Putting Best Practices to Work

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QP

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What to Expect
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VOLUME 42/NUMBER 11

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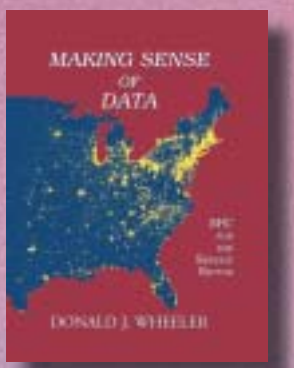

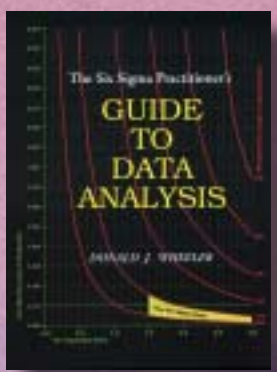

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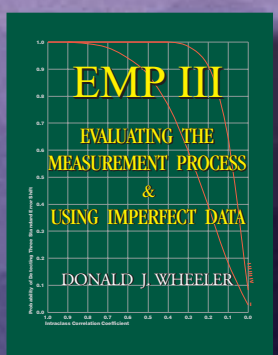

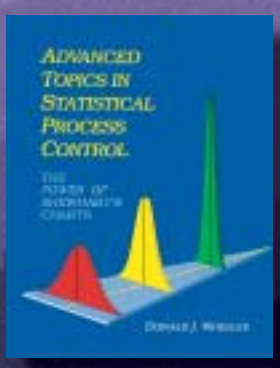

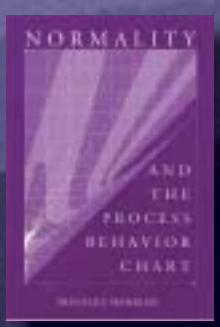

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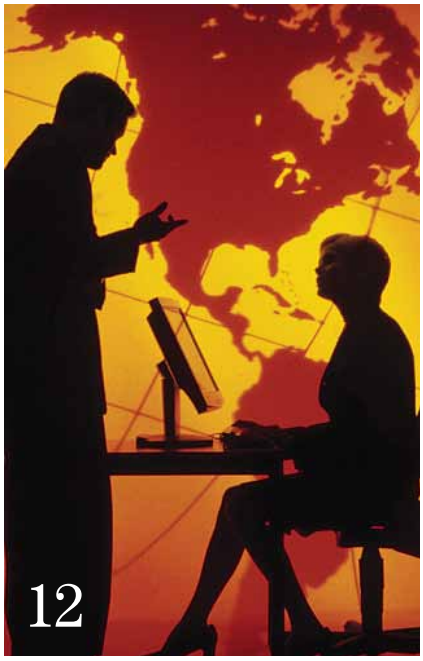
  Interview with A.V. Feigenbaum and video of his speech from ASQ's World Conference on Quality and Improvement earlier this year.
- **Free Download**
  Calculator featured in 3.4 per Million column helps with project selection.
- **Volviendo a los Fundamentos**
  Back to Basics translated in Spanish.

DEPARTMENTS



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The results of the 2009 QP Salary Survey.

- **COMBINED EFFORT**
Meshing organizational development with process-focused management.

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Lessons Learned

Quality leadership: past, present and future

OVER THE YEARS, QP has had the honor of publishing articles by many of quality's premier leaders—gurus, as they're often called.

Among those recognized as gurus are W. Edwards Deming, Joseph Juran, Philip Crosby, H. James Harrington, Kaoru Ishikawa, Walter A. Shewhart, Shigeo Shingo, Frederick Taylor and Genichi Taguchi. *Quality Progress* has published articles by most of these respected quality leaders over the course of many years. Many of these articles can be found by using the advanced search tool on www.qualityprogress.com. (Search by author.)

Armand V. Feigenbaum is one of the last living gurus, and this month, we have the pleasure of publishing yet another of his enlightening and insightful articles, "Spring Into Action," p. 18. In this article, Feigenbaum points to five areas companies can focus on to help them emerge from economic turmoil and return to profitability and success. This article is based on a speech he delivered at the 2009 World Conference on Quality and Improvement. Attendees found inspiration and hope in his words; I hope the article will do the same for you.

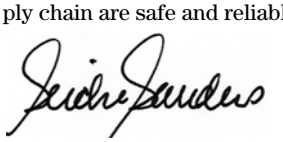
We've also created a section on the QP home page with links to all the articles Feigenbaum has written over the years, as well as video of his speech at the 2009 conference and a short audio interview.

Thinking about the pioneers and great thinkers in quality and all they have given us leads to an important question: Who are tomorrow's quality leaders? Greg Hutchins asks that very question in his Career Corner column, "Where Have All the CQOs Gone?" p. 49.

Like Hutchins, QP wants to know who is making things happen and leading the way in discovering—and defining—quality's future. If you know of someone, or if that someone is you, drop me a line at editor@asq.org. We'll find a way to incorporate these stories into an article, interview or other section of QP.

Two articles this month focus on significant regulatory changes taking place in the aviation industry. In "What's on the Horizon?" p. 30, author Michael J. Dreikorn addresses changes to aviation regulations that will require organizations to adapt to new management, design and production standards.

Similarly, in "Aerial Coverage," p. 34, Jim Clifford discusses a soon-to-be-published aviation, space and defense standard: AS9017—*Control of Aviation Critical Safety Items*. This standard will address aviation critical safety items to ensure parts in the supply chain are safe and reliable. QP



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INBOX

QP gives its readers a chance to provide instant feedback via the comment tool on the web pages of the magazine's feature articles. The following are just two examples of what readers are talking about. Log on to the magazine's website at www.qualityprogress.com to join the conversation:

Be patient

I recommend A.H. "Jack" West's article ("Critical Stage," Sept. 2009, p. 22) to all those folks faced with a decision to cut the lean Six Sigma function. There must have been a reason why you implemented it in the first place, and chose and hired skilled people who were once your elite supervisors and staff.

Watering down the purpose of the LSS group and negating the successes and benefits proven by the department thus far is not smart. This is especially true for businesses that have only been using the method for three years. Give the process a chance and continue to be very supportive. You will not be dissatisfied.

Bruce P. Wilkins
LSS Black Belt
American Red Cross
Kent, CT

Areas of concern

Thanks to Anshuman Tiwari for writing this very useful article ("Danger Zones," Sept. 2009, p. 42). I think he has identified some very critical areas of the Baldrige criteria.

I did one full cycle of assessment for the California Awards for Performance Excellence and can relate to his questions in many ways. I am also impressed with Tiwari's quotes from various management books in the appropriate places.

I have no doubt that when Baldrige criteria are applied diligently to an organization, it has a long-term effect on growth and profitability. Regardless of whether an organization applies for the award, it is definitely worthwhile to use the criteria as a framework.

One of the challenges I have come across in other business maturity assessments is in the area of knowledge management. Most organizations underestimate this area and suffer severely during headcount reduction or high attrition, which impacts sustainability.

Another interesting section to consider is best practices. Often, project teams spend months on a particular project, yet it's difficult to get their attention for a few hours to document best practices and lessons learned.

I like the way Tiwari has explained the questions and identified customers, markets and core competencies. I would definitely recommend this article to my colleagues.

Govind Ramu
Senior quality manager, Master Black Belt
JDS Uniphase Corp.
Fremont, CA

WE HEAR YOU

Share your thoughts about commitment to lean Six Sigma projects, the trickiest aspects of the Baldrige criteria or anything else that might be on your mind by e-mailing editor@asq.org.

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EXPERT ANSWE

8D solutions

Q: Some of our assembly processes are 100% labor intensive, and in some areas it is difficult to implement mistake proofing. Occasionally, one piece gets rejected at the customer's end out of, say, 10,000 pieces.

The error is purely nontechnical, such as a missing label or paint mark, visual defect or wrong orientation. We know it is a human error and not a sporadic issue, but some customers insist on exact root cause identification. Is there any specific method to identify root cause in such cases?

P. R. Ramesh
Head of lean and business excellence
Bangalore, India

A: There are many people who can honestly say they feel your pain; they've been there, done that and got the T-shirt. Those people have had similar problems with the production of defects reported directly from the production floor or from the customer via complaints, in which case identifying the root cause may be somewhat difficult.

Do these scenarios sound familiar? There is an important order for a major client. The goods are at the distribution center ready for shipment, when suddenly the production supervisor says, "Hold the boat—we've got a problem!" The call is made to put the goods on hold, and the order is missed. Or maybe a customer received 600,000 parts, and fewer than 10 had broken latches. "How dare they complain! We got 599,990 parts correct!"

In both scenarios, regardless of any indignation the manufacturer may feel, the problem must be addressed. One way to identify root cause is the Team Oriented Problem Solving (TOPS) technique from Ford Motor Co. Back in the 1980s, when its motto was "Quality Is Job One," Ford developed its TOPS methodology.[1] Referred to as the TOPS 8 Discipline (8D), it is a systematic means of arriving at the true root cause.

The question you posed is a perfect opportunity to use the TOPS 8D technique. It is an excellent tool to document problem-solving activities in a manner the customer should accept. The technique has been used to document root-cause and corrective-action activities to the satisfaction of many customers, including General Electric and Intel.

An 8D template is **the perfect way** to convey the answers your customer **desperately wants.**

Tops 8D is structured in such a way as to lead a group through a problem-solving activity. The structure is depicted as follows:

- D-1: Define concern, organize and plan.
- D-2: Describe problem in detail.
- D-3: Contain problem.
- D-4: Identify and verify root cause.
- D-5: Develop corrective action plan.
- D-6: Implement and verify corrective action.
- D-7: Prevent recurrence.
- D-8: Celebrate and communicate success.

When the customer brings an unacceptable part to your attention, the first thing to do if you are using the TOPS 8D is to define the concern or problem in succinct, clear verbiage (D-1). A project plan should be created for the purpose of eliminating the problem and improving the process.

This plan should include scope, key activities, boundaries, responsibilities, timelines and resources. The resources required for problem solving are best supported by a cross-functional team that best represents the manufacturing process.

Next, the team should describe the problem or opportunity for improvement and write a problem statement (D-2) describing the gap that exists between the as-is and desired states. The problem statement must be clear and focused on the specific nonconformance. It should clearly state what is wrong and effectively capture the degree, magnitude and scope of the nonconformance.

With the problem noted, attention must be shifted to containing the problem (D-3). Typically, these are the interim actions taken to ensure the customer receives no additional defective parts. Many organizations make the huge mistake of stopping here, often confusing containment with corrective action. In fact, it is impossible to move from containment to corrective action. Using this process will prevent that monstrous mistake.

At this point, the team is ready to start determining the root cause (D-4). This often starts by brainstorming potential causes, and then selecting which ones to address. Depending on the initial results, it might be necessary to revise the problem statement. Often overlooked here is the verification of the root cause, which means the problem

can be turned on and off by manipulating the root cause.

With the root cause identified, the team is now ready to develop a corrective action plan (D-5). The team must decide on the optimum corrective action and plan its implementation. Once the corrective action is ready for implementation, a pilot test should be performed to make sure the action prevents the problem from occurring. During this pilot, the corrective action's effectiveness can be evaluated. Potential improvements can be documented, and open issues can be addressed.

For corrective action verification (D-6), remove the interim stopgaps. If these can be removed and the root cause does not manifest itself, the corrective action is successful and has been verified.

Another often-overlooked process step is the identification of practices that can prevent the recurrence (D-7) of the defect. Thoroughly evaluate the process, practice or system that allowed the root cause to occur. Regularly monitor and modify it to prevent the problem's recurrence.

Finally, the effort's success should be communicated (D-8). Everyone involved should be recognized, and the effort's completion should be celebrated. This simple practice helps ensure the continued use of the process. Even in difficult situations, it can pull people and teams closer together as collaboration is sought and built.

If you, as a practitioner of the TOPS 8D, document what you have done (your findings) and share them with your customers, you may find they will accept this means of documentation for the root-cause work you have done. The key is the documentation of the work. Creating an 8D template to capture the work done by the team is the perfect way to convey the answers your customer desperately wants. In fact, using this template can become somewhat of a project plan when initiated back in D1.

This process might strike some as cumbersome at first glance. Once a group gives it a try, however, its problem-solving benefits are immediately recognizable.

Keith Wagoner
Director, Continuous Improvement
Lincoln Financial Group
Greensboro, NC

REFERENCE

1. David Bruce Doane, "8D Problem Solving," www.12manage.com/methods_ford_eight_disciplines_8D.html.

FOR MORE INFORMATION

Snee, Ronald D., "Use DMAIC to Make Improvement Part of 'The Way We Work,'" *Quality Progress*, September 2007, pp. 52-54.

Repair vs. rework

Q: There is ongoing discussion at my company regarding nonconforming material. At what point in the process should material be identified as nonconforming and moved to the quarantine area?

Our process allows for product adjustments during manufacturing, and we have customers that require notification when a product is repaired, but some members of the staff do not consider those adjustments to be repairs. Can you provide a definition of repair as opposed to rework?

Jill Short
Business quality manager
Quantum Silicones LLC
Richmond, VA

A: Material should be identified as nonconforming as early in a process as possible, removed from the process and relegated to the quarantine area. The later in a process that material is found to be nonconforming, the more expensive it is to take actions to meet requirements or specifications.

The difference between repair and rework is debatable. Repair is defined as: "Action taken on a nonconforming item so it will fulfill the intended usage requirements, although it may not conform to the originally specified requirements." Rework is defined as: "Actions taken on a nonconforming item so it will fulfill the originally specified requirements."[1]

Therefore, from a common-sense point of view, repair means redoing a step in a process or on a material so requirements are met, and rework means completely redoing a process or reworking a material so requirements are met.

You mentioned a problem at your organization in which some staff members do not consider product adjustments to be repairs. Most likely, the real issue is that the company has not established its own definition of repair. By clearly defining the term, your organization will eliminate any need for staff members to interpret things on their own.

Pradip Mehta
Principal, Mehta Consulting, LLC
Coppell, TX

REFERENCE

1. Donald L. Siebels, *The Quality Improvement Glossary*, ASQ Quality Press, 2004.

FOR MORE INFORMATION

Pintaville, Robert, "Improving a System," *Quality Progress*, January 2009, p. 72.

ASKED AND ANSWERED

Sooner or later, everyone runs into a problem they can't solve alone. Let us help. Submit your question at www.qualityprogress.com, or send it to editor@asq.org, and our subject matter experts will help you find a solution.

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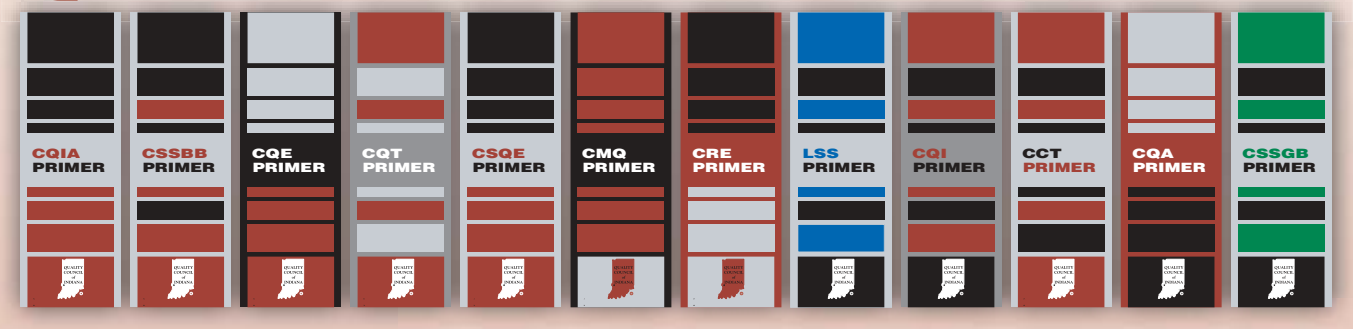

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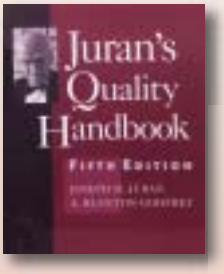

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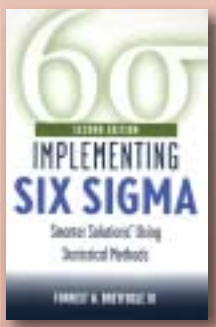

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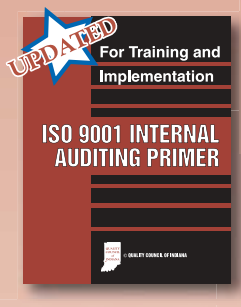

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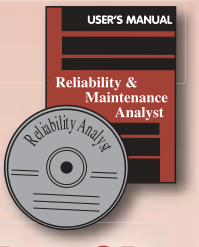

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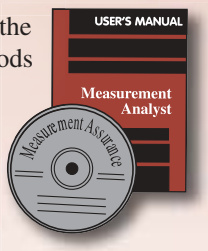

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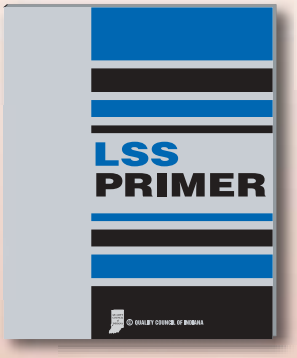

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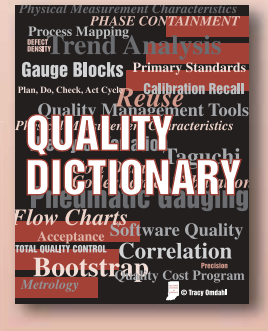

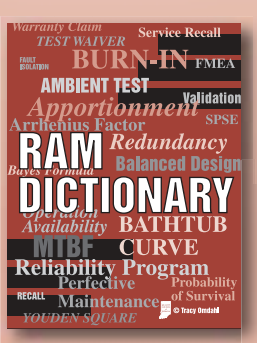

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Contains 2800 definitions. Helpful for Reliability and Quality Engineers.

