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QP

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SURVIVING THE RECESSION

VOLUME 42/NUMBER 6

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- TAKE CARE
Quality of care versus quality of service in healthcare.

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Hold Tight

Let quality be your rock

TALES OF ECONOMIC hardship are easy to come by these days. So, to be honest, when QP editors set about assembling the collection of anecdotes on quality and the economy contained in this month's feature story, "Riding the Storm Out," p. 29, we braced for the worst.

When readers' firsthand accounts began to hit my inbox, I was admittedly surprised. The stories we received aptly capture the steadfast, determined and hard-working nature of those in the quality profession—ideals I knew existed but had worried might be shaken given the current conditions. Also heartening to see were the pure and unwavering belief in the value of quality and the undercurrent of optimism among the sage advice for surviving difficult times.

The key takeaway for me was that these readers are passionate about what they do—the backbone of success, as most successful people will tell you.

One caveat: The majority of our contributors were still gainfully (and no doubt gratefully) employed, so they are not struggling to find a job as I know some of you are. One of our writers did lose his job during the production of this issue—his 10 warning signs you might be next are on p. 30.

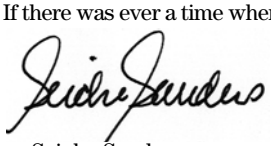
My hope is that whether you're currently employed or searching for a job, the observations and advice presented here not only help you survive, but also come out stronger on the other end of this recession.

This month's cover story also focuses on how sound quality management can be the armor that allows a company to repel negative economic forces and then excel when conditions improve. I love how this passage sums up why such resolve is crucial in a downturn:

"... more companies join the battle to share the market in prosperous times because it looks easy, leading to increased competition. So, for most companies, the market is divided among more players, and life doesn't actually get any easier. In hard times, if you are better than the competition, they will get out and leave you with a larger portion of the market," author Peter Grossi writes in "Prepared for Battle," p. 18.

The month's editorial focus—trends and developments shaping the future of quality—somewhat defaulted to discussions of the economy's impact on the profession. But, I'm glad. During these difficult times, it's even more important to band together, draw inspiration and advice from peers and mentors, network like crazy and find every possible way to prove the long-term value of quality to management.

Pass on these articles, e-mail them via www.qualityprogress.com, discuss them or post them in the break room if you want. Be a voice, speak up and maintain your place at the table. If there was ever a time where quality should be your company's shield of armor, it's now. QP



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INBOX

Strong safety

With the nomination of former New York City Health Commissioner Margaret Hamburg to head the U.S. Food and Drug Administration (FDA), innovative ideas to enhance food safety are needed now. Here's one:

We should request that the FDA use non-FDA quality professionals to audit food harvesting, processing and storage facilities for food safety. Specifically, the FDA could make use of ASQ's certified hazard analysis and critical control point (HACCP) professionals to perform local audits and thus expand the inspection capacity of the FDA.

This idea has plenty of positives, including low cost and professional enhancement, as well as some potential drawbacks, such as authority limits and corruption potential. But those issues can be addressed. Food safety enhancement opportunities are there now. We need to take advantage.

John Haury
Principal consultant, Applied Statistics
Camarillo, CA

Bad behavior

Robert P. Warda's article, "Know Thyself" (April 2009, pp. 30-37), is a timely and well-written piece that closely aligns, yet improves upon, concepts from Paul Hersey, Kenneth Blanchard and Dewey Johnson's work on organizational behavior. I heartily encourage Warda to expand this article into a book.

Having been through many quality improvement initiatives in which staff functioned as nails and senior management as hammers, I have firsthand experience suffering through processes that don't consider or assess the maturity of the prevailing culture.

I strongly agree that project-centered quality improvement without consideration of the supporting culture is best described as the firecracker approach. There's a lot of sizzle, then a sparkle, then a bang, and there's the program. But, before long, all that's left is a cloud of smoke, some bits of paper in the air and the lingering fumes of gunpowder.

Again, this is a great piece of work—hats off to Warda.

Michael R. Engblom-Bradley
Petroleum facility integrity specialist
Anchorage, AK

Delivering improvement

In their article, "Human Touch" (March 2009, pp. 30-35), John Nelson and Jean-Paul Lemarquis have it right when they say that reducing defects also shortens delivery intervals and reduces cost. There is more to it than that, though.

Consider the lean model of just-in-time (JIT) delivery. Its primary goal is quicker response to customer demand—in other words, shorter delivery intervals. That entails shorter queues and wait times and smaller JIT lot sizes.

That combination of quickness, frequency and leanness exposes defects early while the causal trail is fresh. It also avoids all manner of costs with extensive searches for root causes that, in view of stale audit trails, are often futile.

Get the quality and lean models working together (or treat them as one), and the benefits are compounded.

Richard J. Schonberger
President, Schonberger & Associates
Bellevue, WA

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On a small island located 1,000 miles off the coast of India, ASQ member Milton Kowalewski offers certifications to local Philippine workers. By improving their job qualifications, Kowalewski helps workers obtain better paying jobs and better provide for their families. The pictures above of Kowalewski with the Philippine workers exemplify the spirit of the *Quality for Life* initiative.

If you use your quality expertise at work, in your personal life, or through volunteer efforts, we invite you to share your *Quality for Life* story. Stories can be submitted to qualityforlife@asq.org. You can also share stories or post comments on our blog at http://www4.asq.org/blogs/quality-life/.

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Settling on a system

Q: How many different International Organization for Standardization (ISO) auditing standards are there for determining effective operations for business management systems (BMS) or quality management systems (QMS)? When evaluating the effectiveness of a BMS or QMS via auditing, is there a matrix that will indicate different ISO auditing standards that are compatible with one another, as well as how they differ in content and degrees of compliance?

Mike Whelan
Quality assurance engineer
Saab Grintek Defence
Centurion, South Africa

A: I would suggest you start by looking for basic information on management system standards on the ISO website. In fact, ISO has dedicated an entire section to outlining specific applications of its various standards.[1]

These sector-specific standards are compatible with the ISO 9001 management system standard. While I was not able to find a matrix that specifically addresses your inquiry, the ISO 9001 standard can be interpreted for any business.

There are no degrees of compliance with the basic standard, with the exception of design requirements. If your organization doesn't design its products or services, then those requirements are not applicable. Bear in mind that you can't just assume that's the case. You will need to make a convincing case to an auditor.

Other than that, you are either in compliance or you are not. When you talk about degrees of compliance, there's a chance you may be thinking of the Software Engineering Institute's Capability Maturity Model Integration, which has levels of compliance.

There are also other ISO-based standards that are not administered by ISO itself, such as TL 9000 for the telecommunications industry and AS9100 for the aerospace industry. But, again, these are sector-specific adaptations of the ISO 9001 standard.

This may be covered in one of the many books written about QMS auditing. An oldie but goodie is *Management Audits: The Assessment of Quality Management Systems* by Allan J. Sayle. I would also be remiss if I didn't suggest *The ASQ Auditing Handbook*, third edition, edited by J.P. Russell.

Ken Cogan
President
Navis Pack & Ship MD-1106
Annapolis Junction, MD

REFERENCES

1. International Organization for Standardization, "Specific Applications," www.iso.org/iso/iso_catalogue/management_standards/specific_applications.htm.

FOR MORE INFORMATION

West, John E. "Jack," "ISO 9001 and Advantage in the Marketplace," *Quality Progress*, April 2008, pp. 73-74.

All talk

Q: At my new job, we pay lip service to ISO 9001, which is required by the company to which we sell. But lip service is pretty much all we do. I'm continually asked to develop documentation for processes we don't follow. Can I get into legal trouble for doing this? I was out of work for six months before finding this job, and I need to hang on to it.

Name withheld

A: I cannot provide advice on potential legal issues with your company. I can tell you, however, that if you are certified to ISO 9001, a third party called a registrar is responsible for reviewing compliance to the standard. If the registrar finds your compliance is lacking and the company is not being honest, it can withdraw the certificate.

If your company is claiming compliance to the standard and does not have a third-party audit to back that claim, the customer may choose to cease doing business with your company if they find you are not being honest.

If your company is concerned that legal issues could be a problem, then I would advise you to work through the chain of command at your company.

Lorri Hunt
President
Lorri Hunt and Associates
Kansas City, MO

FOR MORE INFORMATION

Arter, Dennis, "Beyond Compliance," *Quality Progress*, June 2000, pp. 57-61.
Hunt, Lorri, "Energize Your QMS," *Quality Progress*, October 2008, pp. 20-25.

Check your specs

Q: I work at a pharmaceutical manufacturing firm. The general formula followed in the pharmaceutical industry for the tightening of product specifications is: average ± 3 sigma.

I have the following questions:

1. *How many data points would be ideal to calculate the product specification's 3-sigma limits?*
2. *What is the advised limit for standard deviation (sigma), knowing that the rise in sigma will give false and high limits?*
3. *What is the cutoff point for standard deviation at which we would need to say "We need to wait for more data"?*
4. *Why not 6-sigma limits, which would give us more cushion and also sound better than 3 sigma? This question is answered in the December 2008 issue of QP (Expert Answers, pp. 12-13), but more elaboration would be great.*

Pannala Raghu Ram
Hyderabad, India

RS

A: To answer your first question, the approach to setting the product specifications you describe is based on process capability and the desired percentage of the product that is within the specifications.

Assuming Gaussian distribution of random variation, exact knowledge of the mean (μ), standard deviation (σ) and the process in state of statistical control with μ ± 3σ specification limits, 0.0027 fraction of product is outside the limits. Under the same assumptions, a much smaller fraction of product is outside of wider μ ± 6σ specification limits. Shift of the average from target or an increase in random variation will result in a rise in the fraction of product outside the specification limits.

