

TASER's Roadmap to Quality

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Mission and Challenges

TASER International, Inc. has a long history of providing products that have saved countless lives. During the last decade, TASER has experienced a market growth that led to a larger customer base, not only across the United States but worldwide. As a result, TASER's products have been used in new environments and under operating conditions never before experienced. Unfortunately, with new uses, new products, and new customers, quality suffered. New product launches, such as the X3 in 2009, resulted in immediate quality issues with customer out-of-the-box experiences. Problems such as missing manuals, missing components, devices not firing, or lasers not functioning made their way to the customer.

As TASER matured, they experienced many challenges such as these enterprise-wide. At one time, their supply chain was low-performing, with 63% of its suppliers rated as high-risk. This resulted in significant interruptions in delivery, overstock of inventory, and material that was marginally acceptable. Some suppliers were the sole provider of certain parts and material. As a result, TASER had to increase the number and type of inspections done on incoming material, and if problems were detected, a decision had to be made whether to send the supply back or to use the supply and adjust design and production accordingly; either decision resulted in significant delays. Marginally acceptable parts or material received would often require a change in product design and manufacturing to meet quality expectations.

In research and development, an iterative design process (IDP) was used to design and build a product. IDP involved a "design, build, repair, rebuild" approach to product development. Although this

sounds reasonable, it is a costly process that involves building and manufacturing a product, shipping to customers, and—as new problems or failures occur in the field—re-designing the product to fix the problems. The product is then put into production and the process begins all over again. This is similar to testing one feature at a time, seeing if the product works with this new feature, putting it into production, and shipping. Features could be added, removed, or changed at any time. With this process, it can take several years to fully characterize a product, during which time customers experience what they perceive as poor quality. In addition, voice of the customer was not captured up front to determine if new features were really wanted or needed. This type of approach to product development is not uncommon in companies that experience early product successes and then expansive growth. New product development was dictated by schedules and promised dates of new product launches. However, this reactionary approach to problem solving only creates more problems and poor quality as a company's customer base and end-use conditions expand.

Throughout the company, TASER divisions often worked in "silos." Sales, IT, R&D, and manufacturing, for example, worked independently to a great degree, not really knowing what the other divisions were doing until very late in the development, production, or manufacturing process. R&D and manufacturing would work together once the new or redesigned product was ready for full production. This would sometimes result in production delays because manufacturing had to be configured (or reconfigured) to meet new design requirements. In addition, the sales team would not be familiar with product development early in the

design process. As a result, sales would often have a very short window in which to learn about the new product in order to promote it to customers or potential customers. Customer service would be notified of product defects (missing manuals, missing parts) through returns by or complaints from the customer, but this information did not always flow over to other divisions, such as manufacturing.

A New Era of Quality

The challenges experienced by TASER in these and other areas led to opportunities for improvement. Company leadership understood that to remain the industry leader, a complete culture change had to occur and a new level of thinking about quality had to be put into action. New people were brought in and employees moved into new positions to assist in a much-needed culture change. Additionally, in 2009 TASER partnered with Arizona State University (ASU) to move TASER to the next level of operational excellence (OpEx).

Lean Training

One of the first steps towards operational excellence involved education and training. Twenty-five TASER employees went through Lean training delivered by ASU faculty and were given the task of identifying Lean projects within TASER. Results of the projects were remarkable. In manufacturing, for example, problems identified included production being hampered by unnecessarily complex process steps, missing or broken hand tools, and lack of work instructions. In response, standardized tools were adopted, processes were moved to single piece flow where possible, and written and pictorial work instructions were posted at every work station. TASER

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experienced approximately \$1M in savings in the first year alone and expects nearly \$1.5M in savings in the second year because of these and other projects.

VSAT Survey Results and Implementation

While TASER team members were identifying and implementing Lean projects, Drs. Dan Shunk and Douglas Montgomery of Arizona State University conducted a company-wide survey using the value-based strategic assessment tool (VSAT). The VSAT identifies gaps between the desired state and the current state of a particular goal within the organization—a goal such as operational excellence. The survey included questions in five Malcom Baldrige categories: leadership, strategic planning, customer and market focus, human resource focus, and process management. For example, focus groups surveyed thought that the biggest gap in achieving OpEx at TASER was that quality was not engrained in the TASER culture.

