs, analyze data and its variation, identify causes, reduce non-value added activities, mistake-proof designs, control processes, and test solutions. Project management of improvements involves the Define-Measure-Analyze-Improve-Control (DMAIC) process.

CAAA has applied continuous improvement processes to all facets of its operations entailing logistics, manufacturing, and administrative processes. As a result, CAAA has enjoyed great reward including more than \$11 million of single-year financial benefits and expounding intangible windfalls. Successes include projects like “CAAA Demilitarization Recycling” and “Optimize Stellar Truck Utilization.”

The demilitarization recycling project took advantage of new policy governing the sale of material generated from ammunition demilitarization operations. CAAA used LSS methodologies to develop a process that leveraged this new policy. As a result, CAAA contracted with a local recycler to purchase its inert scrap material. The proceeds of this contract go to the product manager for demilitarization benefitting both CAAA and other ammunition demilitarization organizations. CAAA took the next step by replicating this process in its logistics storage operations. Not only has this initiative generated more than \$2 million over the last 3 years, but it has also enabled great increases in inventory management efficiencies.



The Stellar truck project enabled more than \$1.1 million in benefits. Various factors caused less than optimal return on investment involving equipment purchases. The goal of the initiative was to refine capabilities and restrictions of Stellar trucks along with optimizing truck utilization in the performance of the CAAA Depot Operations Directorate. The improvements enabled CAAA capability of controlling its own forklifts allowing the immediate flexibility to reprioritize workload and decreased the quantity of forklift rentals. This flexibility included transporting forklifts to the garage for dead batteries rather than its transportation crews waiting hours for battery change-out by the host base support personnel. Furthermore, since the Stellar trucks carry dock plates as standard equipment, dock plates did not need to be pre-staged at high dock magazines. In addition, a multitude of safety improvements were made to the trucks.

Improvement Programs

The use of improvement programs for improving one or more operational areas is important to a successful CIS. CAAA used two such programs, the Voluntary Protection Program (VPP) and Value Engineering (VE).

Voluntary Protection Program

VPP is a program typically used by U.S. manufacturers to improve their safety culture. This program promotes effective worksite-based safety and health. In the VPP, management, labor, and Occupational Safety and Health Administration (OSHA) establish cooperative relationships at workplaces that have implemented a comprehensive safety and health management system. Approval into VPP is OSHA's official recognition of the outstanding efforts of employers and employees who have achieved exemplary occupational safety and health. After several years of extensive improvement efforts and after follow-up inspections by OSHA, on July 8, 2010, CAAA earned Star Status designation in the VPP Program, making it the second organization in the Army Materiel Command to earn this distinction. Furthermore, using these safety improvements, CAAA passed a historic safety milestone of more than 3 million hours worked without a lost workday incident, dating back to June 11, 2009.

Value Engineering

VE, another example of a regular improvement tool, is an engineering process typically conducted in eight phases: orientation, information, functional analysis, creative, evaluation, development, presentation, and implementation. Although the greatest potential for cost control when applying VE exists in the research and development stage of a new capability, opportunities for the application of VE techniques exist in every stage, especially when considering new available technologies and the experience of actual system deployment and user feedback. There are times when a problem in reliability or maintenance may become the greatest opportunity.

As described in the January-February 2011 issue of *Defense AT&L*, CAAA recently used VE principles with great success in a cooperative joint redevelopment with the Naval Surface Warfare Center, Crane Division. This VE effort turned unusable inventory of decoy flares into good material, supporting the warfighter, saving dollars, and easing the environmental impact of manufacturing new flares. The results were so significant that it yielded a total cost savings of about \$7.8 million while meeting the warfighter's needs, earning the Department of Defense VE Achievement Award for 2008.

Another example of using the VE process involved the production of the M54 burster tube, which is used as a component in a 155mm smoke projectile. The M54 burster tube has a history of being difficult to produce. The initial challenge was to adapt the prototype equipment to the facilities at CAAA, which received the primary pieces of equipment such as the kettle. However, the equipment was not modular and was intertwined with all their other processes. Therefore, CAAA had to develop all the electrical controls, hot water controls, and finishing equipment to produce these items. Furthermore, during the installation and control design process, alternate pouring methods were developed. After more than 2 years of trials, CAAA optimized the system resulting in a less than 1 percent reject rate. Previous reject rates were

from 17 percent to more than 50 percent, allowing CAAA to provide a better quality smoke projectile.

Improvement Analyses

Two different organizational analysis efforts were employed at CAAA to assess its overall improvement performance. These were the Shingo Model and the Baldrige Program.

Shingo Model. This model is based upon the lean management approach taught by Dr. Shigeo Shingo. The principles involved in this approach involve four dimensions of an organization: cultural enablers, continuous process improvement, enterprise alignment, and results. The Shingo Prize for Operational Excellence is a guidebook that describes this model fully and provides an assessment guideline for each of these four dimensions. CAAA used this model in 2007 to assess its pyrotechnic manufacturing operations and in 2009 to assess its logistical shipping operations. In both assessments, CAAA received valuable improvement ideas that it used to improve itself.

Baldrige Program. This is a program designed to raise awareness of performance excellence and recognize national role models by honoring them with the only Presidential Award for performance excellence. The National Institute of Standards and Technology (NIST), an agency of the U.S. Commerce Department, administers this program and educates leaders about the practices of best-in-class organizations. They provide organizational assessment tools and criteria such as the Baldrige Criteria for Performance Excellence, an easy-to-use questionnaire and performance measurement tool. The CAAA Manufacturing and Engineering Directorate conducted an organizational assessment using this tool to improve its critical business capabilities. Results of this improvement within that directorate allowed CAAA to obtain its fiscal year 2009 Net Operating Result of \$21.2 million, which was 4.3 percent above the plan.

The real benefits from using these improvement analyses is not the obtainment of the award, but the improvements to the organization as it improves itself during the assessments.

Continuous Improvement System

The continuous improvement process and tools are complementary, not mutually exclusive. These processes collectively focus upon results, use a team approach, require management by fact, focus on customers and markets, and require strong leadership for long-term effectiveness. At CAAA, the successes speak for themselves. Although not perfect and having many opportunities for improvements, CAAA has achieved significant benefits through its CIS. Anyone can achieve similar results if they too implement an effective systematic fully-integrated CIS throughout their organization.

The authors can be contacted at scott.s.habadurba.civ@mail.mil and lara.e.zilafro.civ@mail.mil.