The random variation in a product is a result of random variation in the process and raw materials. The random variation in the product is minimized when the manufacturing process is stable or in a state of statistical control, with no special causes for deviation from target or increased random variation.

Therefore, the mean (*m*) and the standard deviation for setting the specification limits of a product using the aforementioned approach need to be estimated using product manufactured when the process is in a state of statistical control.

Specification limits calculated using those estimates contain a smaller fraction of the population inside control limits and a larger fraction outside control limits compared to the hypothetical case of known mean and standard deviation. I've calculated those expected fractions using the t-distribution approach. They're shown in Table 1 for various sample sizes (*N*) from 2 to 1001 (numbers of degrees of freedom, *N* – 1, from 1 to 1000). In the last row, the fractions for an infinite number of degrees freedom, with exact knowledge of the mean and standard deviation, were calculated using Gaussian distribution.

The fractions of product outside the specification limits in the table allow for choosing a reasonable tradeoff between the data that need to be collected and the expected fraction outside the specification limits.

Questions two and three can be answered based on the formulated product application requirements, taking into account the product's fitness for use, among other things.

Setting the specifications based on the product requirements is a more effective approach than setting them based on the process capability. When you set the specification limits based on the product requirements, the fraction of product outside the limits is a function of the standard deviation of random variation and the shift of the manufacturing process from the target.

In that situation, to provide for an acceptable fraction outside the specification limits, the allowable process shift and standard deviation of random variation can be determined. If the process is capable of generating product with an acceptable fraction outside the specification limits, the task is completed. Otherwise, the process capability needs to be upgraded by various methods, including robust process and product design, so the process or product is resistant to various sources of variation.

Specification limits / TABLE 1

Degrees of freedom	Fraction outside	
	m ± 3 sigma	*m* ± 6 sigma
1	0.2048	0.1051
2	0.0955	0.0267
3	0.0577	0.0093
4	0.0399	0.0039
5	0.0301	0.0018
6	0.0240	0.0010
7	0.0199	0.0005
10	0.0133	0.0001
15	0.0090	2.43E-05
20	0.0071	7.24E-06
30	0.0054	1.39E-06
40	0.0046	4.73E-07
60	0.0039	1.23E-07
120	0.0033	2.15E-08
1,000	0.0028	2.76E-09
∞	0.0027	1.97E-09

Regarding your question about 3 vs. 6 sigma, indeed, *m* ± 6 sigma specification limits drastically reduce the fraction of product outside the limits—with any sample size used for the calculation of the mean and standard deviation—compared to *m* ± 3 sigma limits.

Wider specification limits are acceptable only if the product is still fit for use when it is ± 6 sigma deviations from the mean (target). Such specification limits can be used if the variation in product is sufficiently small to begin with or if it is reduced through improvements in the process and product designs.

Jeffrey E. Vaks
Roche Molecular Diagnostics
Pleasanton, CA

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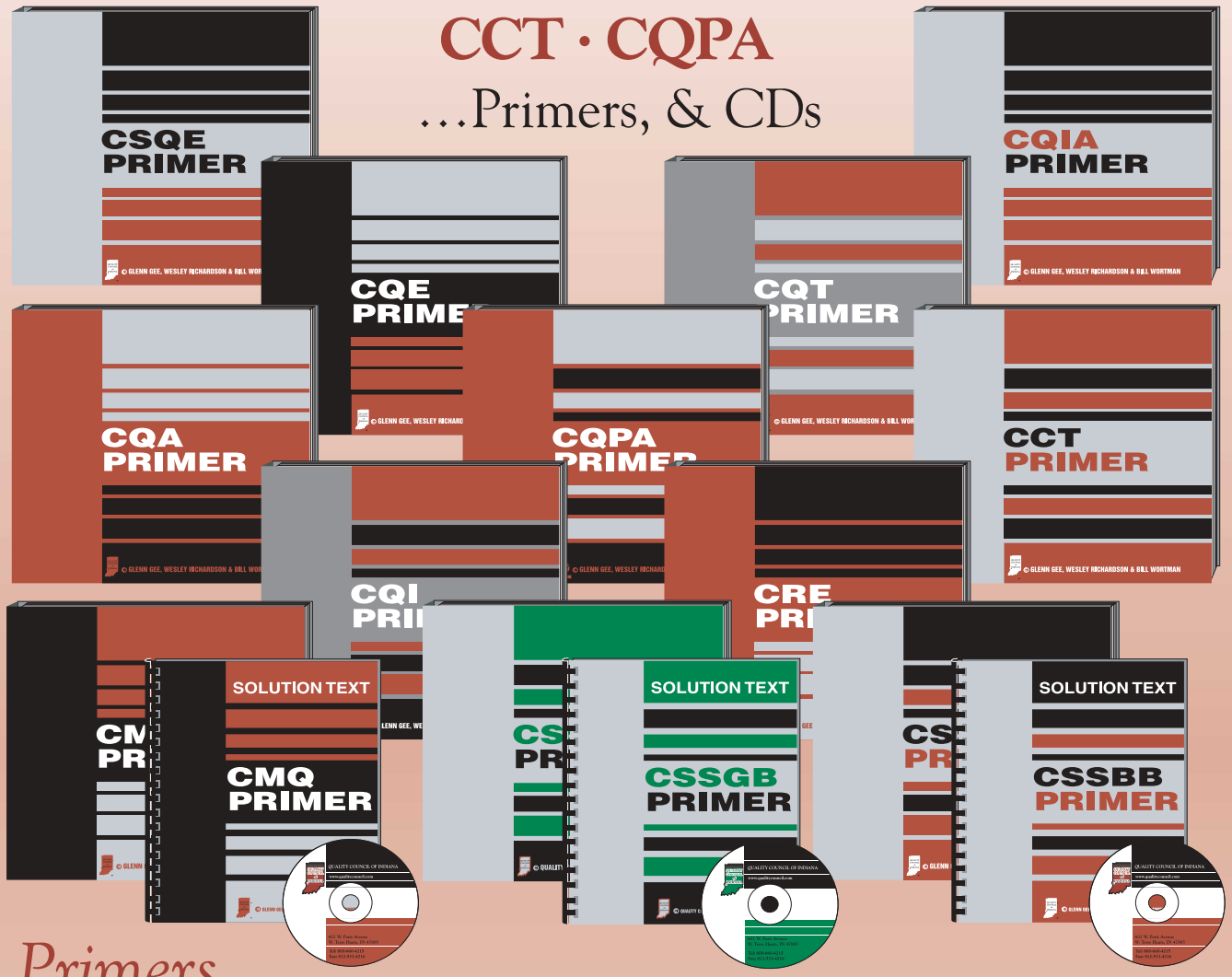

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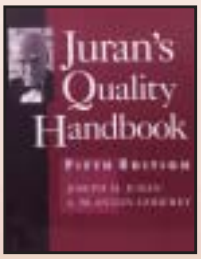

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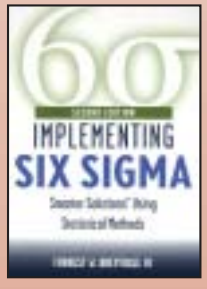

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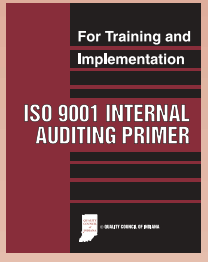

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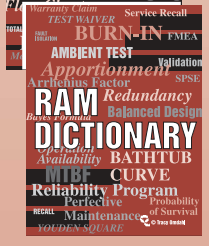

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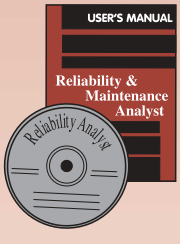

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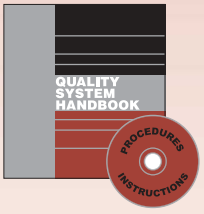
By Edenborough

$60

For Both Book & CD

The QSH details the selection, organization, and writing of quality documents. The disk contains procedures and work instructions. ISO 9001:2008 updated.



AUTOMOTIVE

Ford Finds Its Way

Quality-minded Mulally leads automaker through troubled times

Editor's note: As the U.S. auto industry struggles to remain solvent, there's one company that has bucked the downward trend: Ford Motor Co. Despite the economic downturn, Ford has found a way to control costs, gain market share and increase production.

What's making the difference? Many say it's the quality mind of Alan Mulally, president and CEO of Ford since 2006. Recently, Jim Buckman, executive director of the Juran Center at the University of Minnesota's Carlson School of Management and a senior member of ASQ, interviewed Mulally at Ford's headquarters in Detroit.

"So, you see what we're doing here: Every Thursday morning, we do a gigantic PDCA (plan-do-check-act cycle) of the whole global business," said Alan Mulally, the president and CEO of Ford Motor Co. That sums up Mulally's approach to business—a focus on quality management.

In the 1970s, Ford Motor Co. asked W. Edwards Deming to reintroduce ideas of continuous improvement and contribute to the company's quality-based renewal. Those efforts carried the company to success in the 1980s through 2000. Then, suddenly, Ford's bubble burst as tire blowouts put the company's reputation in the ditch—along with too many of its SUVs. To get things back on track, Ford needed change.

In 2006, Ford Board Chairman Bill Ford recruited Mulally from Boeing Co. Mulally became the first industry outsider in Ford's century-plus history to play the lead role. Adding to Ford's quality lineage, Mulally was a diligent student of the Toyota Production System (TPS) at Boeing and an accomplished executive leader in all things lean. Ford called upon him to use his leadership skills and eye for quality to resurrect Ford.