The VSAT survey was developed to capture three components:

- **C:** Current State of a condition (ex: quality at TASER) (rated 1–5)
- **D:** Desired State of a condition (rated 1–5)

- **V:** Value if gap filled (value or importance of this condition to the company if we can get it) (rated 1–5)

The gap value is then calculated as $(D - C) * V$, where larger values indicate a significant gap between “what is” and “what should be.”

A value gap was calculated for each question relating to the above criteria. The objective was to determine what leaders and focus groups felt were important, but that were keeping TASER from achieving overall Operational Excellence (OpEx). For example, survey results indicated that the #1 gap for the focus group was, “Quality is engrained in TASER values,” with a large gap score of 13.46. This gap score was calculated as follows: on a scale of 1–5, the focus group indicated that quality being engrained in TASER is a highly desirable attribute with a “desired” score of $D = 4.92$. The focus group felt that quality was not engrained in TASER, resulting in a “current” attribute score of $C = 2.23$. In addition, quality at TASER is highly valued and given a score of $V = 5$. The gap score for “Quality is engrained in TASER values” is then

$$\begin{aligned} \text{Gap} &= (\text{Desired} - \text{Current}) * \text{Value} \\ &= (4.92 - 2.23) * 5 \\ &= 13.46 \end{aligned}$$

So what does this mean? The focus group surveyed by the ASU team thought the biggest gap to achieving OpEx at TASER was that quality was not engrained in the TASER culture. The top 12 gaps based on the VSAT results for both leadership and the focus group appear in Table 1. The results indicate a significant amount of agreement between the focus group and leadership and are typical for a technology company that must now blend innovation with operational excellence. In summary, the VSAT results indicated:

- TASER leadership was historically driven by innovation and sales/marketing focus on new products.
- TASER needed to extend innovation into world-class processes.
- TASER Continual Quality (TCQ) was not known by all within the company.
- Formal customer requirements were not being documented on legacy products.
- Quality/reliability were not prominent in the TASER culture.
- NPI processes existed, but were not followed.
- There was a need to accelerate TASER transition from quality control to quality engineering focus

Table 1: VSAT Results (Gap scores given in bold)

Importance	Leadership Top 12 Gaps	Focus Group Top 12 Gaps
1	12.47—Processes in place to acquire new customers	13.46—Quality is engrained in TASER values
2	11.86—TCQ is known by all	13.21—Leadership values quality equal to new product intro
3	11.68—Leadership values quality equal to new product intro	12.26—Robust design for Six Sigma employed
4	11.56—Customer requirements documented	11.93—TCQ is known by all
5	11.41—Quality is engrained in values	11.74—All critical suppliers characterized
6	11.16—A CMMI level has been established	11.46—A CMMI level has been established
7	11.16—Product development innovations developed to meet customer expectations	11.46—Product development innovations developed to meet customer expectations
8	10.63—“Six Sigma-like” philosophy present	11.37—Leadership values quality equal to sales revenue
9	10.41—Open communication	10.88—Customer requirements documented
10	10.09—Senior leaders personally promote	10.83—Learning and development addresses core processes
11	9.85—Leadership values quality equal to sales revenue	10.83—Processes in place to acquire new customers
12	9.80—CTQ parameters are clearly defined	10.81—Senior leaders personally promote