ISO PRIMER

by Bensley & Wortman

The ISO Primer presents a thorough treatment of the ISO implementation and documentation process. The CD contains generic quality manuals in Adobe PDF.

QUALITY SYSTEM HANDBOOK

by Edenborough

The QSH details the selection, organization, and writing of quality documents. The disk contains procedures and work instructions.

ISO 9001:2008 updated.

SURVEY

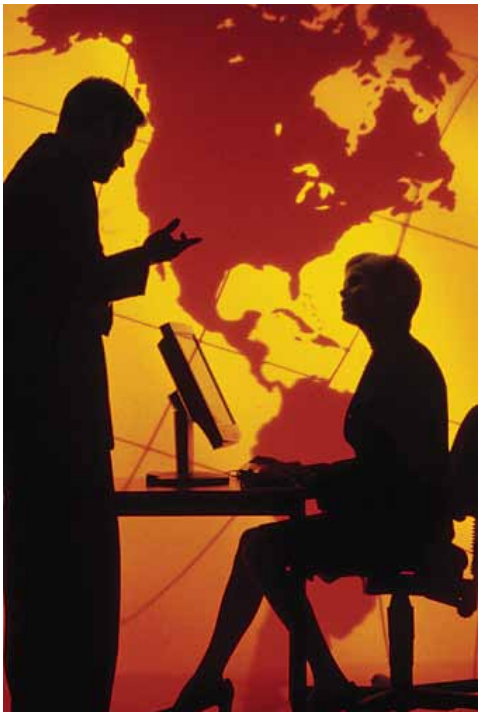
Garnering Support

Top challenge for quality professionals is getting commitment from the top

Ensuring a commitment to quality from top management is the No. 1 challenge facing quality professionals, according to a recent international survey by the Chartered Quality Institute (CQI), a London-based professional organization.

Nearly 65% of the 1,636 quality managers, auditors, consultants and other quality professionals who responded to the survey called this challenge the most critical issue facing quality professionals today. Other critical issues that survey respondents ranked high included:

- Continuing to keep quality relevant for organizations (56.9%).
- Improving the profile of the quality profession (56.2%).
- Broadening responsibilities (for example, environmental management systems and occupational health and safety) (54.6%).
- Maintaining the identity of the quality professional (43.6%).



These critical issues are "particularly important as many organizations take the view that 'quality was addressed during the 1990s and we now have quality under control,'" the report says. "This view is not borne out in our news media with quality problems highlighted in government, business or the global supply chains on a weekly basis."

In addition to these rankings, the CQI report, "Current Trends and Future Directions in the Quality Profession," predicts the quality profession will become increasingly involved in business sustainability, not only in driving cost reductions, but also ensuring organizations work more efficiently and effectively.

Quality professionals also must lead their organizations in encouraging innovation. Organizations need to exceed customer needs and expectations to succeed and recover from economic turmoil, according to the survey.

> "The role of the quality professional **is changing** from that of policeman and procedure writer to that of **mentor, adviser and internal consultant.**"

From the findings, CQI concluded that the role of the quality professional is changing from that of policeman and procedure writer to that of mentor, adviser and internal consultant.

Another key issue facing CQI members is how to develop their competency set to meet the new challenges of a changing work environment, especially given current heavy workloads and the restrictions of company and personal budgets.

In the survey, members provided direct feedback on questions about their organizations' and companies' management and quality methods.

A total of 53.6% of respondents indicated their senior management viewed quality as vital to survival.

Respondents also ranked the top challenges their organizations will face during the next five years:

- Reducing costs (83.3%).
- Ensuring business continuity (73%).
- Reducing defects (70.5%).
- Managing health and safety risks (69.5%).
- Competing through innovation (56.1%).

For more information from the survey and CQI, visit www.thecqi.org.

—Nicole Adrian, contributing editor

HEALTHCARE

KENNEDY URGES ASQ TO KEEP PROVIDING INPUT ON HEALTHCARE REFORM

Congressman Patrick Kennedy (D-RI), co-chair of the House of Representatives' 21st Century Healthcare Caucus, told ASQ, "This is your moment," and urged ASQ to continue to provide input about whether operational excellence and process improvement would be a focus of healthcare reform efforts.

At a September forum on healthcare IT that ASQ organized on Capitol Hill, a panel discussion focused on what needs to be done to prepare for successful implementation of health IT systems.

Congressman Tim Murphy (R-PA), who co-chairs the caucus with Kennedy, also offered encouragement to ASQ. "I look to organizations like you to help us," he said.

The ASQ panel didn't focus on the nuts and bolts of the technology, but ways to prepare for the successful implementation of health IT systems.

"The proven tools of quality management, change management and process improvement can be of immense help in preparing healthcare environments for [healthcare] IT and other transformative activities," said Joe Fortuna, chair-elect of the ASQ Healthcare Division and the panel's moderator.

More details and follow-up from the meeting are found at www.asq.org/advocacy/issues-actions/20090915-healthcare-reform-legislation.html.

CAPITOL Q

ASQ has been in discussions with the U.S. Department of Energy to build their relationship and pursue various collaborations. Since the 1990s, ASQ's Energy & Environmental, Design and Construction Division has worked with the department on conferences and standards … An assistant to Arne Duncan, the secretary of the Education Department, will be a keynote speaker at next year's National Quality in Education Conference, which takes place Nov. 7-9, 2010, in Chicago.

Capitol Q is a regular Keeping Current feature that highlights ASQ's advocacy efforts with government leaders. More information can be found at ASQ's Advocacy Room at www.asq.org/advocacy/index.html.

Who's Who in Q

NAME: Rama Shankar.

RESIDENCE: Glenview, IL.

EDUCATION: Shankar holds a master's degree in materials management from the Indian Institute of Materials Management in India and a master's degree in engineering management from Northwestern University in Evanston, IL.

CURRENT JOB: Managing partner at consulting firm Delta Management Associates, where she provides training to organizations and assists in implementing process improvement projects and establishing quality management systems. She is also an adjunct professor at the Illinois Institute of Technology in Chicago, the Daley College in Chicago and the Great Lakes Institute of Management in Chennai, India.

PREVIOUS EXPERIENCE: Shankar has worked in many industries and disciplines, including optical equipment, medical devices, aerospace, consulting and pharmaceuticals.

ASQ ACTIVITIES: She conducts open enrollment and in-house seminars on Six Sigma—Green Belt, Black Belt, lean for service, supplier quality and root cause analysis. Shankar develops and reviews courses and course material related to Six Sigma and lean. She's been the training institute director of ASQ's Chicago Section since 2005, and she has also served as the section's director and chair in years past.

RECENT HONOR: Shankar has received many awards over the years, including the ASQ Chicago Section's Founder's Award for 2005-2006.

PUBLISHED: She is the author of *Process Improvement Using Six Sigma—A DMAIC Guide,* ASQ Quality Press, 2009.

FAMILY: Married for 26 years, one son and one daughter.

QUALITY QUOTE: You need to be a resident maniac to make things happen. I think quality professionals need to be resident maniacs to follow through and ensure all the minutiae have been addressed to reach a successful solution to a problem.

SHORTRUNS

PRESIDENT OBAMA has nominated Patrick Gallagher to become the 14th director of the National Institute of Standards and Technology (NIST). Gallagher currently serves as the NIST deputy director. He joined NIST in 1993 as an instrument scientist at the NIST Center for Neutron Research (NCNR) and became director of the NCNR in 2004. He assumed the duties of deputy director in September 2008. Gallagher will succeed William Jeffrey, who left NIST in 2007.

RANDY A. DOUGHERTY, vice president of the ANSI-ASQ National Accreditation Board (ANAB) in Milwaukee, has been named chair of the International Accreditation Forum (IAF). The IAF oversees more than 1 million users of third-party certificates to the world's quality and environmental standards. Dougherty had completed his second term as chair of the IAF's technical committee.

AN INTERNATIONAL TEAM that developed standards for optics and photonics has received the Lawrence D. Eicher Leadership Award from the International Organization for Standardization (ISO). The award recognizes superior performance by one of ISO's standards development groups. Elisabeth Leitner of technical committee 172 accepted the award on the team's behalf. For more information, visit www.iso.org/iso/pressrelease.htm?refid=ref1247. Meanwhile, a Dutch business school recently received ISO's award for higher education in standardization. Erasmus University, the Netherlands, was recognized for its work in standardizing programs covering graduate and undergraduate degrees. More details can be found at www.iso.org/iso/pressrelease.htm?refid=ref1246.

A PROGRAM TO HELP toy companies comply with the federal Consumer Product Safety Improvement Act has been launched by the Toy Industry Association. Companies that complete the Toy Safety Certification Program can have their products certified. Toys certified under the program will begin to appear on store shelves next year.

NEARLY 75% of companies said in a recent survey they have not made data security a top strategic initiative, even though most have experienced a security breach involving loss or theft of credit card information. More than half the companies that took the survey also said they do not secure sensitive customer information, such as Social Security numbers, driver's license numbers and bank account details. Imperva, a data security company, and Ponemon Institute, a research firm, surveyed more than 500 companies to gauge progress toward the Payment Card Industry's data security standard. More information on the survey results can be found at www.imperva.com/news/press/2009/09_23_imperva_ponemon.html.

AFTER SEVERAL REQUESTS over the years, scoring data from the Baldrige award selection process has been released for researchers and others to review and analyze. The data—collected from 1990 to 2006—is available in tabular and graphic forms. Future updates to the scoring data website will add features such as individual applicant scores for individual Baldrige criteria items and the ability to track the scoring progress for repeat applicants. To access the information, visit www.baldrige.nist.gov/Data_Analysis/index.htm (case sensitive).

THE INTERNATIONAL ORGANIZATION for Standardization (ISO) released a new standard last month that covers cruise control systems for vehicles. ISO touts *ISO 22179:2009, Intelligent transport systems—Full speed range adaptive cruise control (FSRA) systems—Performance requirements and test procedures,* as being able to improve highway safety and enhance driver comfort. For more information, visit www.iso.org/iso/pressrelease.htm?refid=Ref1257 (case sensitive).

TO COMBAT ABOVE-AVERAGE rates of hospital acquired infections, SUNY Upstate University Hospital in Syracuse, NY, implemented an improvement program to reduce central line infections in all intensive care units. A year after implementation—with the help of quality tools such as checklists and an electronic data-mining system—the hospital has reduced its rate to zero. For more information, visit www.healthleadersmedia.com.

Mr. Pareto Head

BY MIKE CROSSEN

ASQNEWS

BALDRIGE AND HEALTHCARE A three-part, prerecorded webinar series is available from ASQ on how a healthcare organization used Baldrige criteria to drive organizational transformation. The free series, in three one-hour installments, highlights how Baldrige can help organizations address the challenges facing healthcare today. To access the series, visit ASQ's Knowledge Center at www.asq.org/knowledge-center/baldrige/index.html.

SR WEBINAR A four-part webinar series that ASQ presented last month on the importance of social responsibility is now available for download. The webinar focuses on how organizations can build business value by improving environmental and societal outcomes over the long term. To access the webinar series, visit www.asq.org/webinar/seeking-sustainable-success.html.

FUTURE OF QUALITY REPORT The complete report from discussions among business, education and healthcare leaders at a summit hosted by the National Institute of Standards and Technology and ASQ earlier this year is now available to download. At the June event in Washington, D.C., leaders from high-profile companies and organizations weighed in on areas in which they thought quality and performance improvement could have the greatest effect. Download the complete report at www.asq.org/knowledge-center/future-of-quality-dialogue.html.

CALL FOR CASE STUDIES The Healthcare Information and Management Systems Society (HIMSS) and ASQ are looking for success stories on quality and patient safety improvement. The case studies will be considered for publication in HIMSS's new program, "Stories of Success! Leveraging HIT, Improving Quality and Safety." Deadline for submissions is Nov. 16. For more details, visit www.asq.org/healthcare-use/why-quality/stories-of-success.html.

CAREER-FOCUSED PODCASTS ASQ has designed a three-part podcast series featuring tips and strategies for career-transitioning quality professionals. To access the podcasts, visit www.asq.org/career/resources/job-search.html.

DATEINQUALITY HISTORY

QP looks back on a person or event that made a difference in the history of quality.

Nov. 19, 1925

Henri Fayol, a French mining engineer and a management theorist, died on this date. Many call Fayol one of the most influential contributors to modern concepts of management and a key figure in the classical school of management theory.

Fayol developed a general theory of business administration, also known as Fayolism, which included 14 principles of management: division of work, authority, discipline, unity of command, unity of direction, subordination of individual interest, renumeration, centralization, scalar chain (line of authority), order, equity, stability of tenure of personnel, initiative, and *esprit de corps* (employee morale).

SOURCES

12Manage, "14 Principles of Management (Henri Fayol)," www.12manage.com/methods_fayol_14_principles_of_management.html.
Analytic Technologies, www.analytictech.com/mb021/fayol.htm.

KEEPINGCURRENT

ONLINE ONPAPER

QUICK POLL RESULTS

Each month at www.qualityprogress.com, visitors can take a short, informal survey, and we post the results.

Here are the numbers from a recent Quick Poll:

"Organizationally, what is the reaction when an impending audit is announced?"

- Fearful 37.2%
- Defensive 36%
- Resigned 13.9%
- Open and confident 12.7%

Visit www.qualityprogress.com for the most recent poll question posted:

"To aid in your organization's economic recovery, what area should quality professionals focus on?"

- Product development.
- Supply and purchasing.
- Training and human resources development.
- The economics of quality.
- A strategy of hands-on management.

AS SEEN IN QUALITY NEWS TODAY

Monday through Friday, QP editors post the latest local, national and international news related to quality in Quality News Today at www.qualityprogress.com.

Check out some of the most recent headlines posted, and be sure to visit regularly to keep yourself updated on happenings that affect the quality world.

- "FDA Chief Wants to Restore Trust in Agency."
- "Toyota Chooses Up-Front Approach to Troubles."
- "Wal-Mart Saves $3.5M in Transportation Costs."

QUALITY AWARDS LISTINGS

Is your organization looking to apply for a quality award next year?

Consult our quality awards listings, which include state-by-state, national, international and automotive awards, descriptions and details on how to apply.

The listings can be found under the Tools & Resources tab at www.qualityprogress.com.

WORDTOTHEWISE

To educate newcomers and refresh practitioners and professionals, QP features a quality term and definition each month.

Group·think (groop´thingk´)

A situation in which critical information is withheld from the team because individual members censor or restrain themselves—either because they believe their concerns are not worth discussing or they are afraid of confrontation.

Source: "Quality Glossary," *Quality Progress*, June 2007, www.asq.org/quality-progress/2007/06/quality-tools/quality-glossary.html.

WEBWATCH

This month's Web Watch focuses on quality gurus. For more quality-related websites, visit www.qualityprogress.com.

www.csom.umn.edu/page5340.aspx

This is a short but thorough biography of Joseph M. Juran on the Carlson School of Management's website. It begins with his birth and details his accomplishments through today.

www.deming.org

This website is dedicated to the W. Edwards Deming Institute, a nonprofit organization founded in 1993 by Deming. The website features information about Deming himself, the institute and its history, and lists the criteria on which the Deming prize is based. Users can also download a PDF of the Deming Institute newsletter and purchase online educational materials, videos and books about Deming.

www.murtongroup.com/qgurus.htm

Gurus such as Philip Crosby, Genichi Taguchi and Armand Feigenbaum are featured on this site from the Murton Group. A short biography of each is followed by explanations of their respective theories and examples of the tools each developed or used.

www.qualitygurus.com/gurus

This site provides information on gurus such as Deming, Juran, Crosby, Taguchi, Kaoru Ishikawa, Walter Shewhart and Shigeo Shingo, as well as lesser known quality personalities, such as Bill Smith and Mohamed Zairi. Visitors may submit additional information about any of the gurus listed and suggest new names to be added to the site, which adds content regularly. The site also includes a discussion forum.

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Spring INTO Action

by A.V. Feigenbaum

In 50 Words Or Less

- Challenging economic times have made a significant impact on the importance of quality throughout business and industry.
- For business success, companies must emphasize management innovation with a total quality foundation.
- By focusing on five areas, quality professionals have the opportunity to help their companies succeed and become stronger.