Perhaps sensing difficult times ahead, Mulally and Ford quickly refinanced the company and created a line of credit that could withstand a downturn. Later, analysts pointed to this move as the reason Ford—unlike General Motors (GM) and Chrysler—did not take a government bailout.

Of course, no amount of credit can restore product quality and reputation with customers as rapidly as Ford has done. The right type of leadership with energy and enthusiasm can spark a change and make a difference. Ford has found that sparkplug in Mulally.

The right type of leadership with **energy and enthusiasm can spark a change** and make a difference. Ford has found that sparkplug in Mulally.

MULALLY

Some key elements of Ford's resurgence under Mulally's watch have been a radical simplification, a global management system and weekly PDCAs, all of which, so far, have produced impressive results:

- Ford is gaining market share at a fast clip. It just outsold Toyota in April to reclaim the No. 2 spot in the United States.
- New Ford models have received high marks from J.D. Power and Associates and *Consumer Reports*.
- The Ford Fusion has become one of the best-selling mid-size sedans in the United States.
- Ford's cash drain, measured monthly, has been more than cut in half.
- Ford is planning a 25% increase in production at its U.S. plants. GM and Chrysler are more or less shutting down for the summer.
- Rick Wagoner, the CEO of GM, was replaced. The CEO of Chrysler, Robert Nardelli, will be leaving soon.

Radical simplification

Upon joining Ford, Mulally's search for simplicity was radical and immediate. He preserved three brands—Ford, Lincoln and Mercury—and sold off Jaguar, Land Rover and (soon) Volvo. This was preceded and accompanied by a branding and cultural move to "One Ford." As a result, 76 vehicle models became 13.

Hundreds of key parts, such as ignition switches and door locks, are being standardized across all models. This contributes to long-term customer convenience and the "feel" of a Ford vehicle. It has also freed time and energy of hundreds—perhaps thousands—of engineers around the globe. Billions of dollars are saved in internal costs and parts volume pricing.

Global management system

Ford's global management system is an extensive, comprehensive and dynamic

mechanism that allows for transparency and weekly visibility of most critical operating metrics across the globe. Moreover, leaders know not only their weekly performance to plan, but also that of their peers.

Reporting documents move little squares on grids from green to yellow to red coloration based on tracking performance to plan. Leaders are induced to cooperate and create broad "One Ford" success, but they also feel pressure to find solutions and not let problems linger. Psychologically, they have much on the line, as well as their people's job security and their own interests.

Weekly review

These pieces are submitted to headquarters, and a two-hour global videoconference each Thursday morning is attended by senior leadership in Dearborn, MI, and leaders from around the world. Each senior leader reports and responds as critical problems are addressed. Leaders are connected via video or are seated at conference tables. Around the edges of the room, there are dozens of chairs for guests.

"The guests are frontline workers," Mulally said. "We could have our senior vice president of manufacturing bring his line workers from the Michigan truck plant. He introduces each guest at the start of the meeting. At the conclusion of the meeting, I personally go to each guest and ask their opinions and suggestions for improvement."

The obvious message: United Auto Workers are also a vital part of "One Ford" and not just considered a cost burden.

Beyond today's turmoil

There's no doubt that Mulally, 63, values the players around him and the roles they play. He understands his role, too, and recognizes the others who have held his position.

Walking down a hallway at headquarters, while noting historic photographs of the company he leads, Mulally couldn't temper his enthusiasm. "Can you imagine this job I've got?" he asked. "You know, I can barely wait to get out of bed on Thursday mornings and get into our weekly review."

That's when you see the look of a young athlete on game day in Mulally, getting ready to lead his team to a win. At the same time, you can see a teacher in him. Not only is Mulally teaching Ford a new way to operate, but he is also teaching a new way to think.

Who knows? Maybe someday Mulally's gifts as a teacher of quality leadership can be widely shared. Just as he carves out his own place in the executive lineage at Ford, Mulally has become an heir among quality leaders, bringing full life and updated expression to the value-creating ideas of Walter Shewhart.

Could Ford's nascent global management system become a genuine breakthrough in quality improvement systems such as TPS, Six Sigma and Baldrige?

What more can we learn from leaders like Mulally and then, in turn, develop, educate and inspire others to follow in his path? Mulally's knowledge and skills are rare but not impossible to acquire.

He has sparked positive change at Ford. Where else can we take that spark?

—Jim Buckman

AWARDS

MEMBER RECEIVES NATIONAL AWARD

ASQ member Subir Chowdhury received an Outstanding American by Choice Award from the U.S. Citizenship and Immigration Services agency during a recent naturalization ceremony in Detroit.

The award recognizes the contributions of naturalized U.S. citizens who have demonstrated outstanding professional achievements and leadership, civic participation, responsible citizenship and a commitment to the United States.

Chowdhury, an author and consultant, joins an elite group of past award recipients, including Elaine L. Chao, former secretary of the Department of Labor; Carlos M. Guiterrez, former secretary of the Department of Commerce; and John Shalikashvili, former general and chairman of the Joint Chiefs of Staff, U.S. Army.

This year, two others also received the award: Rep. Anh "Joseph" Cao (R-LA), the first Vietnamese American to serve in Congress; and Peter C. Lemon, a retired Army sergeant and Medal of Honor recipient.

Chowdury has received other honors in past years, including ASQ's Automotive Division's William P. Koth Award and ASQ's first Philip B. Crosby Medal.

SOCIAL RESPONSIBILITY

ASQ Kicks Off SR Initiative

ASQ rolled out its social responsibility (SR) initiative with an event in Milwaukee in April attended by more than 200 area business leaders.

Highlights included a keynote presentation by photographer Chris Jordan, a speech by Milwaukee's mayor and the presentation of a $20,000 Community Good Works grant to the Milwaukee Rescue Mission.

ASQ and sponsors for the event, including Northwestern Mutual, Marquette University and Johnson Controls, were on hand to hear about the business case for SR and the role of quality in achieving results.

"As organizations develop further initiatives, quality will provide the tangible methodologies to produce sustainable results while increasing operating efficiencies and cost savings," said Roberto Saco, ASQ president.

Milwaukee Mayor Tom Barrett reported the progress made by the Metro-Milwaukee Green Initiative, launched earlier this year by the City of Milwaukee, ASQ, Milwaukee County and the Metropolitan Milwaukee Association of Commerce.

Members of the initiative hope to learn best practices in sustainability from SR experts and one another. Barrett said 52 companies and organizations have committed to the initiative.

There are other plans to keep momentum behind the SR initiative: ASQ published a monograph of case studies describing how businesses are using quality tools to achieve their SR initiatives, an international SR think tank will be established later this year, and a conference is being planned for 2010 that will feature executive roundtables and mark the release of the new ISO 26000 Guidance on SR voluntary standard.

For more details about these SR activities, visit www.thesro.org.

AT THE EVENT, ASQ awarded a $20,000 Community Good Works grant to the Milwaukee Rescue Mission, Wisconsin's largest homeless shelter. Patrick Vanderburgh (center), executive director of the rescue mission, accepted the check from Paul Borawski (left), ASQ's executive director and chief strategic officer, and Roberto Saco, ASQ president. The grant will be used to implement a quality process at the shelter using case management software.

Who's Who in Q

NAME: Debashis Sarkar.

RESIDENCE: Mumbai, India.

EDUCATION: Master's degree in management from BITS, Pilani, India.

CURRENT JOB: Sarkar is the head of the organizational excellence group at ICICI Bank—India's largest private sector bank—and is responsible for driving quality and improvement across its varied businesses.

PREVIOUS JOBS IN QUALITY: He was the head of corporate quality at Marico Industries, a regional quality manager at Coca-Cola India and the production manager and technology manager at Unilever India.

INTRODUCTION TO QUALITY: In 1991, Sarkar began his career at Cadbury India Ltd. He first worked as a trainee and later a factory quality executive, responsible for driving quality assurance for ice cream products on the shop floor.

ASQ ACTIVITIES: Sarkar has been a senior member of ASQ since the late 1990s, and he serves as the chairman of the ASQ Automotive Division—Team India.

RECENT HONOR: Last year, Sarkar received his second Golden Quill Award from ASQ Quality Press.

PUBLISHED: He is the author of several books, including *Quality in Business, Lessons in Six Sigma, 5S for Service Organizations and Offices—A Lean Look at Improvement* and *Lean for Service Organizations and Offices—A Holistic Approach for Achieving Operational Excellence.* Sarkar has also written several articles for magazines and newspapers, and he is a regular columnist for sixsigmaiq.com.

FAMILY: Married to Sudeshna; one daughter, Trisha.

QUALITY QUOTE: Quality is about changing the mind-sets of people and enhancing the performance of business.

Mr. Pareto Head

BY MIKE CROSSEN

STANDARDS

PANEL PROPOSES STAKEHOLDER ENGAGEMENT STANDARD TO ISO

The International Organization for Standardization (ISO) Technical Management Board has submitted a proposal to ISO for a new standard to provide guidance on stakeholder engagement.

The proposed standard would guide the process of identifying and engaging with stakeholders, with the intent to provide an informed basis for an organization's decisions.

As the U.S. member body to ISO, the American National Standards Institute (ANSI) invites all interested stakeholders to submit comments by June 26. Send them to Steven Cornish, ANSI senior director for international policy, at scornish@ansi.org. For more details, visit www.ansi.org.

ASQNEWS

SURVEY SAYS About 30% of ASQ members said they consider themselves loyal to ASQ, a statistically significant increase of 6% from the same survey taken three years ago.

Market Probe analyzed the responses of 423 members and found that members' overall satisfaction with ASQ increased significantly from 28% in 2006 to 35% this year. Sixty-four percent said they are likely to renew, significantly down from the 70% who said they were likely to renew in 2006.