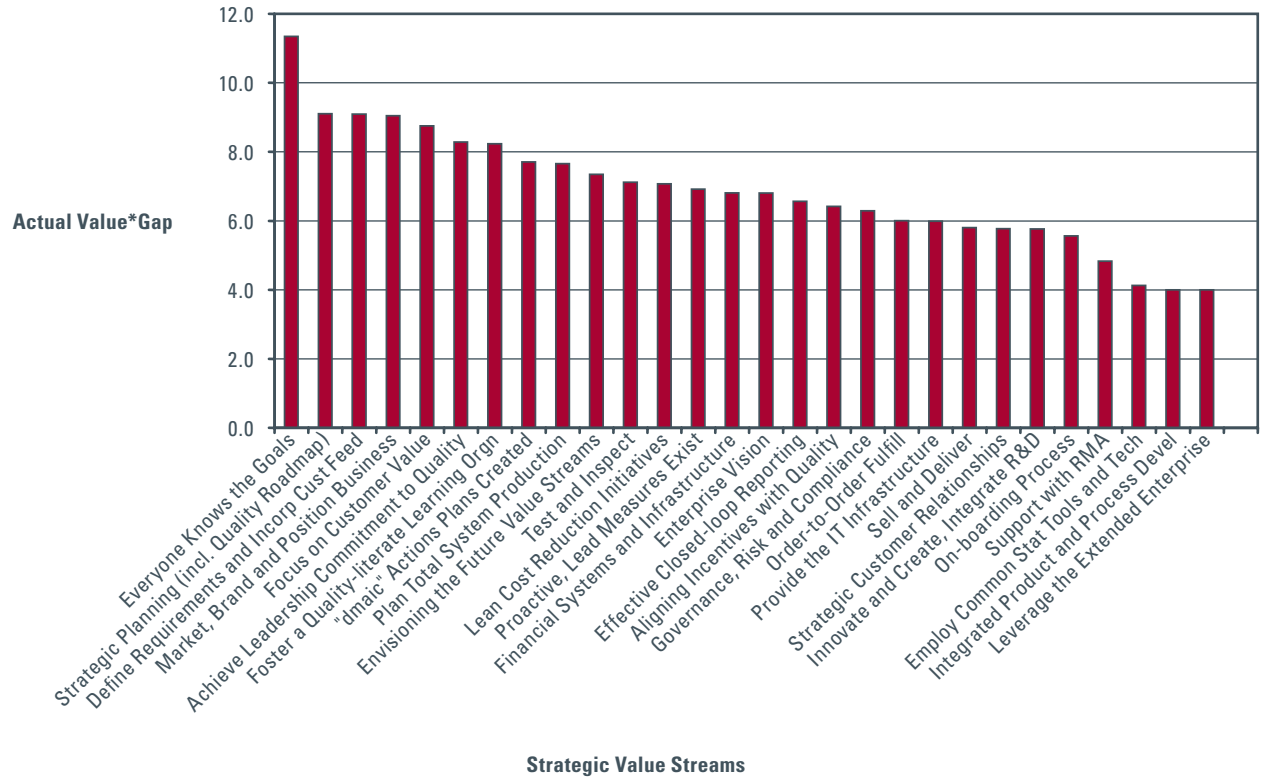


Figure 1: VSAT Results from Executive Team Leaders Quality Workshop

Quality Leadership Workshop

Results of the VSAT survey were discussed with the entire TASER executive leadership team at a one-day workshop in 2010. The team was asked to complete its own VSAT on quality at TASER from the executive perspective. The results of the executive team VSAT are displayed in Figure 1. The executive VSAT identified some top priority opportunity goals:

1. Create a formal customer feedback improvement plan.
2. Foster a quality-literate organization.
3. Develop a quality roadmap for enterprise new product development (NPD) including DMAIC, quality project selection, and organizational value stream mapping.

By the end of the workshop, a roadmap to Operational Excellence was recommended. The recommendations included: (1) a management action plan; (2) continued

education and training; and (3) a gated process to new product development.

Today, TASER has made significant gains in quality improvement in all areas and all divisions and continues on a path of operational excellence. With continual implementation of Lean and quality methods and tools, as well as following the recommendations resulting from the workshop, TASER has successfully addressed many of the challenges and quality issues of the past. Some of the recent successes are discussed in the next section.

Recent Successes

TASER has implemented numerous changes over the last two years that will result in more successful product launches. The true measure of success will be the customers' experiences with new products. Some of the initiatives that TASER has undertaken and implemented successfully are:

- **Quality awareness training** for all employees in the company. These half-day workshops were held over 11 days for every TASER employee from the manufacturing line up to management. The goal of the training was to make employees aware that quality is everyone's job.
- **Continued education and training.** A five-day probability and statistics course was attended by 24 TASER engineers and technicians. This training provides the basis for all future training in quality and improvement.
- **A Stage (Phase)-Gate process** for new product development. The stage-gate process has allowed TASER R&D to concentrate their efforts on only the most important features of new products. Gates are in place to make sure every key TASER employee is on board before moving to the next stage. Feature freeze and