LAST YEAR, I was presented the National Medal of Technology and Innovation. It was a great honor for all of us at General Systems Co.—and for all of us in the quality profession—to be recognized for our efforts related to total quality and innovation.

Not only was the award an opportunity to shine the spotlight on quality and its direct link to innovation, but it also reminded us about how an emphasis on management innovation—with a total quality foundation—can become a centerpiece for America's economic recovery and the return to strong and successful business growth.

Management innovation and **total quality** are the keys to **business success**

Economic, human and technology changes have created one of the most turbulent and challenging periods in our history, and it has made a significant impact on quality in business and industry worldwide. This includes:

- Increased speed and aggressiveness of quality competition.
- Greater customer demands for higher standards of quality value in products and services—not just a focus on reducing defects.
- Expansive IT activities of corporations. For example, potential buyers regularly read blogs or visit chat rooms to investigate the quality of products and services. In some instances, this ability seems to influence purchasing decisions more than the seller's advertising and promotion initiatives.

Moreover, companies' strong emphasis on looking globally for better ways to satisfy the demand for customer value and to improve productivity has created another reason to focus on global management quality.

You can see this in the rapidly growing numbers of companies that are reaching across oceans and international borders, leveraging total quality management (TQM) activities in areas of development and design, supply production, and the assembly of products and services.

These leading companies are emphasizing a systematic approach and attention to quality, closely managing the data and information pertaining to their products, and emphasizing new and even more focused quality approaches in the areas of product safety and product integration.

Together, these factors explain why more global corporate leaders have come to emphasize that—in global terms—quality is not only a technical subject, but also a fundamental way to manage and lead organizations. In other words, quality has become the basis for systematically guiding, empowering and supporting the constant pursuit of product and service quality excellence. It is also the basis of strong and continuous innovation in design and engineering, supply, production, sales and other related processes throughout an organization.

Most importantly, these issues highlight the basic principle of the global business experience: What makes quality value better in any part of the organization can make quality value better in every part of the organization—what we call the "domino effect of quality." It's the basis for the management innovation focus on total quality by which today's corporate leaders emphasize:

- Customer product and service value leadership that's locked on current and future quality capability.
- Operating cost leadership for the company's economic strength.
- An empowered company culture of superior performance that emphasizes customer satisfaction, which drives the company's TQM initiative and, in turn, creates profitability and further growth.

Strong and successful companies will say that quality has become a global language for their businesses. Fundamental to the competitive strength of these companies is how effectively they understand and implement this language of quality throughout all parts of their operations.[1]

Focus on five areas

To be a successful company today, there must be a continuingly effective emphasis on management innovation with a total quality foundation. Five key areas companies should focus on to build this competitive quality leadership strength are:

1. **Product development:** Companies must emphasize better and more powerful management innovation quality initiatives to strengthen the quality of their product development and introduction. These initiatives must emphasize and integrate consistent customer value performance throughout the company's entire operations.
2. **Supply and purchasing:** The companies' quality management of supply and purchasing must be emphasized and must be productive, especially those activities that deal with internationalization and outsourcing.
3. **Training and human resources development:** Companies must provide a high level of quality training in all major activities. Only such a high level of quality practice and attention to quality can guarantee consistent, high-quality value that today's individual and industrial customers demand.

EXCLUSIVELY FEIGENBAUM

Hear an interview with A.V. Feigenbaum from earlier this year and see his conference presentation from the 2009 ASQ World Conference on Quality and Improvement at www.qualityprogress.com. There, you can also find links to his past QP articles.

Management innovation—with a total quality foundation—can become a centerpiece **for America's economic recovery.**

4. **Economics of quality:** Companies must measure and manage the economics of quality and its costs in terms that truly recognize the financial power that can be realized by the effective implementation and execution of quality processes.
5. **Hands-on management:** Companies must effectively emphasize a new character of the strategic and operational, hands-on management leadership of quality.

Let's expand on each of these five areas.

1. Product development

Companies with more effective quality management place great emphasis on speedier, more systematic quality processes that help them introduce and develop new, competitively strong, high-value products in today's rapidly changing global markets.

This emphasis on speed and system ensures the clear integration of quality systems into their development and design processes.

This is quite different from practices of years past in which these processes—while well intentioned and well constructed—could be separate, technically led islands without bridges to connect activities with other key quality processes in the company's international quality network.

Today, the integration of these processes is clearly and consistently guided within these leading companies. Their careful, consistent systems measure and update in real time the quality value for customers throughout the companies' markets.

This data can guide companies to make and revise plans almost immediately to redesign a product's development, thus avoiding any negative impact on customer-value satisfaction. This systemic quality value discipline creates the product and service strength of today's quality value leaders—from the smallest companies to the largest and strongest. These leaders always have their fingers on the quality pulse of their markets so they're not blindsided by their competitors' quality improvement changes.

2. Supply and purchasing

Leading companies in today's highly complex, internationally oriented supply, procurement and outsourcing activities focus on establishing and maintaining productive partnerships with their suppliers.

This activity is very different from the primarily single-dimension "negotiate and squeeze them down" emphasis of years past. Today, a company's success often hinges on its suppliers' flexibility—an ability and willingness to partner quickly and help the company build the products and services—and a greater emphasis on quality effectiveness and efficiency in those supplier relationships.

3. Training and human resources

The third area involves a better, more consistent quality motivation of a company's human resources. It's far different from the earlier practices of some companies, which were characterized by fireworks displays, management speeches, well-packaged motivation sessions and well-structured DVD presentations. When you returned to your workplace, however, you still faced ambiguous quality practices and departmental walls that made significant quality improvement efforts slow and ineffective.

Today, instead of the rhetoric and the rousing, corporate leaders are emphasizing senior management support and practices that encourage, develop and use fundamental quality knowledge, skills and attitudes of the men and women throughout their organizations, which are networked as learning organizations for constant quality improvement.

This new emphasis on quality leadership creates a powerful environment of trust, openness and honest communication, encouraging the development of individual quality improvement entrepreneurs.

It also means systematically structuring full opportunities for continuous and rigorous quality improvement. In this environment, employees are provided with the quality tools, processes and support to help them develop their own forms of quality analysis, teamwork and benchmarking improvement for the business.

There is always a better way, and the people best qualified to establish this better way are those closest to the work itself—as long as they are provided with the tools, support and encouragement.

4. Economics of quality

Today's top corporate quality leaders pay close attention to the measurement and management of the new, internationally driven economic and cost pressures their organizations face as they globalize. These leaders emphasize strong management and quality-based economic and cost leadership to meet and beat these forces head on.

One of the competitive, quality-based strengths that stands out in many of today's global corporate quality leaders is their ability to systematically measure the costs of quality associated with achieving complete customer value satisfaction. They also possess the ability to measure business failure costs that are created when this does not take place.

Because these costs are systematically measured, they can be systematically managed, providing a substantial competitive advantage in helping to achieve genuine cost management and true cost leadership for the company.

This makes these companies' systematic emphasis on high customer quality value and low quality costs—together—a key element in the way they compete and effectively lead in profitability and growth.

The explicit management and measurement of the economics of quality provides a significant quality-value leadership strength, which has proven to be a great advantage for these companies' success and profitability—something their competitors without a focus on quality costs and measures can only hope to achieve.

5. Hands-on management

Leading companies are building their competitive strength through a firm, strategic and hands-on emphasis on continuous management innovation based on quality.

In more highly successful companies, senior management approaches quality in day-by-day operational and strategic terms with a hands-on strategy and leads by using TQM-based quality processes.

In an increasing number of these highly successful companies, senior management focuses on quality leadership—directly and systematically. This is also true of the finance, equipment and personnel processes, and brick and mortar assets, which have always had hands-on management leadership.[2]

Most importantly, in terms of TQM, this leadership approach provides a clearly defined and highly significant role for the company's quality experts and professionals today. This role includes direct support in quality terms from the company's senior management.

In competitively strong global companies, constant innovation in quality terms will likely represent an increasingly significant leadership role for quality professionals during the next several years. Innovation is a key to these companies maintaining, improving and strengthening their total quality control and management structure.[3]

Supporting these five areas of management innovation and total quality provides a highly productive role and a strong opportunity for today's quality professionals in their abilities to directly help and lead this powerful new quality movement at their companies.

Moreover, a focus on these areas can spark additional enthusiasm and satisfaction. Such a commitment to excellence and improved economic, social and human welfare that results from focusing on these areas can bring satisfaction to our work, our companies, our quality control societies and even our own personal lives.

Indeed, it supports the emphasis on management innovation with a total quality foundation as one of the centerpieces of America's economic recovery and return to successful growth. QP

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EDITOR'S NOTE

This article is based on a presentation A.V. Feigenbaum delivered at ASQ's World Conference on Quality and Improvement in May 2009 in Minneapolis.

A.V. FEIGENBAUM is president and CEO of General Systems Co. in Pittsfield, MA. He holds a doctorate in engineering and economics from Massachusetts Institute of Technology. Feigenbaum is a past president and an honorary member of ASQ, and has authored several books.

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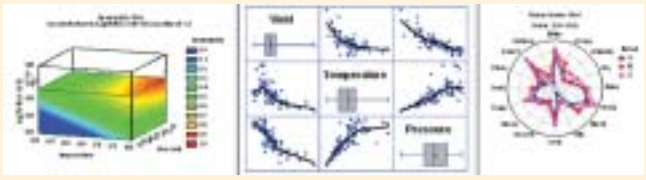

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Managing

If not supported from the top ...

In 50 Words Or Less

- Management support is crucial to the success of any quality initiative.
- Securing that support can be difficult depending on leadership's level of quality commitment.
- Get the backing you need by illustrating the benefits using measures that impact management.

Expectations

... quality will hit rock bottom

by Russell T. Westcott

ONE KEY CONDITION is vital for initiating, implementing and sustaining a viable quality initiative: There must be management support. Surprisingly, very few articles and books on quality even mention this need, let alone what to do if support isn't there.

Even the body of knowledge for ASQ's Certified Manager of Quality/Organizational Excellence (CMQ/OE) offering does not specifically address the need. As an instructor for the CMQ/OE refresher course, however, I emphasize how crucial it is to secure top management support (and I hope other instructors do, too).

Many in the quality profession think of management commitment as:

- The top manager's statement that he or she supports quality.
- A signature on a requisition for quality tools.
- Appointment of someone further down in the organization to spearhead a quality initiative.
- Establishing a quality initiative as a one-time activity to meet a near-term objective—for example, achieving ISO 9001 certification or training all personnel in basic Six Sigma techniques.

In clause 5.1, the ISO 9001:2008 standard specifies a requirement for management commitment, listing five means for demonstrating continual improvement and showing evidence thereof:

- Communicating to the organization the importance of meeting customer, statutory and regulatory requirements.
- Establishing the quality policy.
- Ensuring quality objectives are established.
- Conducting management reviews.
- Ensuring the availability of resources.

In her book, *Quality*, author and practitioner Donna Summers successfully captures the critical criteria and defines management commitment as:

> "Participation of the highest-level officials in their organization's quality improvement efforts. Their participation includes establishing and serving on a quality committee, establishing quality policies and goals, deploying these goals to lower levels of the organization, providing the resources and training that the lower levels need to achieve the goals, participating in quality improvement teams, reviewing progress organizationwide, recognizing those who have performed well and revising the current reward system to reflect the importance of achieving the quality goals."[1]

Is that what your top management does? The levels of effort, concern and intensity management allocates to supporting quality in an organization can range from total malaise to fierce commitment (see Table 1).

Quality-in-chief

Examine the style and actions of the president of the United States as a role model of what management commitment is and what it takes to make it effective. The president appears to all, regardless of your personal political and social beliefs, to be visibly and personally involved in what he believes is the best approach to maintaining the United States as a viable world-class country.

He restates his policies and direction with substantive rationale. He champions transparency of government practices and measures. He takes responsibility for any personal or organizational shortcomings on his watch. He identifies with and shows empathy for the needs and wants of our highly diversified populace. He chooses his advisers and co-workers wisely, with concern for building unified processes for improvement.

The president works toward presenting an "all for one, and one for all" vision of normalcy and steadiness in a turbulent environment. He symbolizes the country's goals. He is visibly and personally involved in improving the quality of life for us all. He's human, so he makes mistakes, but we expect him to acknowledge his error, outline a plan to recover and do better.

If someone on as public of a stage as the presidency can behave that way, why can't we emulate that style? I believe it is doable. Regardless of where you are in the organizational hierarchy, there are actions you can take to help your organization and yourself:

- Stop griping and start innovating.
- Create quality objectives for yourself and your work unit if none exist.
- Offer to show others how to create and meet quality objectives.
- Assess the organization's need for a commitment to quality.
- Devise, demonstrate and document continual improvement initiatives. Use this experience and documentation to further your goal of bringing about organizationwide commitment to quality.
- Build your competence (knowledge, experience, skills, attitude and aptitude) to become an organizational champion for quality.
- Select someone in top management who has expressed concern for quality and offer to work with him or her to develop a commitment to quality.
- Create, sell and implement a process for achieving measurable quality improvement and management commitment.

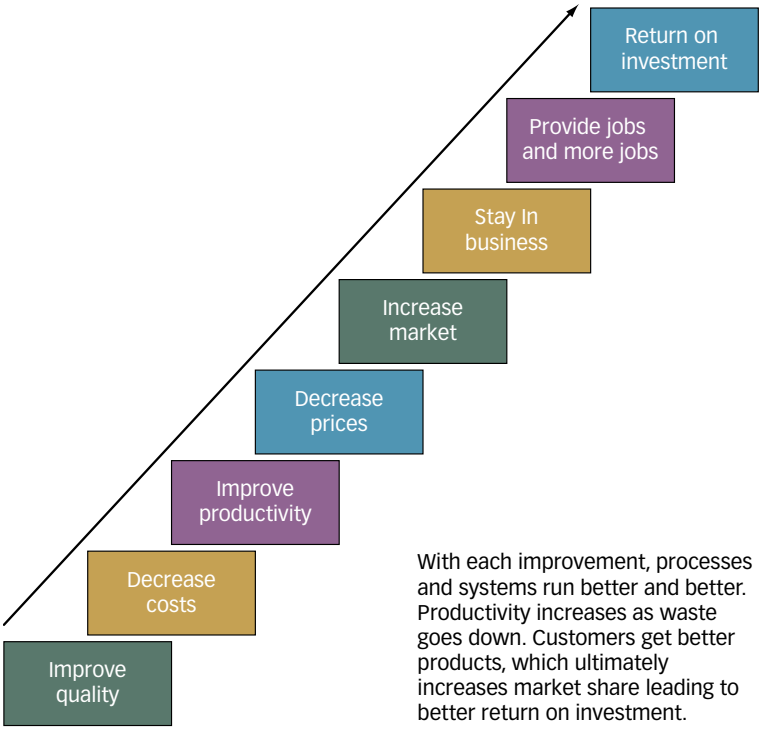
Out of the office

Management commitment to quality is an oft-mentioned essential requirement for the success of a sustainable quality initiative in any organization. Intuitively, everyone knows it is needed. But what is it actually?