Overall satisfaction with ASQ sections, forums and divisions has remained stable during the past three years, the survey revealed.

All of these results indicate a significant difference between 2006 and 2009 at the 95% confidence level.

ENTERPRISING ENDEAVORS Tyco Electronics, the engineered electronics parts manufacturer, and the Shafallah Center, an organization that cares for students with mental and physical disabilities in Qatar, have become ASQ enterprise members, joining 20 other organizations at this level of membership. For more details on enterprise memberships, visit www.asq.org/enterprise.

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 the most recent Quick Poll:

"Whom do you think should shoulder most of the blame for the recent food-safety crises?"

- Growers and manufacturers 57.5%
- State and federal regulators 22.7%
- Foreign suppliers 13.7%
- Third-party auditors 6%

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

"What quality method is most effective at cutting costs and increasing efficiency during difficult economic times?"

- Lean
- Six Sigma
- Lean Six Sigma
- Total quality management

In 50 Words Or Less

- For well-prepared organizations, the economic environment is hardly more of a challenge in bad times than in good.
- Regardless of the economic conditions, the focus should be on sound quality management.
- Adhering to those principles will keep costs down naturally and prepare the organization to weather difficult circumstances.

by Peter Grossi

Prepared for Battle

Defend yourself **in any economy** with **sound quality management**

THE CURRENT CONDITION of the global economy has many organizations scrambling to cut costs by any means necessary. During these difficult times, there is less money circulating, income is harder to maintain, and there is increasing pressure from customers to lower prices.

What organizations need to keep in mind, however, is that while the impact of a recession may be significant from a psychological perspective, in reality the application of sound quality management principles has a much more significant effect on an organization's success than the state of the economy.

There are many companies that have prospered in recessionary times, and they have done so by focusing their efforts to meet the demands of the market. And while there are countless issues that can affect the prosperity, even the survival, of companies, the application of these principles can help make hard times a lot easier.

Constant response

A supermarket provides a good metaphor to illustrate the false impressions created by macroeconomic factors. If you go shopping late in the evening when the store is quiet, you expect shorter lines at the checkouts and more rapid service; but what actually happens is the supermarket anticipates the reduced demand and opens fewer checkouts, so the lines turn out to be the same as busier times.

In a similar vein, more companies join the battle to share the market in prosperous times because it looks easy, leading to increased competition. So, for most companies, the market is divided among more players, and life doesn't actually get any easier. In hard times, if you are better than the competition, they will get out and leave you with a larger portion of the market.

The difference between boom and recession is not simply a matter of prosperity; it has more to do with adaptability and being better than the competition. In other words, it is an internal matter more than it is an external one.

There is an exception to this rule that applies when the market is in serious decline. This can happen when a competing technology comes to the market and makes your existing products unattractive or obsolete. It can also happen when you sell a product on the back of another product (for example, if your company supports or accessorizes products made by another company). In this case, you can have the rug pulled out from under you when the products you support are no longer on the market.

But in other circumstances the basic principle remains the same: If an organization is competitive and is prepared to follow the needs of its market, it will survive and prosper.

The following examples illustrate how the application or neglect of well-known quality management practices can lead to dramatic consequences, regardless of the macroeconomic climate. These examples can be analyzed in greater detail to identify further good practices, but for the sake of brevity, only a few of the more obvious ones are mentioned here.

Delivering disaster

Company X was (note the past tense) a distributor of electronic components. It faced increasing competition from larger companies and had to find ways of maintaining its profits, so it chose to use the cheapest carrier it could find to reduce its order-related costs.

It subsequently found that about 30% of its sales team's time was spent handling customer complaints arising from delivery problems, which led to loss of reputation, loss of orders and employees distracted from their primary responsibility of generating business. And, because the company had to send repeat deliveries, its order-related costs also increased.

Company X tried to respond by cutting prices, but that simply ate away its margin further and had little impact on customer satisfaction. The cheaper prices attracted new customers, who were lost just as quickly because of delivery performance. In the end, the company ran out of money because the bank lost confidence in the company's ability to repay its increasing debt.

Company X had introduced invoice discounting as a means of injecting cash into its balance sheet by using a finance company to collect debts. That cash injection didn't last long, however, and the crisis soon returned.

The company had been repeatedly advised that the cheap carrier was nothing more than a quick way to ruin a business, but the illusion of saving money was too compelling to resist. The other illusion—that the company could save itself by manipulating the balance sheet—offered false hope and could never have made any real difference, because the weakness was in revenues.

At the root of the problem was the company's failure to implement a simple review of customer-value perceptions and satisfaction. For example, ISO 9001 requires that attention be given to understanding customer requirements, monitoring performance, ensuring purchased products or services are adequate, and taking steps to deal with evidence of poor performance.[1]

None of these things is difficult when clearly understood. But when company directors get focused on short-term cash, they can easily be baited into cutting

In hard times, if you are **better than the competition,** they will get out and leave you with a **larger portion of the market.**

essential quality management activities in favor of a financial mirage.

Purchasing problems

Focusing too intently on cutting costs from a purchasing perspective can be just as damaging. Company Y was (there's that past tense again) a manufacturer of electronic equipment. It assembled and sold items made under license from another company's designs. The products were of good quality, but the profit margin depended on obtaining components at good rates via bulk purchases.

At any given time, a large number of nearly completed products were stacked up, each awaiting a very inexpensive item such as a screw or a cable tie. For weeks, they remained in that incomplete state. The problem was that the required items were bought cheaply by the thousands, and it was not considered economically feasible to buy small quantities, even if it was required to alleviate the backlog.

The penalty for poor planning should have been a few dollars on extra delivery charges and a few cents per product (less than 0.1%) for the delayed batches. But, in the end, the situation tied up large amounts of cash, delayed deliveries, made customers unhappy and eventually sank the company.

In this case, Company Y failed to understand the basic principles of workflow and waste. Its leaders didn't comprehend that waste also included the money the company was throwing away on stagnant inventory and the diverting of production items into holding areas.

In *Gemba Kaizen*, Masaaki Imai describes the seven principle areas of waste that have since been identified as key areas addressed by lean.[2] The problems experienced by Company Y arose from neglecting several of these principles—specifically inventory, motion and waiting. This example shows that waste is not just about the finer points of efficiency; it can take a whole company down.

Keep it clean

Even daily tasks we take for granted can sink a company. For example, Company Z provided the service of winding electrical transformers and frequently used several coil-winding machines. The wire used to wind the transformers was coated in an insulating film, which created dust during operation. The dust accumulated in the machinery and was drawn into the air ducts around the motors, which were not maintained. As a result, every couple of weeks a machine would overheat and stop working because dust clogged the motor bearings.

Each time this happened, a manager disassembled the machine, stripped down the motor, cleaned the dust out and reassembled the machine. On occasion, the damage was so severe that another motor had to be ordered.

While waiting for delivery, production was stopped on the machine for at least half a day and possibly as long as two weeks. It would have taken only a few seconds each day to keep the outer covers clean and a few minutes each week to clean out accumulated dust inside the motors.

The costs weren't confined to the replacement parts or the manager's time that could have been spent on other things. Delayed production also affected customer service, and the company eventually failed.

The principle of total productive maintenance, in which operators perform basic maintenance regularly and use free moments to keep their areas clean, has been promoted for nearly half a century, and yet it is unheard of by many companies. It certainly could have helped Company Z.

Improving value

Dealing with problems such as the ones encountered by the aforementioned companies only makes it more difficult to maintain profits, even when times are good and the product is in high demand. In fact, these examples were taken from a time of economic prosper-

ity. But when there is strong competition or times are difficult, the prospects are bleak indeed. So how do you cut costs?

The most important rule is that whatever you do to maintain your financial viability, it must not have a visible effect to the customer. Cutting costs in ways that delay output, create hostility or compromise relations with customers is not the answer.

In the end, that will do two things: reduce the perceived value of your products or service—leading to loss of business and downward pressure on your prices—and increase recovery costs from complaints and loss of morale. That's a double whammy you can certainly do without.

Prosperity depends on how well the company focuses on **adding real value.**

Ideally, you want to cut costs in such a way that you improve the apparent value of your products or services. That will increase the profit margin and lead to more orders and reduced recovery costs.

It is overly simplistic, however, to state that reducing costs automatically means reducing the quality of a product or service. The following situations call for corrective actions that are performed with quality in mind but, in the end, also cut costs:

- **Delaying products or services for any reason without adding value.**

This situation invariably results in increased costs through stagnant stock and reduced customer satisfaction that stems from being forced to wait for delivery of the product or service.

There are always excuses for putting projects on hold. Sometimes, they are planned in such a way that the required parts, information or other resources are not available when needed.

Sometimes, products or services are overproduced or produced unnecessarily early. While they are being produced, other products in demand are delayed and their customers kept waiting.

In many cases, delays arise because the information required to plan and progress the work is not available to the people involved.

Effective management of information is inexpensive if it is thought through and organized. A comparatively small organizing cost can lead to substantial recurring gains.

- **Using cheap and unreliable materials or services.**

It's true that you get what you pay for, so you should expect to run into problems when you contract with the cheapest supplier and disregard the quality of product or service.

Of course, you don't want to pay for more than you need, and some purchasing options may offer features you do not need. You shouldn't pay extra for next-day delivery if a little planning could allow you to order a couple of days ahead. You shouldn't pay extra for support options if you don't need them. You shouldn't pay extra for a brand name if you are only concerned with a product being delivered to specifications.

But you should pay extra for any features that might wreck your own processes if absent. These value-adding, supply-side features may include consistently compliant items, on-time deliveries, low failure rates, ease of use and reliable support.