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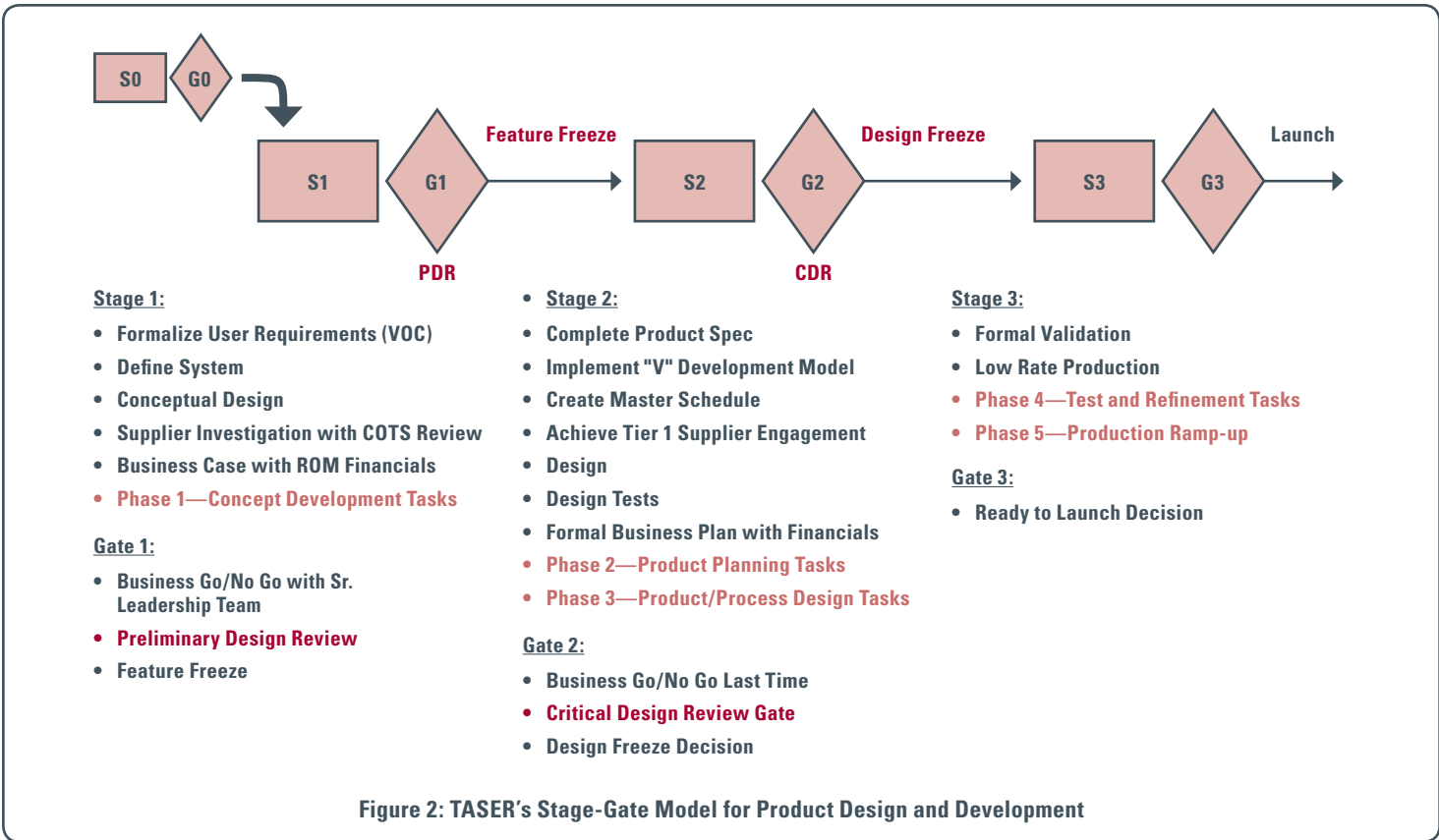