Employee perceptions vs. management actions / TABLE 1

Level	Management actions taken	Employee perception
1	Talks about quality only when customers complain. Management threatens employees with dire consequences if they do not improve their performance.	Doesn't care about quality.
2	Mentions quality concerns often in employee meetings. Does little else other than authorizing the buying and display of posters throughout the facility exhorting a need for good quality.	Talks a good game.
3	Repeatedly buys a new consultant's canned approach to solving quality issues without establishing goals, objectives and measures to evaluate the programs and without ensuring the programs are implemented and completed on properly. Resources are expended for initiatives that are never aligned with the organization's strategy, needs and capabilities.	Susceptible to becoming enamored with the latest program.
4	Returns from a top-management boondoggle (golf, poker and fun in the sun) fired up about what other organizations are doing to combat quality problems. Establishes a top-level committee to do the same at the organization. May even opt to join a fact-finding mission to Japan to study its companies' methods.	Looks everywhere else but never asks the employees what they could or would do to improve quality.
5	Top-management pays no attention to the quality function, which has been relatively untouched over the years and plods along with a reliance on inspection to ensure quality is delivered to the customer. The concept of voice of the customer has not reached the employees responsible for producing quality products and services, nor has the concept of treating internal customers well because that will affect treatment of external customers. Quality goals, objectives, mission, values and strategy have not been adequately addressed, if at all. Morale is low, but top-management either doesn't know it or doesn't care.	Not sure if top management knows quality exists. Sees edicts about what will happen in the event of another customer complaint. Sees nothing being done about the poor work environment.
6	Top management makes a unilateral decision that implementing Six Sigma is the answer to the organization's quality issues. A consulting firm is hired. Much money is spent on training Green and Black Belts. Lessons from the ill-fated total quality management implementation days are ignored. A year or so after most of the low-hanging fruit has been picked and consumed, the organization is faced with real complex process reengineering issues. The quality initiative grinds to a halt. Meanwhile, highly skilled Master Black Belts are departing for greener pastures.	Focus appears to be on cost cutting, productivity increases and downsizing. Decision making is concentrated in the hands of the project leaders. Workers ask: "What's in it for me?"
7	Top management commits to quality improvement by approving the purchase of programs, materials and equipment. Responsibility and accountability for implementing quality programs are delegated to selected staff members. A quarterly staff meeting is held to review and assess quality improvement progress.	Many new quality programs are superimposed on workers already overloaded. An overall strategy and consistent approach is not evident. Worker morale is spiraling downward.
8	Top management receives a wake-up call when foreign competition threatens the organization's sustainability. Every facet of the organization is challenged: structure; leadership competency, decision-making style and commitment to quality; cultural norms; financial stability; ability to attract, satisfy and retain investors; ability to deliver on time the products and services customers need at a competitive price; the quality, effectiveness and efficiency of processes; workforce competencies; supplier capabilities; ability to attract and retain capable employees; and adaptability in a rapidly changing marketplace. Initially, panic overtakes rationality before management realizes it must change or be overrun.	If management doesn't do something about it, the organization is going down the drain. It appears as though the United States is not going to be the top dog anymore. Japan, South Korea, India and China are taking away business. Hopes management is smart enough to combat this trend.
9	Top management begins to recognize the validity of the organizational culture model that depicts an inverted pyramid, with customers at the top, employees in the center and management at the bottom, supporting the empowered organization. Strategic planning, with continual quality improvement as an overarching goal, forces the organization to align and evaluate its commitment to quality. Fragmented quality efforts that do not strategically fit the plan are discontinued. Top management goes back to school to learn how to support the commitment to quality and how to empower the entire workforce to work toward the vision, mission, goals, objectives and quality policy. Top management has carefully instituted periodic skip-level meeting to hear the voice of the employee. Management walk-arounds are now a frequent occurrence.	Sees positive change in management's attitude and actions. Employees are now invited to sit at the table and work out ways to continually improve processes. Management's focus shifts from punishment for making a mistake to figuring out what can be done to prevent this from happening again. Encouraged after seeing what top management is doing to get the organization moving in a more positive direction.
10	The CEO is continually seen and heard via daily involvement in support of and commitment to the quality initiatives. Essentially, the CEO leads the quality improvement effort.	The entire organization believes in and supports the concepts of continual quality improvement, customer focus, a productive and enjoyable work environment, teamwork, collaboration and open communication at all levels.

Deming's chain reaction / FIGURE 1



With each improvement, processes and systems run better and better. Productivity increases as waste goes down. Customers get better products, which ultimately increases market share leading to better return on investment.

Do you have it? If you need it, what do you do to get it? Put aside or delegate the papers you've been shuffling. Get out of your office and, as Masaaki Imai advised, go to *gemba*—go to the workplace, because that's the source of all information.[2]

Several years ago, I went into a general manager's office and dragged him (figuratively) out of his office and into the workplace to witness what his people were doing. The objective was three-fold: get him to see and acknowledge what his people were doing to sustain and improve quality; allow his people to experience a (previously nonexistent) visit from senior management; and encourage the general manager to vocally reinforce the good work being done by his people.

Substantial changes occurred: His people saw the big boss actually involved in championing quality, the general manager felt encouraged to go to *gemba* more frequently, and quality significantly improved because of a more appreciative workforce.

The right sell

Have you ever attempted to sell management on initiating a major culture change for the organization? Unless the impetus originated with management, don't attempt to sell culture change. Instead, identify areas

MANAGEMENT MENTIONS

"Observing many companies in action, I am unable to point to a single instance in which stunning results were gotten without the active and personal leadership of the upper manager."

—Joseph Juran[1]

"Many executives are doing something about quality; but unless they build it into the fabric of their organizations, they will not get complete and lasting results. Since any quality program can bring instant improvement, they may think the battle is won. But changing a company culture takes a while. Everyone in the organization has to work in a new way."

—Philip B. Crosby[2]

"The best way to regain top management support for fundamental quality techniques is to demonstrate the techniques' effectiveness. Make it easy and riskless for top management to endorse basic—not trendy, not expensive—quality methods again."

—Scott Dalgleish[3]

"Total quality is totally dependent on the support and involvement of this most senior group. Top managers like to delegate, but this is a case where delegation equals abdication."

—David Hutchins[4]

"You can't take on Six Sigma with a lackadaisical attitude. You can't implement it piecemeal ... If you're in, you're in deep, and you're in for the long haul. Of course, for real and lasting process improvement, that is how it should be. Without 100% management commitment to the Six Sigma program, Six Sigma turns into just another 'management program.'"

—Peter Peterka[5]

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for improvement that address improvement in the metrics by which the top management are measured. Sell the significance of making those improvements, and build in gradual steps leading to a change in the culture.

According to a recent article by author and consultant Tom Devane, in the context of Six Sigma, "There are two proven, successful ways to get a foot in the door for organizationwide Six Sigma efforts that address the reluctance of senior management:

- Stealth Six Sigma.
- Limited initial commitment Six Sigma.

Stealth Six Sigma demonstrates significant improvement benefits while maintaining a low organizational profile … The objective of a limited initial commitment Six Sigma project is to address several issues of executive interest and show dramatic improvement quickly."[3]

When approaching middle management in preparation for implementing a major quality improvement initiative, I was told, "We'll go along with the project if you can get the boss on board." My primary effort became convincing the boss, a vice president, to support the project and sustaining his interest and personal involvement throughout the implementation.

But there's a difference between supporting a change and mandating acceptance of a change. "Once people are set against a change, top management cannot command them to modify what's in their hearts." The approach can result in asking top management to "compel unwilling compliance … When people resist change, bringing top management support down on them only solidifies the antagonism and drives resistance underground."[4]

It may help to reflect on an adaptation of W. Edwards Deming's chain reaction (see Figure 1).[5] Given that each link in the chain is critical to an organization's health and sustainability, it should be obvious that continual management support is essential.

For example, in *Out of the Crisis*, Deming discusses unemployment, stating that "unemployment is not inevitable … It is created by management." In Japan (at the time he wrote the book), "management takes the cut."[6] During the economic downturn in the United States, there were numerous cases in which management took a bonus and went on a business boondoggle, while the workers were terminated—a gross example of sheer lack of management support.

The evolution of quality / FIGURE 2

The next stage

Our organizations are at some stage in the evolution of quality (see Figure 2), but many are still a long way from reaching world-class status. Defining, planning for and applying solid management support are keys to gaining a higher level in the evolutionary march toward organizational excellence and world-class recognition.

"The quality of the output of a company can't be better than the quality at the top," Deming said. "Top management makes quality. Job security and jobs are dependent on management's foresight to design products and services that will entice customers and build a market; and their foresight to be ready, ahead of the customer, to modify products and services."[7]

Put meaning and action behind the phrase "management support." It really pays off. QP

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What's on the Horizon

More changes in the air for the U.S. aviation industry

by Michael J. Dreikorn

In 50 Words Or Less

- Regulatory changes in the aviation industry will force organizations to adapt to new management, design and production standards.
- Quality leaders must ensure their organizations have a plan in place to deal with the myriad alterations.

STANDARDS AND REGULATIONS are what ensure everyone's on the same page. They keep meat and produce on the shelf instead of on a recall list. They're a guarantee to customers and partners that the same process is going to be followed this time and the next and the next.

Their value to the aviation industry is no different. They're the peace of mind organizations need to get the results they want. But, just as the industry evolves, so, too, do the standards and regulations that govern it. The industry has seen several changes made recently, and more are on the way.

The first half of 2009 has already brought the U.S. aviation industry a substantial amount of change. Production and maintenance work continues to move—sometimes in surprising directions. Examples include airline maintenance to South America and production work returning to the United States from China.

The recessive economy continues to push organizations to tighten their collective belts and make some tough decisions. Military spending has been up in the air, unfortunately landing a final blow to the F-22 program.

Needless to say, this is a very dynamic industry that requires organizations to foresee change and to adapt quickly. But how much attention are organizations placing on monitoring the changing environment of requirements?

Earlier this year, AS9100C was released, bringing with it a number of additions, revisions and deletions to the industry's standard for quality management. The most notable revisions to AS9100C included expanded and more-defined expectations for management's role in managing the quality of the organization. This also includes requirements for risk management and effective measurement in prevention.[1]

Though registration to AS9100C will not actually start until May 2010, leadership needs to thoroughly understand the new requirements and engage process changes to ensure compliance.

Changes in the offing

The final months of 2009 will bring even more changes to the aviation industry's requirements environment. The Federal Aviation Administration (FAA) published significant revisions to 14 CFR 21 in October. This represents the first major change to the regulation since 1964.

For those not familiar with 14 CFR 21, it is the set of regulations that governs the design, production and continued airworthiness of U.S. civil aircraft. According to the Notice for Proposed Rulemaking (NPRM), regardless of what type of production approval an organization holds, there will only be one quality system model.

Currently, there are three types of FAA production approvals: Production Certificate (PC), Parts Manufacturing Approval (PMA) and Technical Standard Order Authorization (TSOA). Historically, each of these types of production approvals had their own definition of a quality system. For example, a PC holder has been required to have a documented quality management system, whereas a PMA holder had no regulatory requirement for a documented quality management system.

Some might be surprised by this, but consider the state of vertical integration in the 1960s and 1970s. The prime manufacturers (PC holders) had much smaller supplier bases, and there was little need for complex quality management systems for those who produced aftermarket replacement parts (PMA holders).

But times have changed significantly. The changing face of the global aviation industry has given rise to a very large industry of replacement parts. And, with the complexity of modern design and production techniques, the FAA regulations that were created in the 1960s have long been out of date.

Having been personally engaged in the rewrite of 14 CFR 21 since the late 1980s (as a regulator and industry representative), I have witnessed many attempts to move the "stick in the sand" to meet the changing environment. In most cases, the hurdles of bureaucratic processes have prevented true alignment. But my hat is off to the fine professionals at the FAA's Aircraft Certification Service for finally getting the job done.

Based on the NPRM, quality management system requirements will be more closely aligned to AS9100 and will be consistent throughout the production side of the industry. Table 1 (p. 33) is an excerpt from the NPRM and illustrates the scope of the proposed changes.

Safety blitz

The FAA also recently released Advanced NPRM (ANPRM) FAA-2009-0671, requesting public comment on draft rules for safety management systems (SMS). SMS is not a new concept, but it is evolving from a voluntary process to one that will be regulated and enforced.

The aviation industry is not one in which **trial and error can be practiced** without the potential for **catastrophic consequences.**

Similar to some of the new requirements of AS9100C, an effective SMS will proactively seek out potential risk, establish accurate measurement methods and engage in prevention processes. Though airlines and airports have been the traditional targets for voluntary implementation of SMS, the ANPRM suggests it will also be required of repair stations and manufacturers.

For all types of aviation-related organizations, the existence of a regulatory-based SMS requirement changes the game significantly. Historically, there has been a large amount of organizational discretion when it comes to proactive risk management. Now, the possibility exists for federal enforcement actions toward organizations that are not managing risk effectively.

As previously noted, the concept of SMS is not entirely new. The International Civil Aviation Organization (ICAO)—the entity responsible for global aviation safety—has been working on developing global SMS requirements for a few years. Notably, most of ICAO's SMS implementation focus has been on airport and airlines. The space agencies, such as the National Aeronautical and Space Administration (NASA) and European Space Agency (ESA), have also been engaged in risk-management programs for years.

Ask yourself this

With all of the changes the industry is facing, who is keeping track of the changes in requirements at your organization? Is your organizational leadership aware of the significance of these requirement changes? What is your organization's plan for incorporating requirement changes into your system? More importantly, how is your organization going to integrate these changes into its culture?

There is no question about it—top leadership in every aviation-related organization must be involved in the process of identifying and understanding requirement changes. All too frequently, the responsibility for compliance to external requirements—such as FAA regulations and standards from the International Organization for Standardization—falls on the shoulders of the quality leader. That's not good enough for 2009 and beyond.

As the new requirements specifically define top leadership engagement, quality leaders need to understand what that means for them to effectively lead and engage. Enlightened leaders will recognize the commonality of the new and evolving requirements and should seek out broad integration of processes and procedures. Stovepipe reaction to new requirements will only add to the complexity of an organization's processes and to resulting waste.

When an organization treats requirements management as a process, they are enabled to manage variation much more effectively and efficiently. In one of my books, I describe an environmental scanning and integration process that ensures organizations are ahead of external requirement changes. In short, the ideal process includes being an active participant in the change and integrating new requirements through people, process and behavior.[2]

People mover

Central to managing change effectively and efficiently is the people in the organization. At the end of the day, an organization will comply with requirements because they must. The status of compliance may satisfy an auditor but brings little value to sustainable performance.

ARE YOU READY?

With several of the regulatory changes already in effect, aviation organizations are trying to keep up. Share your experiences with other members by using the comment tool on this article's web page at www.qualityprogress.com.

Changes to 14 CFR 21 / TABLE 1

14 CFR Part	Amendment to 14 CFR
Part 1	• Expand the definition of "Approved."
Part 21 Subpart A—General	• Add definitions of the following terms: "airworthiness approval," "article," "commercial part," "design approval," "production approval," "standard part," "State of Design," and "State of Manufacture."
	• Amend § 21.3(f) to require all production approval holders (PAHs), instead of just technical standard order (TSO) authorization holders, to report the results of their investigations into certain accidents or service difficulty reports.
	• Require an applicant for a type certificate (TC) or supplemental type certification (STC) to provide a statement certifying the applicant has shown compliance with applicable requirements.
	• Amend requirements related to domestic and international transfers of TCs.
Part 21 Subpart B—Type Certificates	• Require an applicant for a major change in type design to provide a statement certifying the applicant has shown compliance with applicable requirements.
Part 21 Subpart D—Changes to Type Certificates	• Delete reference to an approved production inspection system (APIS). A person who is producing under a TC would be required to obtain a production certificate (PC) in accordance with subpart G within six months of the date the TC was issued or the effective date of the final rule, whichever is later.
	• Enhance quality system requirements to reflect current industry standards and best practices.

Note: For full table, visit www.qualityprogress.com.

Simple compliance to requirements can be expensive from many perspectives. Take, for example, the amount of energy that is required to turn a rusty gear. Then consider the amount of energy that is required to turn a well-lubricated gear. The lubricated gear will require less energy to change, as will the organization that integrates requirements into its organizational DNA.

When every member of an organization truly understands the importance of proactive processes and structured methods, and comprehends their value in the system, they become committed to performance; no one will need to tell anyone they need to do something. People will know what is required and want to do it correctly because they believe in its importance. Addressing the belief structure of an organization through process, resources, behavior and leadership will take an organization beyond compliance to a new level of commitment and result in the desired performance and safety culture.

There is an interesting coincidence with the timing of all these changes. Currently, the average age of an aviation professional is 59 years old, and much of the domain memory in the industry is quickly leaving. Some might look at this as an opportunity for instituting great change without the burden of graybeard caution. Others might see the vacuum of professional knowledge as a risk. I suspect the latter is correct.

What was previously known in a tacit environment might be forgotten, and new lessons will need to be learned. This, in itself, is a huge source of risk. The aviation industry is not one in which trial and error can be practiced without the potential for catastrophic consequences. Whatever the right answer is, aviation organizations must be thoughtful about the changes in their environment and respectful of those who must meet those requirements. QP

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AERIAL Coverage

New standard **targets safety concerns** in DoD's supply chain

by Jim Clifford

In 50 Words Or Less

- In the 1990s, the U.S. Department of Defense determined it needed to better manage its supply chain for equipment with safety critical applications.
- Policy has led to confusion. A new standard will address aviation critical safety items and ensure parts in the supply chain are safe and reliable.

TO HARMONIZE REQUIREMENTS across the supply chain for the management and control of U.S. Department of Defense (DoD) aviation critical safety items (CSIs), a standards publication group has reconciled final industry comments and is preparing to publish a new aviation, space and defense standard—AS9017.

The standard, *Control of Aviation Critical Safety Items*, is the result of a two-year, collaborative effort of member companies of the Americas Aerospace Quality Group (AAQG) and DoD representatives responsible for CSI policy on behalf of the branches of the armed services. The standard will be published by SAE Aerospace.

The publication group, the Americas Aerospace Quality Standards Committee (AAQSC), is affiliated with the AAQG and is now Technical Committee G-14 of SAE International.[1] The AAQSC, composed of individuals with technical expertise in aerospace and quality, is responsible for creating and developing aerospace and defense quality standards for the Americas, as well as developing the Americas' position for international quality standards, such as AS9100. The AAQSC is linked to AAQG project activity, but the group is composed of a larger population of quality professionals.

The AAQG is a cooperative organization within the Americas (North, Central and South America) formed to establish and maintain a dynamic cooperation based on trust among the Americas' aviation, space and defense companies on initiatives to improve quality performance and reduce cost throughout the value stream.

Without question, many realized there was opportunity to strengthen the value stream as it related to the DoD's supply chain. There were questions, however, on just how to accomplish such a complicated task and get everyone headed in the same direction.

Safety concerns spark action

The U.S. government has always been serious about aviation safety. After "repeated receipt of defective, suspect, improperly documented, unapproved and fraudulent parts used in safety-critical applications"[2] in the 1990s, however, the government realized robust processes were required to manage aviation CSIs.