- **An ineffective ordering process for your customers.**

A little time spent making sure customer orders are clear and understood can save a lot of time and wasted production, not to mention unnecessary disputes that lead to lost business. In fact, this aspect is a requirement of ISO 9001 because it often affects perceived quality of service and relationships.

- **An inefficient workplace.**

Having frequently used materials (tools or documents) far from their points of use wastes time. Disorganized storage can lead to time wasted in search of things, as well as damage or other losses.

A few seconds or minutes lost here and there might not seem like much, but they add up to a startling proportion of labor costs and create the impression the company doesn't care. It doesn't cost much to review and improve physical layouts and access to resources, which can lead to cost savings while enhancing the employees' view that they are valued.

- **Failure to properly maintain resources.**

Poor maintenance results in critical requisites of a process becoming unavailable at inconvenient times and leads to workflow delays. Many companies wait for their resources to break down or run out of the materials necessary for proper function. Regular maintenance need not be expensive or time consuming; it could amount to a simple check and cleaning at frequent intervals.

For administrative resources, it may mean keeping the information systems (computers and papers) well organized and structured. The unexpected absence of vital materials could be avoided by making the stock situation easily visible—for example, by putting the materials next to the machine rather than hidden in a cupboard. Given some careful planning, effective measures can be implemented at little or no cost and can reap dividends.

Perhaps the most important factor in saving costs is the attitude of the people. If people are surrounded by inefficiency and waste, they will be less motivated to be creative and improve their own efficiency.

At many companies, employees generally feel undervalued. These companies are surrounded by waste, and nobody believes they should be doing anything about it. Managers make rules and post notices that are easily avoided with plausible excuses, and nothing improves.

Military experts say you can't win a war from the air; you need to put the troops on the ground. Along those lines, you can't regulate efficiency by putting up notices and sending memos; you need to get out there and help people be constructively creative.

When attention is given to wastefulness in everything from workplace activities to supplier and customer relationships, it is easier for everybody to feel they are respected for making a unique contribution. This isn't about cash. Morale and creative input don't appear on the company ledger. But they do make a company more stable and profitable, and that can make all the difference in surviving hard times.

Sound investment

Regardless of the economic climate, by reducing waste and focusing on adding value, costs come down and performance goes up. The perceived value of your products or services increases, which combats the downward pressure on your prices, and the margin between price and cost improves from both directions. In times of recession, your weaker competitors will fail and get out of your way, and in boom times it will be more difficult for new competitors to muscle in on your market share.

These things can be achieved by implementing established and well-documented practices. It is not enough to talk about them and send people to training courses; it is necessary to apply them proactively, to have confidence they will work and to resist the temptation to sacrifice critical management principles in favor of the illusion of financial gain.

An important consideration is that company executives are not usually trained in quality management principles, and many see quality as someone else's job. They fail to understand that quality is about sound, efficient management practices—not simply inspection. They think money is more important than quality and fail to realize that management of quality is the key to financial success.

This tendency is fostered by the pressures brought on by a recessionary climate but is in no way justified by it. In boom times or recession, the prosperity of a company depends on how well the company adapts to the prevailing situation and market forces, and how it focuses on adding real (perceived, rather than imagined) value and reducing waste in its many forms.

Each organization operates in its own unique environment, and a simple formulaic approach learned in a training course doesn't generally work. Nor does manipulating balance sheets by invoice discounting or the sale and lease of assets.

These measures can help to overcome a short-term problem (perhaps related to expansion) but cannot sustain the viability of a wasteful company. These evils are just as damaging in boom or recessionary times, and companies that combat them will be more secure, whatever the economic climate. QP

REFERENCES

1. International Organization for Standardization, *ISO 9001:2008—Quality management systems—Requirements*.
2. Masaaki Imai, *Gemba Kaizen*, McGraw-Hill, 1997.

PETER GROSSI is director of 2k Business Services Ltd., a management consulting company in Ponthir Newport, Wales. He earned a doctorate in organization performance modeling from the University of Wales, Newport.

RIDING THE Storm Out

QP readers offer ideas for keeping your head above water during the recession

VIRTUALLY EVERYONE and every organization has been touched in some way by today's turbulent economy. Smaller budgets, unexpected layoffs and workplace shake-ups have become commonplace. Some businesses are feeling slight pains, while many others are struggling to survive.

No one is immune from these troubles, and that includes those in the quality profession. We asked QP readers to share their perspectives on what they see happening in their corners of the world.

Many of those who responded stayed upbeat and quickly offered ideas to help others. They're not waiting for the worst to pass; they're doing something to improve their organizations—and themselves—today. More than one said they see a silver lining and are convinced that these gloomy days can be the time for the profession to shine.

Ramping up quality efforts

Mary Ann Kaufman
Quality systems engineer
Consolidated Precision Products
Minneapolis

Sandra Dotson
Systems analyst
Intuitive Research and Technology,
Huntsville, AL

WE HAD BEEN weathering the downturn in the economy fairly well, but more recently, that changed.

As customers have delayed orders, we've had a few cuts and some reorganization. I expect more of both in the very near future.

Regardless of what happens to the workforce, however, I absolutely cannot let it affect our quality management system (QMS). Fortunately, I work for an organization that I truly believe will not sacrifice our QMS or the quality of our product. If there are significant cuts in resources, however, I may need to keep a closer watch to ensure compliance.

Our director of quality has said that this economy raises the urgency of improving quality. We need to and intend to continue efforts to reduce waste and costs, and improve product flow. That should position us even better in our market going forward.

NO ONE HAS been spared from the roller-coaster ride of today's economy.

The important thing now is not to get caught up in our own frustration and to keep our focus on the long-term goal.

Now more than ever, quality has to be made the top priority. There are limited amounts of money to be spent, and a decrease in quality will force that money to be redirected to pay for rework instead of allowing the company to grow and move forward.

Any type of decrease in quality has a far-reaching, negative impact. A company that experiences a drop in quality will feel that negative impact in a major way. Without a quality product, there are no buyers and no intake of money, which will result in the cutting of benefits, salaries and job positions.

"NOW MORE THAN EVER, QUALITY MUST BE THE TOP PRIORITY."

Mike Lawson,
ISO coordinator and
QMS management representative
Nucor Steel
Plymouth, UT

AT NUCOR STEEL Utah, we are looking at the current economy as an opportunity to strengthen ourselves. We are looking at ways to cut costs, reduce downtime and improve our processes without sacrificing quality so when the economy turns around, we come out even stronger.

It is an opportunity for us to reevaluate suppliers to ensure we are getting the best quality materials at the best price. We are taking the opportunity to provide additional training to help team members better understand the importance of the roles they play in our processes and how they affect the quality of the finished product.

We are reviewing our processes to identify areas where we could reduce material consumption. We are investigating causes of delays and ways to prevent these delays.

We realize that our product quality, as well as our reputation of taking care of customers, is vital to our success. When there is a downturn in the economy, the market is more competitive, and that is the time to improve quality.

Chuck Moore
Quality manager
Southern Champion Tray
Chattanooga, TN

Nanette Silveroli
Performance and quality improvement coordinator
Children & Families First
Wilmington, DE

Customer service will lead the way

IN THE CURRENT economy, some organizations focus on cost cutting, which ends up sacrificing quality and customer service. Those areas fall by the wayside as some organizations look to produce things even cheaper. The quality-focused companies will pick up the business when these cost cutters fail. Some customers try the cheaper and lower-quality products, but then they realize the hassle of dealing with a company that has inferior quality is not worth the few pennies they save in product cost.

Focusing on quality and strong customer service will result in strong financial performance in a difficult market and will help retain customers while bringing in new ones. Facilities in our industry are frequently closing while we continue to grow. Focusing on malapropos items results in a loss of focus on what matters: quality, integrity, customer service and people.

CHILDREN & FAMILIES FIRST, a private, nonprofit social services organization in Delaware, has more than 200 employees and serves more than 50,000 people each year.

To survive the economic downturn, we have expanded services through mergers with other nonprofits; diversified our funding sources; reduced overhead costs by consolidating telephone, cell phone, fax and copy machine services; and relocated staff from leased office space to office space owned by the organization. Teleconferencing and web conferencing are used to decrease travel costs and travel time.

We are accredited by the Council on Accreditation and continually seek ways to improve the quality of our services. In 2008, we adopted two evidence-based service models: functional family therapy and nurse-family partnership.

These two service models have sophisticated web-based client data systems that provide a range of reports to monitor quality. We believe that focusing on quality and customer service will give us the edge for future funding.

"FOCUSING ON QUALITY AND CUSTOMER SERVICE WILL HELP RETAIN CUSTOMERS WHILE BRINGING IN NEW ONES."

Keep auditing alive

Martha Tregellas
Auditor II internal auditor
Hawker Beechcraft Corp.
Wichita, KS

AUDITING IS THE future. We are challenged by higher customer standards while trying to lower costs. As we continue to look at ways to cut costs and capture more of the global market, we must look at outsourcing potential and meet all our customer needs. That means thinking globally.

Outsourcing has a huge impact on our overall quality. Trying to get everyone in the "food chain" to be on the same quality level is challenging. Not only do we need to ensure our internal processes are under control, but we also have the added responsibility to ensure our suppliers meet our standards. Incidentally, these may not necessarily be their standards.

The better we become at documenting our processes and controlling those processes, the more successful we will be. Auditing the processes both internally and externally should help standardize the quality. It goes without saying, "We are only as strong as our weakest link."

Invest in staffing, quality learning

Donna Wies
Quality program coordinator
Union Sanitary District
Union City, CA

MY ORGANIZATION IS a special government district providing wastewater collection, treatment and disposal services to three cities in the San Francisco Bay Area. Income is generated through sewer fees to residents and businesses. Currently, our fees are in the lower 15th percentile compared with agencies providing similar services in our region, while our level of regulatory compliance and customer service is high.