Figure 2: TASER's Stage-Gate Model for Product Design and Development

Table 2: Customer Survey Results of Important Considerations in an ECD Purchase		
What attributes are most important to you when considering your next ECD Purchase?	Total	Percent
Price	270	67%
Ability to fire a second cartridge to deal with a missed shot or poor contact	242	60%
Overall size of the ECD	232	57%
Ability to engage multiple suspects with a single ECD	126	31%
Overall weight of the ECD	119	29%
Ability to display a warning arc without having to unload cartridges	96	24%
Size of grip	96	24%

Table 3: Customer Survey Results for Important ECD Features		
What is most important in an ECD?	Total	Percent
Effective	300	99%
Price	205	55%
Battery life	198	54%
Simple user interface (easy to use/operate)	195	53%
Overall size of the ECD	130	35%
Flashlight integrated into the ECD	88	24%
A video camera that can be attached to your ECD	80	22%
Dual laser sights	79	21%
Overall weight of the ECD	60	16%
Size of grip	30	8%
Graphical user display	22	6%

design freeze are held firm—to allow R&D to work only on those features and designs that are viable. See Figure 2 for the stage-gate process implemented by TASER.

- Voice of the customer.** Over the last 18 months, TASER has included VOC like never before. If a feature is not seen as important by the customer, it is not included in the new product—no matter who in the company thinks it should be. See Tables 2 and 3 and Figure 3 for how VOC influenced new product development.
- Continual improvement circles.** Driven bottom up, these teams are responsible for driving improvements within their areas or within their control. The system is simple. An idea can start from anyone within the company and be submitted on a “TASER Continual Improvement” form. Upon submittal, all ideas are reviewed through the Change