CSIs are defined as, "A part, an assembly, installation equipment, launch equipment, recovery equipment or support equipment for an aircraft or aviation weapon system that contains a characteristic which failure, malfunction, or absence of could cause a catastrophic or critical failure, resulting in the loss of or serious damage to the aircraft or weapon system, an unacceptable risk of personal injury or loss of life, or an un-commanded engine shutdown that jeopardizes safety."[3]

So, the government went to work.

According to the *Aviation Critical Safety Item Handbook:* "In response, each DoD acquisition organization, program office, functional specialty, supply center, contract management office and contractor established and applied their own approaches for managing critical items. Although they (the individual organizations) all had the same intent (that is, to ensure the quality of safety-critical parts), the proliferation of terms, policies and procedures created unacceptable risks caused by gaps, confusion and error."[4]

The Joint Aeronautical Logistics Commanders' (JALC) group[5] followed this lead and issued policy in 2002 endorsing a coordinated and common approach to managing CSIs. The JALC appointed the Naval Air Systems Command (NAVAIR) as the lead agency to coordinate and issue joint policy and guidance.

In November 2003, the U.S. Congress passed a bill mandating the DoD to "prescribe in regulations a quality control policy for the procurement of aviation critical safety items and the procurement of modifications, repair, and overhaul of such items."[6]

During the next several years, NAVAIR led the way and made great strides in implementing the new law. Considerable policy, instructions, Defense Federal Acquisition Regulation clauses, Defense Logistic Acquisition Directives and guidance documentation were created to prescribe for the government the regulations required by the public law.[7]

Unfortunately, given the length of time during which these documents were published, there was some inconsistency and overlap in government instruction, and there weren't many defined requirements that could be applied to the contractors.

As a result, there was considerable variation in the actual contract requirements issued to contractors, and there was even more variation in how government agencies managed and oversaw the contractors' activities.

Addressing variation

In this sometimes jumbled and disjointed environment, Jack Fletcher (formerly of Bell Helicopter and now a senior specialist of quality initiatives at NASA's jet propulsion laboratory) proposed in September 2007 to the AAQG that an aerospace standard be developed.

STANDARD ANSWERS

After AS9017 is published, e-mail questions to the assigned Americas Aerospace Quality Group document representative. Find contact information at www.iaqg.sae.org/iaqg/publications/AAQGstandardsregister.pdf (case sensitive).

The initial project proposal spelled out the situation and the opportunity for improvement: "Left to our own devices, multiple sets of requirements will be developed and flowed down to suppliers. We all share the same suppliers. Common suppliers will be receiving different sets of flow-down documents creating confusion and possible conflict."[8]

The project success criteria were defined as:

1. Develop a consistent set of requirements flowed down to shared suppliers.
2. Develop consistent evaluation criteria for suppliers.
3. Cost savings for suppliers and prime contractors.[9]

Developers of the new standard met considerable resistance, in part because many in the supply chain did not produce DoD products. In addition, many in the supply chain that actually did produce DoD products had not yet recognized variations across the supply chain. Some prime contractors mistakenly believed that control of CSIs did not apply to them because of the limited activity they had encountered to date.

In 2008, the reins of AAQG project leadership passed to Michele Gagne, a program manager at Bell Helicopter. Under her leadership, the development of the standard reached new heights: The amount of supply chain variation eventually became visible to a majority of AAQG members, the DoD service branches signed on as full partners in writing the standard, and a majority of AAQG companies reached a consensus in creating common requirements for the entire supply chain for CSI management.

Building the standard

From that point, several formal and informal ballots across the industry were held to identify key requirements for suppliers that supported government policy. At the same time, any requirements proposed needed to be carefully crafted to ensure they didn't conflict with existing prime contractor requirements. Organizations involved at this stage of the standard's development included the AAQG, SAE, the Aerospace Industries Association and government agencies.

The standard eventually was organized according to the AS9100[10] process structure (that is, the "eight elements"), so AS9017 requirements were considered to be an addition to (and complementary to) the applicable AS9100 requirements.

The majority of the new standard's requirements are contained in the "Product Realization" and "Measurement, Analysis and Improvement" sections. The standard outlines the requirements a supplier must have in its system for key processes, such as: CSI identification; customer communications; planning; process control; production changes; purchasing flow down; identification and traceability; work transfers; product process verification (also known as first article inspection); and control of nonconforming material and audits.

The AS9017 standard is intended to be contractually flowed to suppliers via the prime or first-tier contractor. This will make it auditable for compliance as a customer requirement as part of a quality management system audit. AS9017 is not intended as a standard for registration via a third party.

Currently, there are no intentions to mandate the government to flow this standard to prime contractors. The government could accept it as a mutual contractual requirement, however, if it is proposed by a contractor in response to a request for proposal.

As of October, the standard has passed all AAQG/AAQSC ballot cycles. The standard—with final ballot comments incorporated—has been submitted to the SAE International Aerospace Council for the last official SAE endorsement (ballot) before publication. Publication is expected during the fourth quarter of 2009. QP

REFERENCES AND NOTES

1. An chart showing AAQSC as the Technical Committee G-14 of SAE International is found at www.sae.org/standardsdev/aerospace/aeroorgchart.pdf.
2. JALC, *Aviation Critical Safety Item Handbook,* draft version, Sept. 14, 2007.
3. The National Defense Authorization Act, U.S. Congress, Nov. 24, 2003, also known as Public Law 108-136, www.gpoaccess.gov/serialset/cdocuments/sd108-11/pdf/pl108-136.pdf. Specifically, see Sec. 802, "Quality control in procurement of aviation critical safety items and related services," p. 1,141.
4. JALC, *Aviation Critical Safety Item Handbook,* see reference 2.
5. The JALC is composed of the commanders of Naval Air Systems Command, the Marine Corps, the U.S. Army, the U.S. Coast Guard, the Defense Logistics Agency, Defense Contract Management Agency, NASA and the Federal Aviation Administration.
6. The National Defense Authorization Act, see reference 3.
7. Much of the initial and current policy and guidance documentation can be found at the Defense Supply Center's CSI policy website, www.dscr.dla.mil/externalweb/userweb/aviationengineering/technicaloversight/csiguidanceandpolicy.htm.
8. Jack Fletcher, "Proposed Project Plate for Critical Safety Items—Quality System Standard," presented to the Americas Aerospace Quality Group, Sept. 20, 2007.
9. Ibid.
10. International Aerospace Quality Group (IAQG), *(AS/EN/JIS-Q) 9100—Quality Management Systems—Aerospace—Requirements*, IAQG, 2009.

WEB RESOURCES

Americas Aerospace Quality Group: www.sae.org/aaqg.
SAE International Aerospace: http://aerospace.sae.org.

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Auto group **finds a fix** for repair inefficiencies, **retools its culture**

In 50 Words Or Less

- Seeking to cut its repair costs, a used-car dealership group turned to lean Six Sigma tools.
- The resulting quality improvement program helped identify, track and cut down on defects.
- Other benefits included a more-engaged workforce and improved interactions between management and technicians.

Attitude Shift

by Marc Young

THE AUTOMOTIVE REPAIR business is not what most would call progressive, yet in some dealership groups, there is a growing movement to use advanced manufacturing concepts.

In a used-car dealership group based in Richmond, VA, a lean culture change took place that started with a redesign of its process for reconditioning used cars. Using the concept of single-piece flow and the introduction of quality tools that allow the operations managers to do their own quality assessments and run their own quality improvement programs, the group has seen numerous benefits—a few of which it didn't expect.

The change in the manager's normal activities of approving and reviewing work for the technicians working on cars was subtle, unannounced and introduced in phases at locations across the country. Even though the program has been running for as long as two years in parts of the group, no one involved would say it was a culture-change tool. It's just a quality program that is "run by the inmates."

Looking for a fix

In any car dealership—whether used or new—the reconditioning and repair shops perform mechanical and cosmetic repairs to make the vehicles more saleable or to provide service to a customer after the vehicle's sale.

When a vehicle is repaired, it's sometimes not done correctly, which creates a defect. In some cases, the technician doesn't notice, or it takes the customer who buys the vehicle days or even weeks to discover it. When that happens—and when there is a warranty on the vehicle—the customer brings the vehicle back to the dealership for repair; this is called a comeback.

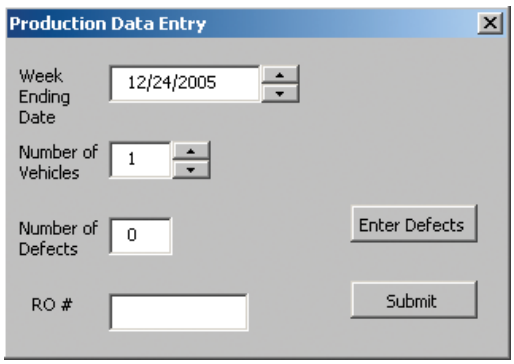
A comeback hurts the dealership group in two ways: The customer is less inclined to trust the dealership to deliver a high-quality vehicle or a high-quality repair, and the repair needs to be redone, which costs time and money, thereby reducing capacity and profit.

In addition, the service technician who repairs the vehicle and the service technician who did the original work may not be the same person, and there may be no defined process for communicating the defect to the technician who did the original work on the vehicle. This causes the following problems:

- Service consultants (the person who talks to the customer and inputs data into the dealer management system) and the service technicians have no way to check whether their inputs on the cause or history of the problem are correct.
- The original service technician has no way to determine what happened to a particular vehicle after his or her work is finished.
- Service managers do not know in which areas technicians need to improve.

Typical reporting systems for dealership groups use comeback rates to grade service technicians on quality, but these systems typically do not provide information that's detailed enough to help them understand and manage quality. Instead, the systems are more likely to report how one technician or dealership compares with others in the group. These ranking systems also are subject to manipulation and, as a result, are even less likely to be helpful in improving the job done by the technician.

Data-entry form / FIGURE 1



Lean Six Sigma to the rescue

Applying the Six Sigma model of define, measure, analyze, improve and control (DMAIC) to this problem yielded results that far exceeded the expectations of any of the participants or managers involved. The solution also yielded a culture-change agent in the form of a spreadsheet program that was beyond the expectations of the developer and project Champion.

The project Champion had experience using direct feedback to get technicians and managers more involved in doing their repairs correctly, and the developer had an idea that a simple spreadsheet would help them see trends. But neither had an inkling the program developed would take on a life of its own and be the catalyst for changing how managers looked at their data. Fortunately, by outlining the DMAIC process used to solve the problem, it was easy for all parties involved to see how this happened.

The first step, define, was accomplished by filling out the project plan, which used an A3 format—one of the lean tools introduced to the dealership group for program planning. In this format, the participants record the problem, analysis, corrective actions and action plan on a single sheet of paper (typically the A3 size).

The plan defined the problem as the inability of the technicians and their managers to use the data from comebacks to manage their quality on a daily basis. To address the problem, a system was needed to show them specifically what went wrong and the frequency

of problems in a particular area. The plan also called for immediate feedback to the technician, so the new process needed to allow for regular interaction between the manager and the technician, as well as easy data updating.

The program also needed to be built so the problems could be broken down into categories and subcategories. This parsing of information would help the manager and the technician zero in on the root cause of a problem.

Building the program so these categories and subcategories could be expressed as variables was necessary because not enough data had been collected on the subcategories to determine what they were. As the participants discovered when the plan unfolded, sticking to a generic approach made the program more valuable than it would have been if it was just a tool for measuring and analyzing technician quality.

What to do with data

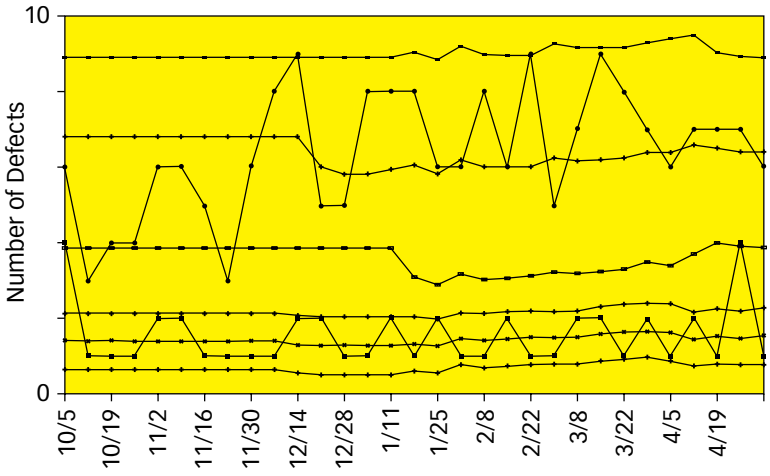
The next step, measure, is accomplished by collecting data from the reporting system or from the feedback forms that were filled out by the manager and reviewed by the technician. The latter is preferable over the reporting system, because it yields more specific information on exactly what went wrong.

The feedback form includes five main categories so the same form can be used if a vehicle has more than one problem. The subcategories are filled out with the corresponding number of the main category entered in the field in front of the subcategory. Also included in the form is a section for users to include more specific details about any problems.

After the form is filled out, the manager can enter data into the database in the comeback quality program (CQP)—an Excel program that stores data for each technician on a rolling, six-month basis. The data is entered via easy-to-use forms (see Figure 1) so that only basic Excel skills are needed to use the program.

The inclusion of these forms ensures all data input is in specific categories and subcategories. Typical dealer management systems allow freeform data input by the service consultant, which reduces the ability to analyze specific defects. This is a frustrating situation for managers and analysts alike, so restricting data input to specific categories and subcategories helps analysts and managers understand problems.

Trend chart of production and defect data / FIGURE 2

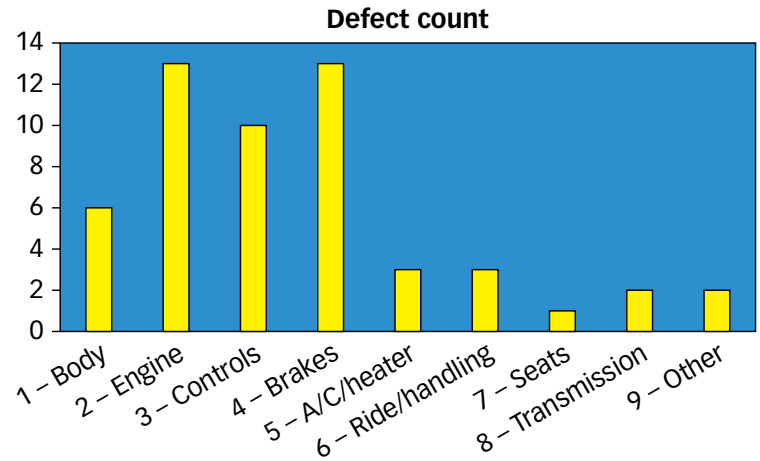


Smart charts

As the manager enters the data, he or she can see the technician's trend chart of defects vs. production. Also available to the manager are multiple Pareto charts for the categories and subcategories. This is the analyze phase of the program.

The trend charts help the manager understand how the technician is doing over time (see Figure 2), and the Pareto charts help him or her understand which areas need improvement (see Figure 3). These root cause analysis tools enable the manager to understand and improve the technicians' processes.

Pareto chart: defect frequency / FIGURE 3



Implementing a CQP has several benefits:

- Repair orders and any trends are reviewed directly with technicians, so there is a daily focus on improving quality.
- Technicians and managers have control over which category the defect should be entered in and, as a result, have more faith in the data and resulting charts.
- Continuous review of the repair inputs drives service personnel to input the comeback data correctly.
- The program can drive greater process performance via the analysis tools and the data provided to the manager and the technicians.

The next step, improve, occurs when the CQP flags a specific subcategory for high frequency. In that case, the manager sits down with the technician and sets up an individual development plan (IDP). In the past, these performance plans were used to browbeat the technicians without helping them identify the cause of the problem (a big no-no, according to W. Edwards Deming).

Instead, the manager uses a template (also in Excel) to guide the discussion with the technician so they can work together and formulate a plan for how to measure, analyze, improve and control the specific problem identified. An example of a template is shown in Figure 4.

This is the stage in which the manager and the technician need to seriously review why the defects occurred. But the template is only a guide, not a list of required actions to take. If there is an engine noise detection problem and the technician needs a hearing aid, no amount of review or training will help.

In the case of the dealership group, as the system was used more frequently and managers and technicians began to explore these root cause issues, the CQP and the IDP programs allowed for an unforeseen improvement in interactions between management and technician that helped to create more of an engaged culture—a lean principle.

Meeting of the minds

The final step of the plan, control, was accomplished by a unique implementation plan devised by the project Champion.

Normally, a program of this type would be monitored and controlled by dealership headquarters staff to make sure it achieves the improvements desired. Instead, the managers held a monthly conference call led by one of the managers, with headquarters staff providing administrative help only. This created a peer-to-peer control system that promoted use of the program, as well as the sharing of problem-solving methods and successes.