Our largest costs are energy, chemicals and staff, each of which go up every year. One way we are able to maintain low rates is by employing a relatively small, high-performing staff. This requires an effective recruitment process and training program.

We are continuously looking for ways to improve the efficiency of our operational and business processes, and reduce energy and chemical use.

One way that we maintain effectiveness and efficiency is through a system of organizational performance measures that are aligned from the district level down through the work teams. All employees are trained in quality principles and tools, and work teams have quality leaders who track and report performance measures and help their teams identify opportunities for improvement.

"PEOPLE IN QUALITY ROLES CAN TALK ABOUT C_{PK} AND VARIATION BUT DON'T CONNECT THAT TO COST SAVINGS."

Talk ROI and cost savings

Evan J. Miller
Principal
Hertzler Systems Inc.
Goshen, IN

WE HAVE SEEN ongoing business opportunities in the face of the down economy. A long time ago, we realized we needed to connect our solutions to the value our customers get from using these solutions. This translates to always asking our customers how they will calculate the return on investment (ROI) for implementing our solutions. We've learned that if they can't answer that question, we're wasting each other's time.

I wish it weren't so, but my personal experience is that people in quality roles often have a particularly difficult time getting to ROI. They can talk about C_{pk} and variation but don't connect that to cost savings. An ASQ Quarterly Quality Report last year pointed out that companies are paying more attention to cost cutting, becoming more efficient and reducing waste as a result of the economic downturn. It also found that over 75% of quality professionals strongly agree with the statement, "I believe that quality confers a competitive advantage," while only 34% believe top management feels the same.

My experience concurs with the quarterly report findings: Companies are responding with opposite reactions to the downturn. Some are going into crisis mode, and others are pursuing real business opportunities. Whether quality will play a role in that pursuit may be a function of the ability of the quality staff to think like an executive.

Review, redefine your career

Donna Horton
Operations manager and consultant
QualPro Consulting LLC
Mesa, AZ

I AM NOT a typical quality professional. My degree is in English, with an electronic engineering technology minor. After many years in technical writing, I found myself back home but out of work. Having pretty good technical skills, I found an entry-level job in manufacturing. I moved through a number of interesting positions, and in 2005 I ended up as the company's quality auditor. Not knowing what that really meant, I went to a local ASQ meeting.

Last year, I had a good job. My team spent the previous year working toward Capability Maturity Model Intervention Level 3 and had finally achieved certification. The company mood was changing, however, and I was concerned whether the emphasis on quality would continue. At that time, I wrote, "We are losing three Black Belts and one auditor in a business sale, and the remaining auditors are concerned for their jobs."

Then, the sale fell through; we were all out of jobs. Since then, only two of us found full-time corporate positions, and one of them is getting laid off again.

I think it's time to redefine our careers. Personally, I considered what quality services companies still need, what my core talents are, and how to make my skills more portable to meet those needs.

Many companies that need to meet regulatory or customer requirements can't afford a robust quality department. Now, I work with a small consulting group focusing on Food and Drug Administration-regulated businesses. I conduct gap assessments and audits, help develop quality management systems and absolutely love learning so many new things in the process.

"LOOK FOR SUCCESSES IN SMALL IDEAS FIRST."

John G. Suedbeck
Quality auditor
Metrics Inc.
Greenville, NC

I HAD BEEN at the same site for more than 16 years when my luck ran out and I was let go. I was anxious about starting a new job and did as much research as I could. A lot of what I found proved useful. After one year at my new job, I jotted down what I believed worked best for starting a new job off on the right foot.

Early on, learn the corporate culture. Key cultural issues include: what is of primary importance to the organization; what methods are used for controlling behavior; how members treat one another and nonmembers; how members deal with the external environment; what is the dress code; how decisions are made; and at what level decisions are made. Once you understand the culture, work with it and not against it.

Quickly learn your new responsibilities, and flow chart procedures and actual process flow. Be aware of the differences, if any.

The performance plan is the first line of direct communication from your boss on what the company expects from you. Understand the key metrics and what is expected of you. Speak up if there is a barrier to being able to meet expectations.

Look for successes from small ideas first. Take full advantage of your 401k plan. Be teachable. Make friends above and below. Join the team. Instead of stating how it was done at your old job, link suggestions to best practices. Ask for advice from your peers, even if you know the answer.

AMONG THE IMMEDIATE victims of an economic downturn are staffs from organizations' supporting functions. Organizations often assume that roles within supporting functions are less critical in terms of survival. Any headcount reduction inevitably starts there.

True, employees in supporting functions neither design products nor physically build them. They do play critical roles, however, in the product realization process.

Govindarajan Ramu
ASQ fellow,
Fremont, CA

Get headed in the right direction

Without pointing to the example of specific organizations, but relying broadly on general observation and industry news, it is not difficult to discover that among all supporting functions, training and quality employees tend to be included in the first round of reductions, followed by planning, customer service and sales.

For some organizations, reducing headcount in certain supporting functions may turn out to be a way to cut costs. The only true guarantee of sustainable cost reductions, regardless of the type of organization or industry, is to achieve improvements in efficiency. Before turning to headcount reduction as an easy answer, organizations need to consider the long-term impact on overall efficiency.

There is also a widely held misconception that all staffing should be proportional to revenue and volume of products and services. Hence, organizations tend to reduce headcount unilaterally once a product or service has been outsourced or revenue drops. The staffing of supporting functions is not necessarily proportional to revenue and volume. Even if volume decreases, customers will continue to need a variety of support functions.

Unilateral headcount reduction can cause abrupt loss in knowledge and interruption in service to customers. Organizations need to evaluate job functions and responsibilities carefully and plan the transition of knowledge and duties before reducing headcount.

Without a well-thought-out impact analysis, headcount reduction or other cost-cutting measures can end up more expensive in the long run and overshadow any short-term gains that might be achieved. In a nutshell, sustainable cost reductions come from improvements in efficiency.

An economic downturn can be an opportunity in disguise, allowing organizations to view their headcount not as overhead, but as an investment that will lead to lasting efficiencies. When business volume declines, rather than automatically turning to thoughts of reducing headcount, organizations can take advantage of the downturn by evaluating the skill sets of their employees, training to fill gaps in skills, challenging current business processes, reducing waste and variation, improving performance and integrating processes. The investment will pay off by better equipping organizations to make the improvements that will enable them to survive the downturn and make a stronger comeback as the economy recovers.

"AN ECONOMIC DOWNTURN CAN BE AN OPPORTUNITY IN DISGUISE, ALLOWING ORGANIZATIONS TO VIEW HEADCOUNTS AS INVESTMENTS THAT WILL LEAD TO LASTING EFFICIENCIES."

Word to the wise

THE GRAVEST NECESSITY for any quality manager in this shrinking economy is to have a direct involvement with those functions that impact the bottom line. It is also necessary that the quality manager be able to prove that the quality function does enhance the bottom line. But even more so, this must be perceived and believed by top management.

This involvement and perception is essential if the quality function is to remain untouched by the knife of downsizing or economic adjustment, which is all too familiar these days.

The culture and politics of the company may dictate that only the engineering or manufacturing functions have a direct hand in effecting quality on the line. If the quality function is perceived by top management as a reactive response rather than a preventive measure, it will be seen as an area for cost reduction. To a cash-strapped finance department, it may be an irresistible target for cost savings by wage reduction.

If the quality manager is to preserve his job and staff positions, he should be aware of some warning signs at his company and know how he is viewed by other departments. Is this true at your company?

1. The quality department is bypassed in planning new production.
2. The quality function is viewed only as an after-the-fact operation.
3. Senior management has no ongoing interest or training in quality.
4. Quality cannot present real financial data on its contribution to the bottom line.
5. Customer satisfaction is not proactively measured and used for improvement.
6. Other departments are "not sure" what the quality function does.
7. Top management views the quality function skeptically because of chronic issues.
8. The quality manager does not take action to offset these perceptions.
9. The quality manager does not report in a direct line to top management.
10. There are reductions in wages or people for the quality manager's department and not for others.

The quality function must be seen as essential to the survival of the firm, and the quality manager must be the missionary to top management and other departments for the function to survive intact.

—Name withheld by request. Author was recently laid off from the company at which he worked.

SHARE YOUR OWN STORIES—whether they be of hardship or hope. We all hope the economy turns around soon, but in the meantime, perhaps your advice or support could help someone else through the storm—or vice versa. Visit www.qualityprogress.com, click on this article's link and post your comments at the bottom of the page. Or send your comments via e-mail at editor@asq.org.

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ASQ

In 50 Words Or Less

- The pursuit of the theoretical limit involves organizations striving for perfection in everything they do.
- Former U.S. Treasury Secretary Paul O'Neill has applied the practice in manufacturing, government and healthcare settings.
- The successes that resulted convinced him that organizations don't need to settle for good enough.

FORMER TREASURY Secretary Paul O'Neill (left) joined Alan Greenspan to testify before the Senate Banking Committee on the state of the U.S. banking system in the wake of the attacks on Sept. 11, 2001.

In a Perfect World

Interviewed by Brett Krzykowski

For former U.S. Treasury Secretary **Paul O'Neill**, good enough **doesn't cut it**

ANYONE LOOKING FOR proof that quality has a place in all aspects of society can make the search a short one by examining the professional career of Paul O'Neill. Relying on transparency, systems thinking and—most importantly—the pursuit of the theoretical limit of perfect performance, O'Neill has cut a swath through myriad industries.