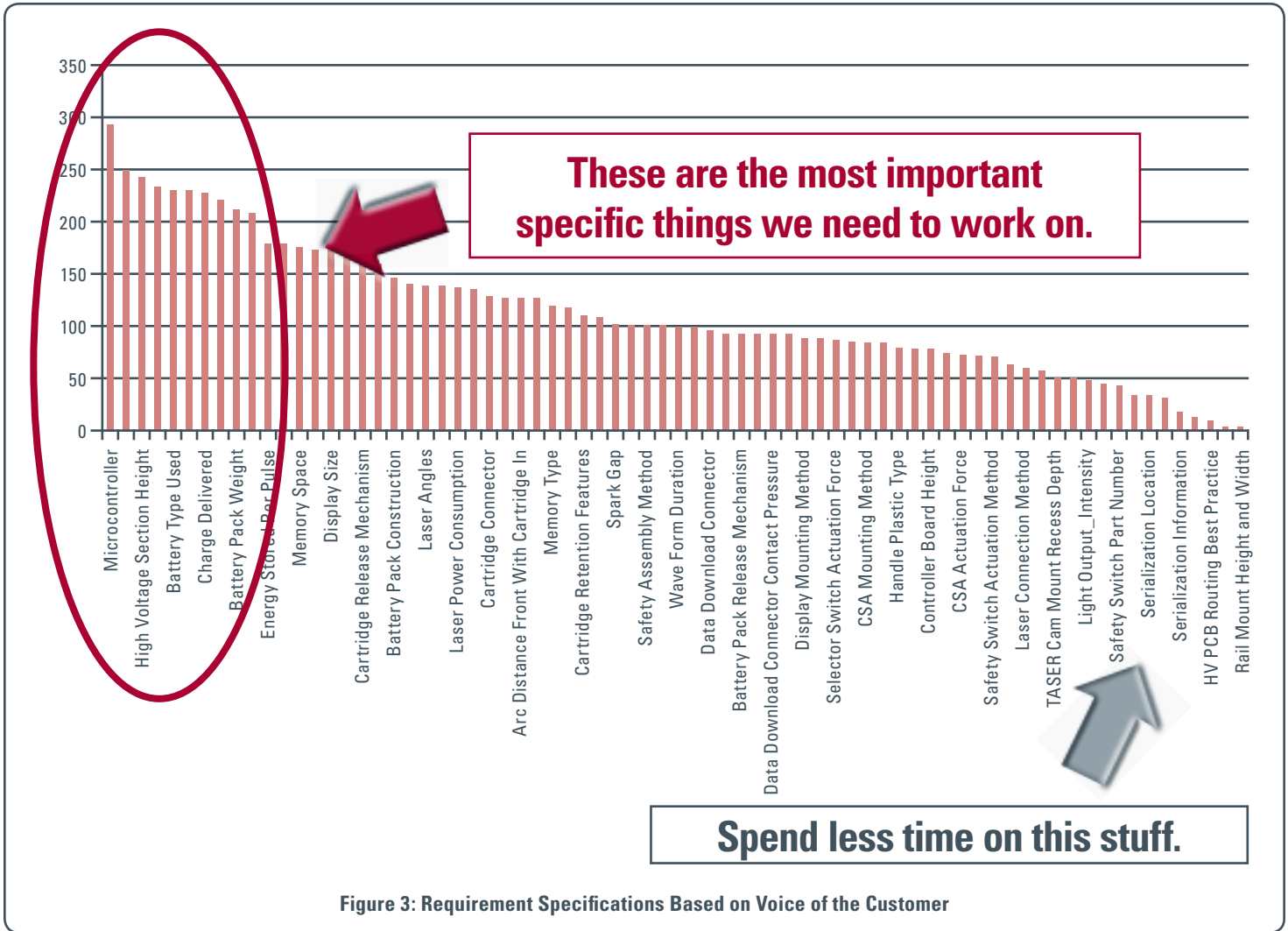


Figure 3: Requirement Specifications Based on Voice of the Customer

Control Board process and evaluated for further implementation. If the board decides that the idea has purpose, merit, and/or value, it then becomes actionable through a continuous improvement circle. The circle, or team, then goes through a process to address all actions that need to be taken, processes that need development, and any financial considerations. These teams incorporate elements from the traditional quality circles, kaizen events, and Lean practices as the fundamental building blocks.

Currently, TASER is looking forward to developing value stream maps (VSM) for the entire organization since the mapping will certainly help drive many valuable improvement circles to further optimize and align their organizational structure.

New Product Results

As a result of the new quality management and training initiatives that have taken hold in TASER, new product failures have been almost nonexistent. Product testing has resulted in some failures, but those have been mapped back to material, manufacture, or design problems that have been eliminated. Here are some of the key focus areas for our validation tests on a new electronic control device (ECD):

- LASER testing
- Flashlight testing
- High voltage coil testing
- Cartridge connector testing
- Trigger switch cycle testing
- Life cycle testing
- Drop testing

While a full product validation is performed to ensure all results meet or exceed design specifications and environmental criteria, each test element is carried out under the strict control of an approved test protocol and defined sample size. Final results are documented, and any noted failures receive full root cause analysis to characterize and correct the issues.

ISO and Auditing

TASER was initially certified to ISO9001:2000 in March, 2006. At that point, all internal audit activity was outsourced to a local auditing company. Additionally, quarterly surveillance was in place and conducted by the company’s registrar. With the renewed focus on quality management initiatives, TASER has begun doing their own internal audits, and

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the entire company became accountable for any and all improvements. As a result, TASER has created an exceptional track record with quarterly surveillance audits. Based on those results, a petition was submitted with the registrar to reduce the quarterly audits to an annual surveillance. TASER is now certified ISO9001:2008 and entering its third year of annual surveillance auditing. Their most recent audit, held in early April 2011, produced only two opportunities for improvement, with no major or minor findings.

The Future of Quality at TASER

Quality excellence is being instilled successfully throughout TASER. The focus is on business processes and making people more productive. In addition, guard bands are in place system-wide to protect against making bad product. At the Quality Leadership Workshop, attendees were provided with the seven facets of TASER's roadmap to quality:

1. Get TASER leadership aligned and link quality to the strategy of TASER.
2. Formalize Customer/Market Feedback.
3. Develop clear communication of company goals to all employees.
4. Establish a rigorous stage-gate process to design-in quality.
5. Effectively manage all changes in streamlined, lean processes.
6. Foster a quality literate organization.
7. Characterize the suppliers.

TASER has demonstrated successful progress on each of these fronts. Most importantly, the culture shift that has taken place enterprise-wide at TASER has been nothing short of astounding. As long as employees feel empowered, supported, and encouraged to make suggestions and to say "no," TASER will continue to reach new heights in quality and operational excellence. The key to continued improvement will be management's support of quality initiatives, education and training, and listening to the voice of the customer.

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