Technician improvement plan template / FIGURE 4

Technician improvement plan – engine defects				
Engine components, cooling system, batteries, charging system, fuel system, belts, hoses, engine performance and drivebility.				
1. Manager to observe technician perform two engine compartment inspections.	Date	Stock no.	Tech Sign	TPM Sign
Comments:				
2. Manager to verify completed engine repairs on two vehicles.	Date	Stock no.	Tech Sign	TPM Sign
Comments:				
3. Manager to observe technician use scanner on two vehicles.	Date	Stock no.	Tech Sign	TPM Sign
Comments:				
4. Manager to observe technician perform check for oil leaks with dye.	Date	Stock no.	Tech Sign	TPM Sign
Comments:				
5.	Date	Stock no.	Tech Sign	TPM Sign
Comments:				

It was important to encourage the manager's use of the program, because the potential for pushback was great. Most managers have a long to-do list, a relative unfamiliarity with Excel and a conviction that new programs are nothing more than a bother. Having other managers share success stories combated these issues.

The program runs on its own, and the culture is slowly changing to one of engagement and continuous improvement by the managers and the technicians. At the outset, there was no way to expect a culture change, because it was not a stated goal of the program. But when you provide tools for others to get involved in their own problem solving, engagement happens.

Another benefit of the program occurred when one of the managers asked if he could use it to examine cosmetic defects. The variables mentioned earlier made this an easy transition. Another asked if it could be used to track retail warranty problem areas—and again, it was easy to create the program for this new area. All that needed to be done was to replace the category and subcategory variables with a new problem area.

Through these developments, everyone involved in the program could see how problems from the shop floor through the top-management levels could be tracked and solved. All it took was a bit of data collection to find out what the category and subcategories should be, and what person or group needed to be monitored, and presto—they had the beginnings of a quality improvement program.

There is a caveat, though. At first, it may be best not to call it a quality program, because most high-level managers do not believe they can apply any kind of quality analysis on the management work they do. But, after putting this program into practice, everyone involved will discover it's an extremely effective tool for injecting more science into the art of management. QP

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BY CHRISTOPHER L. GRACHANEN

High Risk, No Reward

Reducing calibration costs could be an expensive mistake

THE TROUBLED economic environment has caused many companies to reexamine their calibration policies and to question the need for calibration and frequency of calibration for much of their inspection, measurement and test equipment (IM&TE). This is often the direct result of mandates from senior management to reduce operating expenses.

Nondiscretionary expenses—in terms of required head count, occupancy and raw materials—are quickly reduced to levels of absolute necessity to achieve the biggest cost savings. These reductions are frequently laid out as marching orders delivered by senior management, which leaves little room for exceptions or alterations.

For frontline managers further pressured to reduce operating expenses, this generally leaves only a few possible areas available for additional cost reductions: employee incentives, capital acquisitions or upgrades, and services (internal and external).

The first two areas are typically frozen by a company's finance group after essential, product-driven expenses have been optimized. This leaves services as the only area frontline managers have to make any real cost-reduction decisions.

Against all odds

For many technical groups, IM&TE calibration costs account for the lion's share of service expenses. As a result, frontline managers often have no choice but to reduce their active IM&TE inventory to the bare essentials to trim calibration costs. This is to be expected and makes good business sense.

Unfortunately, the pressure to further reduce operating expenses (calibration costs) may put IM&TE users at odds with a company's ISO 9001 requirements, as well as good laboratory shop practices based on fundamental metrological concepts.

Essentially, the ISO 9000 series of quality standards requires IM&TE to be calibrated if it is used to help decide a product's acceptability (conformance to applicable specification criteria). IM&TE users may want to deactivate or change the active calibration status of an IM&TE piece to no calibration required (NCR) to avoid calibration costs if they still want to use it for what they consider to be nonessential, non-critical measurements.

Cost savings from **circumventing calibration** are rarely significant when compared to the **costs of a product recall** or suspension of ISO accreditation.

Essential arguments

Determining product-essential measurements is subject to wide interpretation for measurements that are not obviously used to evaluate a product's functionality, quality and performance. To illustrate, we'll look at a case involving a product prototype powered by a DC power supply whose output is monitored by a calibrated, handheld DC digital multimeter (DMM).

On the surface, you could argue the power supply is only a source and does not need to be calibrated, because its output is set up and monitored by the DMM.

Upon closer examination, however, power supply attributes (specifications)—such as periodic and random deviation (PARD) and transient response—can have an adverse effect on product performance if they are out of tolerance. The monitoring DMM cannot readily detect these DC power supply attributes and, if found to be out of tolerance, their adverse influences on product performance are unknown.

Another potential sticky situation involves a DC shunt whose initial resistive value is assumed by users not to change because it is constructed of solid metal and may not be subject to excessive wear or abuse.

This notion may be the case for users who employ shunts only to determine the presence of current (go/no go) and may not be applicable for other users trying to make accurate current measurements (all current shunt resistive values change to some degree over time). Normally, IM&TE is used by different users for different applications, and it is a safe bet that an application's accuracy requirements are not the same as those of other applications.

Irregular intervals

Another calibration cost-cutting posture IM&TE users often propose is increasing calibration intervals.

At a recent metrology conference, I learned that many of my calibration colleagues have been requested by IM&TE users to arbitrarily increase calibration intervals to reduce calibration costs during these tough economic times.

I will not belabor the merits of statistical vigor used to predict the likelihood of acceptable IM&TE performance within a calibration interval period. I will note, however, that calibration interval changes that do not reflect analysis of past performance or other reliability-based information impose an unnecessary risk for consumers and producers.

Business decisions based on flawed measurements that stem from out-of-tolerance IM&TE can lead to increased field failures and longer product development cycles. The costs to the organization would be substantial, and in the worst-case scenario, customers would be put in life-threatening situations. A company's calibration-related measurement risk exposure can be greatly reduced by adhering to a sound calibration program based on industry-accepted best practices.

An ailing economic environment often requires drastic cost-cutting actions if an organization is going to remain viable. Cost savings realized from circumventing industry-accepted calibration practices are rarely significant when compared to the costs of a product recall or inability to sell product because of the suspension of ISO accreditation.

Without rigorous root cause analysis, the contributions of calibration-related measurement risk to faulty business decisions often go unrecognized. Because of a lack of information and inadequate understanding or appreciation of the ramifications, companies seldom take into consideration calibration-related measurement risk exposure when making calibration cost-cutting decisions—a short-sighted approach that costs everyone in the end. QP

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CALIBRATION COMMENTARY

In the midst of the current economic climate, some organizations have reinforced their quality activities, while others have chosen a different direction. What have you experienced? Share your thoughts by e-mailing editor@asq.org.

BY NECIP DOGANAKSOY, GERALD J. HAHN AND WILLIAM Q. MEEKER

Divide and Conquer In Reliability Analyses

Gain understanding by looking at different population segments

ALL PRODUCT IS NOT created equal. Some units are more likely to fail in service than others. Thus, in reliability evaluations, you need to identify subpopulations with different failure susceptibility. This is accomplished through segmentation—a divide-and-conquer strategy that breaks down the product population into meaningful subpopulations so you can conduct separate analyses on each and then act on the resulting information.

Segmentation (also known as data stratification) is one of the so-called seven basic quality tools.[1] In this column, we describe and illustrate the use of segmentation for, principally, reliability applications.[2]

What creates subpopulations?

In a specific product application, subpopulations result from differences in the manufacture and use of a product. Differences in reliability may, for example, be due to variability in raw materials and components or differences in manufacturing processing conditions.

In a recent application, Yili Hong, William Q. Meeker and James D. McCalley segmented data on a fleet of high-voltage power transformers according to manufacturer and manufacturing period—first to model lifetime and then to predict the remaining life for the units in the fleet.[3] In another application dealing with the prediction of warranty costs for an electronic product, the population was broken down into component genealogy groups consisting of combinations of part numbers.

Segmentation is especially appropriate when failures due to a particular defect occur in only some production lots. In studying the cracking of the plastic casing of a laptop computer, for example, segmentation revealed such failures took place exclusively on units built during a one-month period at one of several assembly plants. This led to further study, which revealed the wrong type of screw was used in assembly at this plant during this time period, and grease on the screws led to chemical degradation of the plastic casing.

Isolating the problem facilitated root cause identification and steps to ensure the problem would not recur in future product. More immediately, it led to identifying and, when needed, repairing previously built computers that were vulnerable to this failure.

Also, different units of a product population often experience different use environments. A problem may be accentuated or perhaps limited to occur at only extreme ambient conditions, such as severe heat or cold. Moreover, the performance of a dishwasher may depend on the characteristics of the local water supply. In such cases, you might focus immediate corrective action on product in the most vulnerable geographical regions; segmentation of the data by region will help identify the subpopulations that warrant special attention.

Example: aircraft engine

The following example deals with a system that bleeds off air pressure from an aircraft engine to operate a compressor:[4,5]

Initial analysis. Lifetime data were available on bleed systems from 2,256 engines in military aircraft operating from various bases. Figure 1 shows a Weibull distribution probability plot for the 19 failures that occurred. Note that unfailed units, although not shown in the plot, are taken into consideration in arriving at the plotting positions.

The slope of the plot seems to change around 600 hours, indicating that a simple Weibull distribution does not provide an adequate representation for the lifetimes. This pattern, which is common in our experience, suggests a mixture of early (infant mortality) failures (on the left side of the plot) and wear-out failures (on the right side).

Segmented data analysis. Examination of the data revealed that 10 of the 19 failures occurred at base D, one of the bases where aircraft were stationed. Separate Weibull probability plots for the lifetimes of the systems at base D and those

at all other bases are shown in Figure 2.

The data in each of these two plots scatter around straight lines, suggesting that simple Weibull distributions provide adequate representations if you consider base D and the other bases separately. Moreover, the probability of failure by 3,000 hours is estimated from the plot to be 0.467 for the systems at base D, as compared to 0.013 for the systems at the other bases.[6]

A recent analysis suggested that lognormal distributions might provide a better fit to the data than Weibull distributions. Fortunately, both analyses led to similar findings.

Resulting action. Further investigation revealed the serious failure problem at base D was caused by corrosion accelerated by salty air (base D was near the ocean), and a change in maintenance procedures was implemented there. This resulted in essentially eliminating the failure mode.

Note that segmentation analyses typically do not provide cause-and-effect conclusions by themselves. The difference in failure probabilities between base D and the other bases could have been due to one factor or a combination of many factors. The determination that the underlying cause was corrosion due to salty air involved an engineering assessment of failed parts. The segmentation analysis, however, helped focus and expedite the physical evaluations.

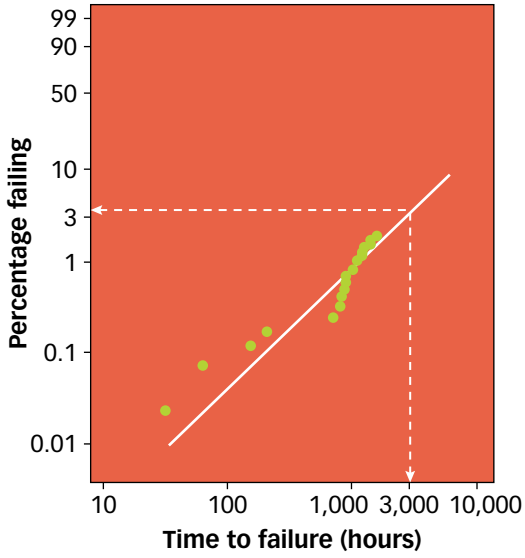
Identification of subpopulations

If at all possible, the selection of subpopulations should be based on physical considerations. This requires an in-depth understanding of the design, manufacture and use conditions of the product.

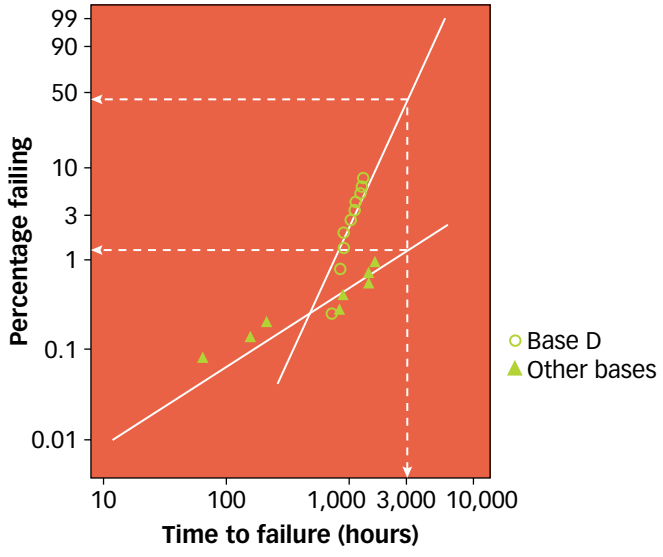
In practice, however, the reasons for differences between subpopulations may not be known and, therefore, effective subpopulations often cannot be readily determined. If you knew what created the differences—at least, to the degree that these pertain to the manufacture of the product and are controllable—you would, in fact, want to act to remove them. Thus, identifying subpopulations may be a trial-and-error process.

Initially, subpopulations are often arrived at somewhat arbitrarily, based upon, for example, the period of production (week, month, quarter or year). Such choices should, however, be trumped by manufacturing knowledge. The times at which changes are introduced on line, for example, generally provide an improved criterion for segmentation. Segmentation might also be based on factors such as parts supplier, the geographical region

Weibull probability plot for bleed systems lifetimes / FIGURE 1



Weibull probabililty plots for systems at base D and other bases / FIGURE 2



where the product is being used, customer type or a combination of these.

The fact that a Weibull probability plot of the data does not result in a straight line, as in the bleed system example, also suggests the existence of subpopulations (and multiple failure modes, as discussed later) and might provide clues for defining subpopulations.

Segmenting data elsewhere

We have discussed segmentation in the context of reliability data tracking for nonrepairable products. Segmentation of data, however, is useful in many other situations.

For example, a chemical cure process showed inconsistent results. To gain improved understanding, the data were segmented and plotted in various ways, including by shift. The resulting plot showed two of the shifts were providing satisfactory product, but the night shift was not.

To find the cause for this difference, a late-night visit to the factory floor revealed the third-shift operators frequently turned off the plant's air conditioning. This increased humidity, which in turn had a negative impact on product performance. After correcting the problem, it was decided to control chart the performance segmented by shift.

Another example arises in the comparison of drugs, an area that has become known as comparative effectiveness research and was part of the 2009 U.S. economic stimulus bill. In assessing the effectiveness of competing drugs or medical devices, you want to know if a particular drug is effective in one or more parts of the population, such as the elderly, even if it may not be so in other parts. This calls for segmentation in the data analysis.[7]

Multiple failure mode analyses

Segmentation bears some similarity to the analysis of multiple failure modes discussed in one of our earlier columns.[8] In both cases, the life data cannot be described adequately by a single, simple distribution.

In studying multiple failure modes, information on the mode of failure of each failed unit is required. All of the data is then used in each analysis, but observations from failure modes other than the one under consideration are taken as censored.

In contrast, for the bleed system example, failure mode information was not available at the time of the analysis (and possibly one or more of the base D failures was not actually from corrosion). Thus, the data were segmented into subpopulations, and separate analyses were conducted for each subpopulation.

In both situations, the results of the individual analyses can subsequently be combined to obtain an omnibus analysis for the entire population. For segmentation, this requires knowledge of the proportion of units in the population belonging to each subpopulation.

Short term vs. long term

In the short term, segmentation may result in the speedy and accurate isolation of field problems to well-identified segments of the total product population, so you can identify the most susceptible units and take corrective action. Segmentation may, for example, help determine whether a recall is needed, and if so, what part of the product population needs to be recalled.

By isolating a problem to a relatively small part of the population, you may be able to address an otherwise extremely costly problem without inconveniencing customers not impacted by the problem. The long-term answer, however, is to eliminate the problem in future units, perhaps by designing a sufficiently robust product whose performance is insensitive to the use environment. QP

ADDITIONAL INSIGHT

To find columns dating back to 1999 written by this trio of experts, click on Statistics Roundtable under the Departments & Columns tab at www.qualityprogress.com, and search the column by year.

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Where Have All the CQOs Gone?

The search for today's quality leaders

DURING THE summer, I got a call from an acquaintance who said his position had been eliminated. He is the chief quality officer (CQO) of a major company. He's getting a great severance package, but it was still unexpected and unnerving.

Two other CQOs I know have lost their jobs in the last six months. It's a sad shame for these professionals—CQOs are endangered officers. What does it say about our profession? And how can we change this pattern?

Rise of the CQO

I've been in and around quality for more than 25 years. When I first started, most organizations didn't have a quality department. Then, during the explosive growth of quality between 1980 and 2000, the quality function grew in importance to become a critical C-level function.

Quality evolved from being a technical position to first and second-level manager and then to director level. Many companies had quality vice presidents and some even developed a CQO position—the profession's top spot.

It was an exciting and lucrative time to be a quality consultant professional. Quality professionals were at the forefront of national and organizational competitiveness, and they, along with consultants, were in huge demand to stabilize and improve internal and supplier processes using lean and other common quality tools.

Critical question

Times have changed. Where have all the CQOs gone, and why isn't quality at the C-level table anymore? These are great—though troubling— questions at the core of the future of quality and the employability and promoteability of quality professionals.