At manufacturing giant Alcoa, he helped reduce workdays lost to injury to almost zero.[1] During his time at the U.S. Treasury, he whittled the process of closing the financial books from five months to three days.[2] But his current passion is healthcare, an industry in which he has already made his mark via the Pittsburgh Regional Health Initiative (PRHI).

During a recent interview with Brett Krzykowski, QP's assistant editor, O'Neill spoke about the ills of—and cures for—the U.S. healthcare system, the signs of economic calamity everyone ignored, and the U.S. government's resistance to the quality way of thinking.

QP: A big focus of yours has been this idea of the pursuit of the theoretical limit—that organizations shouldn't settle for anything less than perfection in everything they do. During your time at Alcoa, you met some resistance from people who thought this was a ridiculous pursuit. But the results certainly indicate that this works, as far as a zero-loss workday and the number of safety incidents dropping to miniscule proportions (see sidebar, "Taking Alcoa to the Limit"). Do you think businesses are hurting themselves by settling for being good rather than striving for perfection?

Paul O'Neill: I do, because when you establish goals using the concept of a theoretical limit, effectively it lets you identify the complete spread between where you are at any particular time and perfection.

Identifying the size of the opportunity doesn't mean you can capture it all. But it's the right kind of a thought process so that you don't effectively compromise yourself into a position where you're satisfied with something that's clearly short of the possibility.

I've found, when you're talking about workplace safety as the area of attention, it's easier to get substantial agreement that the organization and the people in it should strive to eliminate incidents in the workplace. When you're dealing with manufacturing processes, there are more people who can explain to you a thousand reasons why we can't be close to perfect.

QP: But there certainly seems to be applications of this pursuit of perfection outside of manufacturing, and you've spoken about that.

O'Neill: There are applications in everything we do.

QP: In particular, you've made comments about healthcare and how the pursuit of the theoretical limit could help cut costs by as much as 50%. Maybe you can flesh that out a little bit and also talk about how those ideas have been met in the healthcare community.

O'Neill: It's useful to break this up into a microdimension, which means at the local level, and to differentiate that from the macrolevel.

At the microlevel, with the work that [the PRHI has] done, we've demonstrated in places, particularly at Allegheny General Hospital in Pittsburgh, that it's possible to eliminate hospital-acquired infections that occur in intensive care units by setting the goal at zero, and then establishing a process of continuous learning and

TAKING ALCOA TO THE LIMIT

When Paul O'Neill became chairman and CEO of Pittsburgh-based aluminum manufacturer Alcoa in 1987, he wasted little time showing how serious he was about the pursuit of the theoretical limit. "I said the first day I was there, no one who works at Alcoa should ever be hurt at work."[1]

Even after it was explained to him that the lost-workday average rate at Alcoa was 1.87 cases per 100 employees per year—compared to the national average of five cases—O'Neill was undeterred. During a tour of the company's manufacturing sites, he told one management group in Tennessee not to budget for safety—when there's a risk, fix it. Then he told hourly workers "Here's my direct home phone number. If they don't do what I just told them, I want you to call me."[2]

Later, a companywide system that relayed real-time safety information was put in place, giving 140,000 people access to incident reports so they could see for themselves what happened and how it could be fixed. By the time O'Neill left Alcoa in 2000, the lost workday rate was 0.15. As of April 2009, it was 0.114.[3]

"I believe that the pursuit of excellence is a habit like breathing if it's really well developed," O'Neill said. "It's not something that can be taken away from the arrival of someone who's supposedly the new leader, because the fundamental ideas will govern the institution on and on and on."[4] *—B.K.*

REFERENCES

1. Joseph M. Juran Center, "Paul O'Neill Keynote Speech," June 25, 2002, www.csom.umn.edu/Page5382.aspx.
2. The Heinz School Review, "Leading Like a Maverick: The Unique Approach of Paul O'Neill," Oct. 15, 2004, http://journal.heinz.cmu.edu/articles/leading-maverick-unique-approach-paul-oneill.
3. Alcoa, "Health and Safety Overview," www.alcoa.com/global/en/about_alcoa/sustainability/health_overview.asp.
4. Joseph M. Juran Center, "Paul O'Neill Keynote Speech," see reference 1.

If you set goals against a **national level of performance,** you've set a barrier that's **not too difficult to get over.**

continuous improvement so that when there is an infection, you learn where there was a break in protocol so you can go back and eliminate the possibility that you're going to have breaks in protocol going forward (see sidebar, "Perfecting Healthcare," p. 38).

At the microlevel, at Allegheny General Hospital and other places we've worked with, we've demonstrated that it's possible to do this and, in effect, to break the conceit that it's a God-given fact that 2% of the people who go through intensive care units are going to get an infection.

At the macrolevel, it's been much more difficult to get people to observe what's been demonstrated at the microlevel and to adopt the concept of a theoretical limit and the practices that lead toward it. In things like central line infections, bloodstream infections and, more broadly, nosocomial infections [for example, staph infections], it's possible and it's been demonstrated, particularly in the workplace safety area at Alcoa, what can be done in an entire institution with 350 operations in 43 countries. It's much more difficult to find the application of those ideas and principles across the whole of society.

Battling benchmarks

QP: You've also talked about benchmarking, which you see a lot of in healthcare. Hospitals track mortality rates, which are low and may be improving, but they aren't perfect. Is benchmarking an obstacle to the pursuit of the theoretical limit in that people seem to be settling?

O'Neill: I think that's right. The convention, for example, in health and medical care is to have measures across the country and measures for individual institutions to find out how they compare to the national averages. It's very routine to find institutions that say, "We're better than the national average, and it's not possible to be better than we are." So the establishment of the idea of national norms is the enemy of continuous improvement.

QP: Is it just that people have gotten used to the idea of having built-in excuses?

O'Neill: I think it's a phenomenon … I'm tempted to say it's a worldwide phenomenon. It's particularly a phenomenon in the United States, I think, that people have a mind-set of, "We don't want to set goals that we're not sure we can attain." So if you set goals that are referenced against some national level of performance, in effect you've set yourself a barrier that's not too difficult to get over, and then can declare yourself superior.

QP: What do you think it's going to take for people to get past that mentality?

O'Neill: I think in health and medical care, it takes enough demonstration of performance close to the theoretical limit in enough places of different sizes and scales across the country, so that it's undeniable that we can achieve much better results.

As is often the case in health and medical care, people say when they're confronted with what seems to be a huge difference in levels of performance, "Well, we take sicker patients, and so while our mortality and morbidity rates may be higher than the places you're pointing to, it's because they screen out the really complicated cases, and the really complicated cases come here. And of course the rates of failure are going to be higher, but it's because we start with a more difficult pool." People can rationalize almost anything.

QP: Another aspect of quality you've advocated is transparency. When you were at Alcoa—and now still—there was an emphasis on each person understanding all the inputs and all the outputs of a process. How can transparency contribute to this understanding, and is it crucial to this pursuit of perfection?

O'Neill: I think the identification, first of all, of everything that went wrong—and, even better, at the great institutions, of things that almost went wrong—is the pathway to moving ever closer to the theoretical limit of perfect performance.

One of the reasons why I think health and medical care performance is such a jumble is because there's such huge pressure against identification of things gone wrong and sharing of things gone wrong so people can learn from them. That's because of the fear of malpractice suits and other legal pursuits. It makes it much more likely that people will not report and share things gone wrong, because there's a financial reason not to.

QP: Is there a way to insulate healthcare and hospitals from that (financial responsibility), or is that always going to be a risk?

O'Neill: What I've advocated is that we get rid of the idea of medical malpractice. It's virtually impossible to find people in the healthcare system that intentionally hurt people, right? There are some flagrant individuals, isolated examples where people decided to make life-and-death decisions. But I guess I would say, at the 99.999% level, people who are delivering medical care do not intentionally hurt people.

> If we had **real transparency** and had collected data in the proper way so that we could see this **growing volume of failed mortgages** at the first payment, we could have **avoided a huge calamity.**

At the same time, we know that people are inadvertently injured, or their hospitalization is longer than it ideally should be. I think we need to recognize the circumstances for what they are, and we need to say to people, "We're not going to have medical malpractice insurance anymore, and we're going to abolish the idea of medical malpractice."

When someone is injured, we're going to create an expectation that the injury or the length of hospital stay will be recorded in cyberspace within 24 hours so we can do a root cause analysis, and everyone in the world can learn from it in a short cycle of time. And in exchange for that, we're going to have an economic arbitration process so that people who are inadvertently injured will be compensated to the extent of their economic loss, and we'll pay for it out of general revenues of the federal government, because that's the broadest base for tax support.

In exchange for that, we expect the people in the delivery system to report without fail, at a huge penalty if they fail to report, with an expectation that the professional societies will take a much more aggressive role than they typically have in disciplining and withdrawing privileges from people who have repeatedly failed to deliver the expected level of performance.

QP: Obviously, transparency is a crucial part of this whole concept. Can there be any real progress without total transparency?

O'Neill: It's really difficult, and in fact one would like to have transparency that goes far beyond just identifying injuries to patients.

For example, we've found in the work that we've been doing that 50% of a nurse's time is spent doing things that don't add value, like looking for medications that aren't where they're supposed to be or looking for equipment that isn't where it's supposed to be. You want to identify and have the people in the process identify every aspect of waste every day, so that people can work on systems redesign to take out the waste.

A significant part of the $1 trillion out of the $2 trillion we're currently spending on health and medical care—the trillion we believe can be taken out—is substantially related to waste rather than injuries or harm that's caused to patients. Much like in a manufacturing process, where we'd work on quality improvement, if we brought those same ideas to health and medical care, we would question the whole idea of batch processing for medications. Because in the same sense that there's an enormous waste that's been discovered in manufacturing processes, the same kind of things exist across the breadth and depth of medical care.