Here's my take:

"Quality is everyone's job." This was Philip Crosby's tag line. Years ago, quality was diffused throughout an organization and into the supply chain. Then, it was moved offshore with the huge outsourcing movement seen during the last 10 years. We, the quality evangelists, were more successful than we anticipated. Quality did become everyone's job, not only in our companies, but also with our supplier bases.

What happens to quality professionals when everyone is responsible for quality? The standardization and commodization of quality seem to have resulted. Quality lost its cachet.

In this journey, something else happened. Quality defined as being good enough became the business requirement as opposed to continuous improvement. Companies said they didn't need a CQO to enhance competitiveness. The person in charge of ISO registrations or product certifications could be a director or even a second-level manager.

Where are today's leaders?

I'd like to see the new faces who are rushing to write articles, keynote events, become spokespeople and, in general, lead our profession into the new era. I'm still waiting to see and hear these people.

Do you know someone who fits this description? Is it you? Are you doing something great in a hot area that is a natural extension of quality, such as risk management, healthcare quality, cyber security or supply chain management?

If you are, great! Get published in QP. Give talks. Write books. Lead a movement. This is what we need to do to get more CQOs back into the workforce. QP

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The Right Decision

Use economic value added metric for project selection

AS THE SIX SIGMA Academy led large deployments at Allied Signal, General Electric and other organizations in the 1990s, one of the great benefits realized was linking define, measure, analyze, improve and control (DMAIC)-based project improvement to financial performance.

The simple idea of focusing on hard savings—results that would make a difference to the bottom line in the current year—crystallized for senior managers at many organizations and gave them the motivation to risk resources and focus on Six Sigma deployment. Focus on financial results allowed organizations to integrate improvement goals in policy deployment systems, which made a huge difference in the success of Six Sigma deployments for early adopters.

A problem with this highly successful idea was that most companies were pushed hard by consultants to focus exclusively on hard savings, and little heed was paid to soft savings—improvements that did not necessarily have an effect on the current-year bottom line. As I have argued previously, it is completely normal and expected for hard savings per project to decline as Six Sigma deployments mature.[1]

The reason for the decline? You will have fewer opportunities for improvement as you make improvements over time. Based on my experience, most manufacturing organizations would see a hard savings of $300,000 per project in the first year by Six Sigma deployment. By the third year, savings per project would be $75,000.

Some naïve managers think this decline means Six Sigma has lost its effectiveness or that a programmatic change is in order. Nothing could be further from the truth. The decline simply implies the organization is solving problems faster than it is creating them. The organization in question should really start to focus Six Sigma resources on product and process development instead of cannibalizing the program.

An additional consideration is that there may be tremendous untapped opportunity for improvement, but that opportunity may lie in the area of soft savings, which might include inventory, cost avoidance, risk reduction or other nonexpense items. As they deploy lean Six Sigma, organizations should consider quantifying the available opportunities for improvement so all areas can be identified and ranked for a sound project selection method.[2]

Enter EVA metric

In my experience working with Six Sigma, I have been using a financial metric called economic value added (EVA), which was developed by the Stern Stewart Co., to evaluate publicly traded companies as potential investments. A close look at this metric and a related metric called delta EVA will show you how to evaluate potential projects involving hard savings alongside projects involving soft savings.

According to Stern Stewart, EVA is defined as follows:

EVA = NOPAT - {WACC x (TA - FL)}.

NOPAT stands for net operating profit after tax, WACC for weighted average cost of capital, TA for total assets and FL for free liabilities. The only quantity in the equation not typically found in publicly traded companies' financial reports and statements is WACC, which represents a weighted interest rate that is associated with the debt and equity structure for the company.

For example, if a company holds $3 million of debt payable at 10% and $1 million of equity with a return of 20%, the WACC is 0.75 x 0.1 + 0.25 x 0.2 = 0.125, or 12.5%, in which 0.75 represents the proportion of debt to total debt and equity, and 0.25 represents the proportion of equity to total debt and equity.

The portion of the formula shown in brackets is also known as the capital

EVA method example / TABLE 1

	Project 1	Project 2	Project 3
WACC	10%	10%	10%
Tax rate	40%	40%	40%
Δ Revenue	$4 million	$5 million	
Δ Expenses	$500,000		$100,000
Δ NOPAT	$2.1 million	$3 million	-$60,000
Δ Total assets		$50,000	-$50 million
Δ Free liabilities			
Δ EVA	$2.1 million	$2.995 million	$4.94 million

WACC = weighted average cost of capital
Δ = delta
NOPAT = net operating profit after tax
EVA = economic value added

It is completely **normal and expected** for **hard savings per project to decline** as Six Sigma deployments mature.

charge. You can think of the capital charge as the amount of money that should be paid to investors as a dividend for the use of their money. Total assets minus free liabilities gives an estimate of the amount of money that has been used by the company. This is known as capital employed. Applying an interest rate based on debt and equity to the capital employed provides you with an estimate of what might be considered a fair return to the shareholders.

If you then subtract the capital charge from the NOPAT and get a negative EVA, it means you did not achieve enough profit to cover the estimated dividend, even though the company may well have turned a profit. This scenario is likely to result in a falling share price. If EVA is positive, however, it means your profit level was large enough to cover a fair return to the shareholder. The EVA estimates how much cash would be available to fund reinvestment and other activities that the shareholder will view positively.

Dealing with delta

Many people and organizations have realized this metric can play a powerful role in helping select worthwhile improvement projects—whether they are Six Sigma projects, "just do it" projects or any other improvement activity. You need to consider how much EVA will change if you are successful with the project. The metric you would use, therefore, is called delta EVA. Delta EVA is defined as:

$$\Delta EVA = (1 - \text{Tax rate})(\Delta \text{Revenue} - \Delta \text{Expenses}) - \{\text{WACC} \times (\Delta TA - \Delta FL)\}.$$

In this equation, the tax rate represents the corporate tax rate, and the Δ symbol represents that change in the respective quantity. For ΔNOPAT, ΔTA and ΔFL, use a positive number if the quantity will increase relative to the current value. Use a negative number if the quantity will decrease relative to the current value as a result of the improvement project. This formula can be easily programmed in a spreadsheet for project selection.

To illustrate the method, consider the following example. Suppose an organization has a corporate tax rate of 40% and a WACC of 10%. Its lean Six Sigma project selection committee is considering three potential improvement projects.

The first project involves a $4 million revenue increase by performing a voice of customer study, which will cost $500,000. The second project entails a $5 million expense reduction in manufacturing and involves purchasing new equipment for $50,000. The third project involves a $50 million inventory reduction and will cost $100,000 to implement. See Table 1 for a breakdown.

Given the limited information provided in the scenario, all three projects are worthwhile to pursue. It is interesting to note that the traditional focus on hard savings would have excluded project 3, even though it had the best overall contribution to EVA.

Risk and return

With simple metrics such as EVA, it is possible for an organization to compare projects with differing levels of hard and soft savings, as well as revenue enhancements. This method has proven invaluable for many who need to choose the right lean Six Sigma projects based on financial impact, strategic value and customer impact.

The delta EVA metric is also exceptionally easy to use because it does not rely on having current financial numbers, with the exception of the corporate tax rate and the WACC.

Black Belts, as well as Green Belts, can perform these computations easily with occasional help from Master Black Belts and financial personnel. When coupled with risk analysis—based on a qualitative risk metric that can be applied across many projects—a risk vs. return plot can be generated. This allows Champions to easily manage a portfolio of lean Six Sigma projects and properly allocate resources.

For these reasons, the EVA and delta EVA concepts should be incorporated into standard certification curricula. QP

FREE DOWNLOAD

A copy of a spreadsheet to perform the EVA calculation can be downloaded from this column's page at www.qualityprogress.com.

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BY J.P. RUSSELL

Trust, but Verify

Combination audit helps minimize risk, ensures sustainability

FOR MANAGEMENT CONTROL purposes, there are far more audits of a product, service or process than audits of systems. While system audits verify management system conformance or compliance, product and process audits focus on the verification of specific methods and product or service characteristics.

Grouping product, service and process audits together is somewhat natural, because a process audit may include a product or service audit. I've dubbed the combination a verification audit.

Verification audits are part of what Joseph Juran called the "little q" (quality control, tactical tools) as opposed to the "big Q" (quality assurance or management systems). System thinking is important, but you can't lose sight of the everyday tools necessary to ensure processes are controlled and risks are minimized.

Supply chain management, outsourcing, process or product complexity and sophistication, certified suppliers and operators, global economies and risk of field failures have all increased the need for ongoing verification. In addition, verification audits need to be performed when there are routine changes in suppliers, equipment, process settings, methods, requirements or personnel.

Meeting requirements

Standards require verification of products and activities to ensure control as part of the plan-do-check-act model.

For example, the ISO 13485 medical-device standard uses the words "verification" and "validation" more than 100 times.[1] Most verifications and validations are integrated into design, manufacturing or service delivery processes and are preformed by operators, inspectors, technicians, engineers, service providers and auditors.

According to clause 7.4.3 of ISO 9001:2008, organizations must establish and implement activities to ensure purchased product meets specified requirements.[2] If risks of nonconformity or failure are low, verification may be a simple inspection. If risks are high, however, supplier processes may be verified, contract requirements affirmed and product or service characteristics and performance checked.

Risks could be high due to complexity; low confidence levels in the supplier; sole sourcing; criticality of the product or service; large amounts of revenue being transacted; material; or safety, health and environmental consequences. Considering the number of product recalls recently, contaminated foods and reports of defects, it seems these risks are greater than ever.

Know your source

The benefits and market advantages of outsourcing has increased reliance on other organizations for important products and services. The organizations that provide the outsourced products and services are run by managers with different goals, skills and values. Increased oversight is needed to ensure suppliers provide what they promise, now and in the future.

ISO 9001, clause 4.1, allows outsourcing of any process, but the organization must ensure control over any outsourced processes and retains responsibility for conformity to all customer, ISO 9001, statutory and regulatory requirements.[3]

Many organizations do a good job of verifying materials and components but

Due to **consequences of failure,** some risks must be mitigated by **verification and validation.**

don't do as well when it comes to services or processors. Supplier services or processors may, in fact, have the greatest impact on an organization.

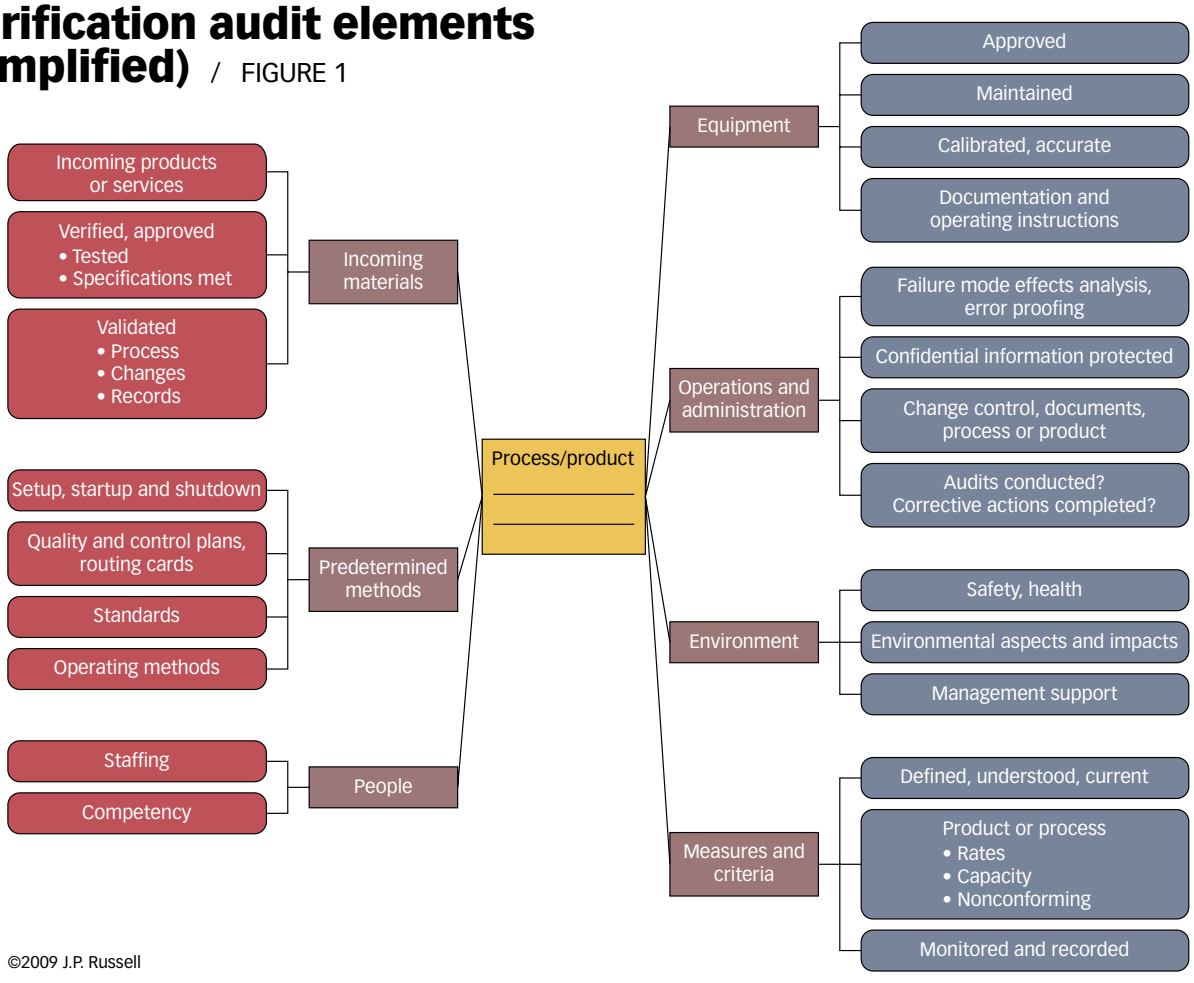
A global economy gives management more options to ensure the organization is effective, efficient and able to survive competitive pressure or increased demand. The advantages could be negated, however, due to failure costs, delays or risks to the wealth of the organization (assets).

Some organizations purchase sophisticated or specialized services that require special equipment or individuals with a particular expertise or trade. In other cases, organizations are becoming more reliant on second-party services to reduce overhead costs, free up internal resources and space, and procure services that aren't their strength.

Organizations carry out projects to design, develop, construct, assemble or build. Designing may require seeking special expertise for various nuances external to the organization. For example, if you are designing a tower, you may need a wind expert. If you are constructing a building, you may need a foundation expert.

The performance of design, development, construction, assembly or building activities may require performance of tasks by suppliers that represent a high risk to the successful outcome of the project. This comes into play in design calculations, modeling, and quality of concrete and pour method, to name a few examples.

Verification audit elements (simplified) / FIGURE 1



Also, there are high-risk activities performed by employees that need oversight. Due to consequences of failure, some risks must be mitigated by verification and validation.

Clause 7.5.2 of ISO 9001 requires organizations to validate any processes for production and service provisions in which the resulting output cannot be verified before delivery to the customer.[4] For example, there may be sophisticated equipment that must be operated and calibrated (applicable in welding, testing pharmaceuticals, medical-device validation and containerization of dangerous materials).

Prepare to verify

One way to mitigate negative consequences of high-risk processes or product use is to conduct verification audits. Verification audits can be a product audit, a process audit or a combination of both.

Product and process audits are considered preventive actions—a form of quality assurance rather than inspection, which has been thought of as quality control.

Once it is determined an audit is needed, standard audit preparation activities should be carried out. You will need to know the audit objectives, criteria and scope. There could be several audit objectives depending on whether it is an internal or external audit, as well as the performance history of the process, product or service. Following are some of the objectives that should be achieved:

First-party audit objectives:

- Verify and validate a process. The process may be an activity that can't be verified by inspection or test. The process may be a special test or procedure requiring special expertise or equipment.
- Verify project implementation activities, such as new products or services.
- Verify product characteristics or validate performance expectations.
- Verify that defects and nonconformities have been addressed.
- Verify training, equipment capabilities and process settings.

Second-party audit objectives:

- Verify supplier organization processes used to provide a product or service.
- Verify supplier product or service characteristics or performance requirements.
- Verify supplier process capabilities.
- Verify conformance to contract requirements.
- Verify material sources and traceability.
- Verify that defects and nonconformities have been addressed.

Verification audits are key tools **to ensure sustainability** of the management system. Results come from checking, **not expecting.**

Third-party audit objectives:

- Approve or disapprove process for license or certification.
- Approve or disapprove product or service for license or certification.

Next, the scope needs to be established. The scope may be an internal or external process or product. There may be one process, processes in a series or parallel processes that need to be verified. There may be one product or service that needs to be verified, or there may be several.

You need to understand the process and product or service you are going to audit. Reviewing the procedure, specifications and records is a good starting point. If there is no procedure, you may need to ask the auditee to provide a description of the processes. Talk to people to get the information you need.

The right tool

There are several tools available that can help you understand the process. They include:

- Process flow diagrams, flowcharts or process mapping.
- Cause and effect, turtle and tree diagrams.
- Failure mode effects analysis.
- Training documents.
- Inspection checklists.
- Procedures.
- Bill of materials, quantities and specifications.

There may also be some type of process input and output criteria, including:

- Specifications and lists.

- Drawings, pictures and diagrams.
- Planned arrangements for process approval.
- Approved equipment and qualification or certification of personnel.
- Test procedures.
- Inspection method sheets.
- First article inspections.
- Contract or regulatory requirements.

Find out about process or product history, including:

- Nonconformance reports and trend analysis.
- Internal and field failures.
- Corrective actions.
- Process or product changes, date and nature of changes.
- Operator or technician changes.
- Revalidation history.
- Customer complaints.

The process elements to be considered for a verification audit are summarized in the simplified spider diagram in Figure 1 (p. 53). Such diagrams can be used to check off the areas verified and can be customized for your situation.

Performing the audit

Follow standard auditing protocols for conducting the verification audit. If it's an internal audit, briefly make contact with the manager or supervisor before starting. If it's an external audit, you will need to hold a short meeting with the manager or supervisor to review the audit plan.

If you are going to check product in addition to the process, you will need to determine your sampling method. For example, you may choose to observe sample selection, inspection and test procedures.

Primary strategies for process audits:

- Tracing and process strategies.[5]
- Test the weaknesses and verify the strengths of a process or series of processes.
- Collect information by using open-ended questions to gather data about process inputs, outputs and the process elements (people, environment, equipment, material, measuring and method).

Primary strategies for the product or service audit:

- Use the requirements.
- Use element/clause strategy.

This method is used in system audits to determine if an organization conforms to requirements specified in elements or clauses of a standard. This same strategy is used in product and service audits to determine if a product conforms to specified requirements that are in an element or clause of a standard, specification or condition document. A product audit can include verification of product characteristics, as well as performance requirements.

Verification audits are perfect opportunities to perform reverse traces, because there are more verifiable links throughout a process or processes. The traces can include, but are not limited to, process settings, personnel training, material traceability, nonconformance handling, material handling and storage, shelf-life controls, process equipment, measurement system and supplier control.

You can also go back to the start and check requirements such as purchase orders, contracts and regulatory or internal requirements.

Verification audits can include error-proofing or mistake-proofing to improve process effectiveness and efficiency if they're part of the audit objectives and purpose. Identified weaknesses can be a potential source of nonconformity if not addressed. An auditor may also observe opportunities for improvement that can be reported if included in the audit purpose.

Reports are normally brief and address the audit objectives. Reports should describe the items reviewed—whether they are characteristics, processes or documents—and the audit results based on the requirements or expectations.

The report should also define the requirements for corrective action and preventive action when appropriate. You can follow up on audit results via records showing that findings have been addressed or via a subsequent audit.

Final thoughts

Verification audits are part of a robust risk-management process to mitigate potential unacceptable losses. The frequency of verification audits depends on degree of risk and performance history.

Processes and the environments in which they take place are constantly changing. Verification audits are key tools ("little q") to ensure sustainability of the management system ("big Q"). Results come from checking, not expecting.[6] QP

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Handheld analyzer

Quickshot XRF's handheld analyzer, which uses x-ray fluorescence technology (non-isotope based), features software that offers real-time results on a touchscreen personal digital assistant. When the user gets back to the laboratory, those results can be transferred to a desktop computer for long-term storage, analysis and report generation.

This system was developed for hazardous substance analysis, and it exceeds the requirements of the Restriction of Hazardous Substances and Consumer Product Safety Improvement Act, with detection limits down to 10 ppm. Various software packages also make it a portable solution for precious metal analysis and positive material identification.

Call: 716-228-2080; visit: www.quickshotxrf.com.

Camera ▼

Photron has introduced the Fastcam SA4, which provides 3,600 frames per second (fps) and up to 500,000 fps at a reduced resolution. The Fastcam SA4 is an alternative for applications that do not require the highest frame rates and has features such as extreme light sensitivity, high dynamic range and image quality for when low noise is critical.

The SA4 is available with an RS422 remote keypad with a built-in, 5-in. LCD viewfinder for remote operation. The camera features a variable region of interest, with 12-bit uncompressed data, a one-microsecond global shutter and 20-micron pixels for low-light, high-sensitivity and high speed applications.

Call: 800-585-2129; visit: www.photron.com.

Software reporting

ChemSW has announced the availability of enhanced Tier II reporting capabilities for their CISPro Global and CISPro Live chemical inventory systems. These enhancements enable CISPro users to automatically track, calculate and report hazardous chemicals on site to address government reporting requirements.

Tier II chemical inventory reports are required by the U.S. Environmental Protection Agency under the Emergency Planning and Community Right-to-Know Act (EPCRA), also known as the Superfund Amendments & Reauthorization Act. EPCRA requires organizations that have hazardous chemicals on site to submit reports about those chemicals state and local agencies.

CISPro Global and CISPro Live contain user-customizable Tier II reporting templates, with fields for average daily amount, maximum amount, hazard categories, number of days on site, storage location, type of storage, and pressure and temperature conditions. Alternatively, ChemSW can create a report template specific to the customer's requirements.

Call: 707-864-0845; visit: www.chemsw.com.

Laser sensors

LMI Technologies' Eyecon 1000 and Eyecon 2000 sensors are designed for rubber extrusion measurement in the tire material preparation area. The Eyecon 1000 provides a large field of view and high-resolution sensor that can be calibrated to a common coordinate system to support any number of sensors making it capable of measuring any shape of extrusion.

The Eyecon 2000 sensor is ideal for measuring distance, surface topography and profiles for 3D modeling in tire geometry applications. Typical applications include run-out calculations, and bulge and depression identification.

Call: 604-636-1011; visit: www.lmitechnologies.com.

Air and electronic column ▸

Stotz has released the MRA air/electronic column. The unit is a statistical process control (SPC) device that incorporates air gaging and electronic gaging into one design.

The MRA eliminates the need for a PC when combining measurements and SPC data. The column is designed specifically for use on high-production, tight tolerance parts.

The MRA features an easy-to-read 12-in. touchscreen. The column can be programmed by using the touchscreen or remotely with computer software. There are four bays in the front of the column that allow either electronic cards or air-electronic cards to be inserted. Each card can host four simultaneous measurements. Each column has the ability to store up to 99 individual programs.

The MRA has several interface connections,

including Ethernet, USB ports, serial ports and a digital input and output port. The MRA is a 19-in. rack-mountable device that operates on standard 110V power, with auto-switching capability for 220V use in European and other markets.

Call: 815-297-1805; e-mail: info@stotz-usa.com.

Wind-powered ventilation ▸

Heavy duty equipment that is shrink-wrapped for protection needs to be properly ventilated to prevent the development of moisture and mildew.

Dr. Shrink's DS-683WP wind-powered vent increases air circulation under the cover. The DS-683WP can run 24 hours a day in any climate and keeps working as long as there's wind, moving 30 cu. ft. of air per hour with a 10 mph breeze.

The vent can either deliver air or remove it, helping to eliminate moisture build-up and maximize air flow.

The vent is made to stay in place with more than 15 sq. in. of adhesion. The base of the vent sticks to the shrinkwrap's surface. Dr. Shrink's DS-683WP can be purchased with or without screens in the base.

Call: 800-968-5147; e-mail: drshrink@dr-shrink.com.

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All employees at a single site are entitled to Site membership benefits. If your organization has more than one site, each site must have a Site membership to share membership benefits with its employees. Identify one primary contact who will receive all ASQ related information, and can disseminate this information to employees.

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Item B0543

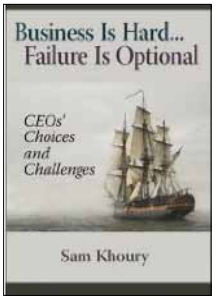
QP REVIEWS

Business is Hard … Failure is Optional

Sam Khoury, For-CEOs-Only LLC, 2009, 112 pp., $16.95 (book).

Although the title and publisher of this slim volume points to CEOs as its target audience, Khoury recommends it to others involved in business and to entrepreneurs. He includes a short test in the preface to determine who might benefit most from the content.

While the subtitle mentions choices and challenges, these are one in the same—



choices made will be challenges, and challenges present choices. The author deals with expectations and goals in several chapters.

Remembering that expecting things to be easy makes them harder is good advice for anyone.

Important ideas highlighted in specific chapters and woven throughout the narrative of the book are judgments and decision-making, and identifying and managing during a crisis. Clearly, this book is timely in the midst of an economic recession.

The book also discusses how to communicate with employees and how to understand the important ramifications of decisions. One important note from the author: Every decision affects cash. As a business school professor, I was grateful for the chapter on uncertainty and risk. Managing under uncertainty is an important skill.

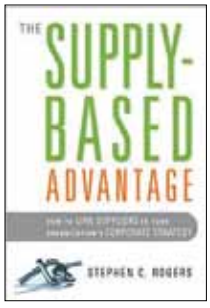
The book is not just a set of rules and recipes. It contains many vignettes and personal case histories to support the ideas presented. The book also provides important questions to ask prospective employees and a series of paradoxes CEOs must embrace to be comfortable in the position. I would especially recommend the book to entrepreneurs, as they often start as CEOs but then find the role of managing a business is very different from starting one.

I. Elaine Allen
Babson College
Wellesley, MA

The Supply-Based Advantage

Stephen C. Rogers, Amacom, 2009, 368 pp., $39.95 (book).

In this book, Rogers provides information needed for a company to gain a competitive business advantage through procurement and supply management. He draws from his years of experience with Proctor



and Gamble and as a consultant. He guides the reader through all the components necessary to reinforce and secure the supply chain.

Although this area is not one that is emphasized in many businesses, the subject should be of high interest in the current economic circumstances of most companies.

The writing style is clear and to the point, and each chapter builds on the previous one. There are many examples provided about failed and successful implementations of this course of action. The stories showing considerable positive results are realized by pursuing and improving supplier relationships. The book also shows what can happen when supplier relationships are ignored and allowed to deteriorate.

Each chapter begins in with a definition of a crucial term and a quote meant to motivate and encourage understanding. The "Practitioner's Take" sections allow the author to give candid advice or opinions without skewing the coverage of the topic being discussed. Unfortunately, most readers will have only a vague understanding of their supply chain details or procurement policies and will not truly understand the intricacies and interactions being illustrated.

All employees, especially executives, will benefit from reading this book. The outlined techniques are applicable to small and large companies.

Marc A. Feldman
Solvay Chemicals
Houston

Quality Companion 3

Minitab Inc., 2009, $625 single-user new license (software).

Minitab Quality Companion 3 is a dynamic software suite aiding management and execution of quality improvement projects.

New features include a more user-friendly interface, additional templates,

import capability for Microsoft Visio diagrams and the ability to create custom data fields and categories.

This software helps the practitioner plan, organize and manage a project through the use of a roadmap that outlines each step of the improvement project, along with the tasks needed for successful project completion. The roadmap includes links to the tools and coaches users

through tool selection and usage.

Templates provided in the roadmap include a project charter, process mapping, cause-and-effect diagrams, brainstorming diagrams and multi-voting tools.

Quality Companion 3 also makes it easy for users to share data and to document, review and report on project progress. It also archives information by keeping everything together in one file and through the use of a free utility called "The Dashboard," which promotes standardization, collaboration and communication.

Minitab provides free technical support, online help and demonstrations to make Quality Companion 3 easy to use. Any Six Sigma belt, quality professional or general project manager will benefit from the features and tools available.

Kunita R. Gear
St. Louis

ISO 9001:2008 Internal Audits Made Easy

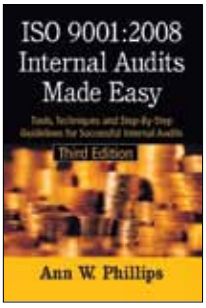
Ann W. Phillips, ASQ Quality Press, 2009, 176 pp., $24 member, $40 list (book).

After reading and reviewing many internal auditing books, this is one of the better ones. Despite how small it is, it packs a punch. In this third edition for the 2008 version of the ISO 9001 standard, Phillips does a good job of explaining the internal audit process.

Any quality practitioner who has read an auditing book will recognize the typical table of contents, but this book adds a little something that stands out.

For example, in the audit preparation chapter, Phillips states, "Preparing for the audit is the most critical phase of the audit."

She goes on to explain that the internal auditors typically perform one to three audits per year; therefore, to develop the confidence needed to ensure the process they are auditing will be thoroughly reviewed, they must know in advance what they are looking for.



She then goes through a very practical seven-step process on audit preparation. This attention to detail is found throughout the book and makes it worthwhile.

The book includes five appendixes:

- Sample process models (similar to turtle diagrams).
- Ten checklists for common processes.
- Audit preparation example, which is also provided on the CD-ROM that comes with the book.
- Internal audit forms, which are also provided on the CD-ROM.
- Revisions related to the 2008 standard, which describes the changes in non-technical jargon.

The book is an excellent resource and should be on the must-read list of any person who is responsible for the internal audit process or just wants another internal auditing book for their collection.

Wayne Sander
Dove Quality Consulting
Dousman, WI

RECENT RELEASES

Green Intentions

Brett Wills, Productivity Press, 2009, 296 pp., $39.95 (book).

The Art of Facilitation

Dale Hunter, Stephen Thorpe, Hamish Brown and Anne Bailey, Jossey-Bass, 2009, 352 pp., $40 (revised edition, book).

School Self-Assessment Guide to Performance Excellence

Peter G. LaBonte, ASQ Quality Press, 2010, 96 pp., $20 member, $34 list (book).

QP CALENDAR

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1-2 **Lean Certification Review and Exam.** Brooklyn Park, MN. Visit the Association for Manufacturing Excellence at www.ame.org.

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2-3 **Product Safety, Recall and Product Reliability Prevention.** Chicago. Visit Randall Goodden International at www.randallgoodden.com.

3 **Crafting and Communicating Effective Vendor Compliance Guidelines (live webinar).** Call Pilgrim Software at 813-915-1663 or visit www.pilgrimsoftware.com.

3-11 **21st Symposium on Quality Function Deployment.** Savannah, GA. Visit the Quality Function Deployment Institute's website at www.qfdi.org.

7-11 **65th Annual Deming Conference of Applied Statistics.** Atlantic City, NJ. Call Walter Young at 610-989-1622 or e-mail demingchair@gmail.com.

8-9 **SCOR Framework.** New York. Call the Supply Chain Council at 202-962-0440 or e-mail info@supply-chain.org.

8-10 **Lean and Six Sigma in Product Development Conference.** Miami. Call Worldwide Conventions and Business Forums at 800-959-6549 or visit www.wcbf.com/quality/5101.

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JANUARY

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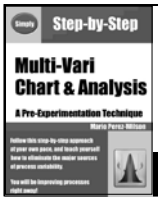

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Measures That Matter

Use measures that drive action and get results

WHAT DO YOU measure in your organization? Sales results? Operating costs? Profit? Employee or customer satisfaction? Perhaps you measure the number of programs your department delivers or the number of attendees at those programs.

You probably have a pretty good understanding of what gets measured in your organization. So, here's a harder question: Why do you measure it?

The most common answers are that you measure to track progress or to determine bonuses and performance ratings. Both may be the case, although I'd argue those are side effects of the real intent.

The real purpose of measuring something is to drive action. Why do you check the temperature in the morning? It's not because you are just interested in knowing about the weather. It's because you need to decide whether to put on a coat, wear short or long sleeves, or bring your gloves.

Driving the future

I once facilitated a goal-setting session to create measures for an organization. We developed a series of measures related to acquiring new customers. One person nervously raised her hand and said, "But that seems unrealistic, because we don't get that many new customers."

That's the difference in thinking about measures as a way to capture the state of your business instead of as a mechanism to drive action. She was using measures as historical tools to describe what happened in the past. Aside from providing some interesting information for an annual report, this way of using measures drives little value. Not surprisingly, those numbers changed little during the course of several years.

I challenged her and the board to use their measures more actively. They needed to determine a plan for how they were going to increase the number of customers. Each month, they would review the metrics and change actions if they weren't making progress.

The point is that if you use measures simply to record the past, then not much is going to change. Measures should be proactive tools to help you change the future.

> The **real purpose** of measuring something **is to drive action.**

Four tips

Here are some tips for driving action through measures:

1. Build your measures around the key drivers and decisions over which you have control.
2. Don't use the same measure as your boss does. Determine the specific and unique contribution you will make to his or her measures.
3. Ask yourself, "Does this measure provide enough guidance for me to take action?"
4. Align the level of precision of your measures with your decision making. For example, don't measure customer satisfaction to the 1/100th of a point if changes at that level aren't going to impact your actions.

I'm often surprised by the number of people who spend considerable time thinking through metrics but then put them away until the end of the year. If you aren't going to use metrics to influence or change your actions, don't waste the effort capturing them in the first place.

Metrics should drive the future—they should not simply be a reflection of the past. QP

BRADLEY KOLAR is the president of Kolar Associates in Naperville, IL. He earned a master's degree in computer science from Northwestern University in Evanston, IL.

MANAGING YOUR MEASURES

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