Cashed out

QP: There's no better cautionary tale for people who seem to resist this transparency movement than the current state of our financial system.

O'Neill: Exactly.

QP: How significant of an impact did that (transparency) have on the situation?

O'Neill: I think it was a huge factor. Beginning in 2005, it was possible to know—although no one seemed to do it—that with a very substantial fraction of newly admitted mortgages, the mortgage holders were failing to make their first payment. That was a tell-tale [sign] two years before we had a calamity. If we had real transparency and had collected data in the proper way so that we could see this growing volume of failed mortgages at the first payment, we could have avoided a huge calamity.

NO ROOM FOR DISCUSSION AT THE WHITE HOUSE

On June 25, 2002, 18 months into his tenure as head of the U.S. Treasury, Paul O'Neill gave a speech that included an extensive discussion about leadership. During his keynote address, O'Neill outlined a trio of elements common in all humans that are recognized among effective leaders: Everyone wants to be treated with dignity and respect, wants to make a contribution to give his or her life meaning and wants someone else to notice his or her contribution.[1]

At the time, O'Neill was in a unique position to comment on the trilogy's importance, because he was in the midst of a two-year stretch of serving a presidential administration he claimed ignored all three.

In 2000, President-elect George W. Bush tabbed O'Neill as his Treasury secretary-designate, the latest entry on a Washington, D.C., resume that reached back to 1961. A few weeks after the election, in December, the Associated Press ran an article about a two-day economic forum in Austin, TX, that was going to feature Bush and O'Neill, among others.

O'Neill first learned of his participation while reading the article in the *New York Times*.[2]

The disconnect turned out to be a precursor to what O'Neill later claimed was a regime headed by an uncommunicative leader.

In a 2004 interview with 60 Minutes, O'Neill said the president "did not make decisions in a methodical way. There was no free flow of ideas or open debate." He added that Vice President Dick Cheney was "part of a praetorian guard that encircled the president" as a means of shielding him from contrary opinions.[3]

While O'Neill had his issues with the White House, the reverse was also true. Never one to temper his opinions, he made several comments that had significant consequences, including a remark in February 2001 that the United States was "not pursuing a policy of a strong dollar," which sent the currency into a nosedive.[4]

Then, in November 2002, during a White House meeting of Bush's economic advisers, O'Neill refused to offer public support for a significant tax cut already in the works. Nine days later, Cheney called and asked for O'Neill's resignation.[5]

Those revelations appeared in a 2004 book, *The Price of Loyalty*, written by *Wall Street Journal* reporter Ron Suskind, who conducted extensive interviews with O'Neill and was provided more than 19,000 internal documents from O'Neill's time as Treasury secretary.

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AFTER TWO years as U.S. Treasury secretary under President George W. Bush (right), Paul O'Neill resigned his post because of his philosophical differences with the administration.

When asked about the book and the allegations made within, then-White House spokesman Scott McClellan said, "The president is someone that leads and acts decisively on our biggest priorities, and this is exactly what he'll continue to do."[6]

—B.K.

REFERENCES

1. Joseph M. Juran Center, "Paul O'Neill Keynote Speech," June 25, 2002, www.csom.umn.edu/page5382.aspx.
2. Michael Tomasky, "Square Peg," *New York Times*, Feb. 1, 2004, www.nytimes.com/2004/02/01/books/square-peg.html.
3. Rebecca Leung, "Bush Sought 'Way' to Invade Iraq?" CBS News, Jan 11, 2004, www.cbsnews.com/stories/2004/01/09/60minutes/main592330.shtml.
4. Phillip Thornton, "O'Neill Muddles Currency Markets With Dollar Comments," *The Independent*, Feb. 17, 2001, www.independent.co.uk/news/business/news/oneill-muddles-currency-markets-with-dollar-comments-692176.html.
5. Rebecca Leung, "Bush Sought 'Way' to Invade Iraq?" see reference 3.
6. Ibid.

QP: Has anything been done to rectify that?

O'Neill: Not yet. I've been advocating that we implement a policy that requires a minimum 20% equity down payment for every new mortgage. So far, no one in the political process is willing to step up. It doesn't seem like a very difficult concept.

QP: You can only hope that other industries are going to be a little bit smarter, because the theories and strategies you've put forth are relatable to food safety, product safety, environmental safety, worker safety. Do you see evidence that people are starting to catch on?

O'Neill: Not nearly as much as I would like. Right now, I would say it's very difficult to find any of this conversation in what's being proposed in Washington for health and medical care reform. If you look really hard, you can find a little bit, but it tends to be a very small part of the conversation.

Federal failings

QP: In comments you've made about the Bush administration, you stated there was a lack of transparency and a lack of communication. It went against the very specific things you've said about what leaders of successful organizations do: You treat people with dignity, you let people make a contribution, and you recognize their contribution (see sidebar, "No Room for Discussion at White House," p. 37). What lessons can leaders of the country take away from those failings?

O'Neill: There's a big question. The idea of transparency, as you said, is essential to the prospect of better performance. To go back a little bit, there was never any evidence of weapons of mass destruction. And there was never enough transparency of what they were relying on as a basis for a preemptive war so that people could make an intelligent judgment. In fact, they shoved [former Secretary of State] Colin Powell out there in front of a pile of surmise and allegation as though that were evidence. It's cost us dearly.

QP: President Obama has created a new position [chief performance officer] to serve as an overseer of sorts. Does that represent a change in thinking, even a minute one?

O'Neill: That's what I was going to say about shifting forward to the current time. I've been advocating so far, without any progress, that if we're ever going to fix our economic situation, we're going to first have to stabilize the financial system. I don't think it's possible to do that without truth and transparency.

I've been advocating that each of the 19 major financial institutions be required to post on the internet the layers of the assets they're currently holding by financial rating categories, beginning with AAA down through –BBB, which is the end of the investment grade rating category. And then for those assets they claim can't be valued, they ought to be put into what I would label a quarantine account, with an understanding the institutions would hold them until maturity, when their value would be revealed.

Absent that, I think what they're talking about now—doing this stress test—kind of stretches the imagination beyond the breaking point. If you think about it, if you can't value assets on a financial institution's balance sheet, then it's impossible to stress test them.

PERFECTING HEALTHCARE

In 1997, Karen Wolk Feinstein, president of the Jewish Healthcare Foundation, approached Paul O'Neill, then at Alcoa, with an idea to create an organization that would bring improvement methods traditionally found in the manufacturing realm to the healthcare industry. The result of their efforts is the Pittsburgh Regional Health Initiative (PRHI), which in the decade since has proven that improving quality and safety saves dollars and—more importantly—lives.[1]

The mission of the organization is to improve healthcare in Southwestern Pennsylvania, but PRHI's focus on continuous improvement and standardization to eliminate errors, inefficiency and waste—what it calls Perfecting Patient Care (PPC) principles—has attracted national attention due to its numerous success stories, including the following:

- Between 2003 and 2006, Allegheny General Hospital reduced central line infections by 95% and deaths caused by central-line infections to zero. And, between February 2006 and February 2007, the hospital didn't have a single central-line infection.[2]
- The Veteran Affairs (VA) Pittsburgh Health System used PPC methods to find dozens of improvement opportunities that reduced its rate of methicillin-resistant staphylococcus aureus infections from 0.97 per 1,000 days of bed care in 2002 to 0.27 in 2004.[3]
- In a separate initiative, the VA Pittsburgh Health System employed a team-based model for diabetes care and increased the number of patients it served while also improving patient satisfaction rates.[4]

—B.K.

REFERENCES

1. PRHI, "History," www.prhi.org/about_history.php.
2. PRHI, "The Bug Stops Here," PRHI Executive Summary, March/April 2007, www.prhi.org/docs/executive_summary_mar_apr_2007.pdf.
3. PRHI, "PPC in Action," www.prhi.org/ppc_action.php.
4. Bill Zlatos, "Three Hospital Programs Earn Fine Awards," *Pittsburgh Tribune-Review*, Nov. 20, 2008.

QP: Is that evidence that while there is a new administration, they still don't seem to be moving in the right direction?

O'Neill: Unfortunately, I think it is.

QP: Is the pursuit of perfection something that has to come from the top down, or is it going to be a bottom-up phenomenon?

O'Neill: I think in order to have an institution that has a shot at being the best in the world, it has to come from the top. It doesn't mean that you can't keep pushing away and try to get people who are in leadership positions to adopt the ideas. But I don't think you can do it from the bottom up.

As many rocks as you throw at an institution, unless the leadership adopts the ideas, there's no hope for that individual institution. That's why it's so important, I think, for the new president to show leadership on these issues.

QP: Is his creation of the new post within the government evidence of that?

O'Neill: I don't think so. I think it's more political posturing than it is a systemic determination to use the idea of the theoretical limit as a structuring device for thinking about and making policy.

QP: With all of that said, is there hope for this line of thinking?

O'Neill: Some of the people that are being discussed as major appointees in HHS [Department of Health and Human Services] know a lot about this. And so I still have some hope that the people at the subsecretary level in HHS are going to bring these ideas with them. But we'll see. They haven't been publicly identified yet.

QP: That has to be a little bit heartening for you. You have to hope that if healthcare can prove this can work, then other industries are going to take notice.

O'Neill: Absolutely. QP

REFERENCES

1. Alcoa, "Health and Safety Overview," www.alcoa.com/global/en/about_alcoa/sustainability/health_overview.asp.
2. Joseph M. Juran Center, "Paul O'Neill Keynote Speech," June 25, 2002, www.csom.umn.edu/Page5382.aspx.

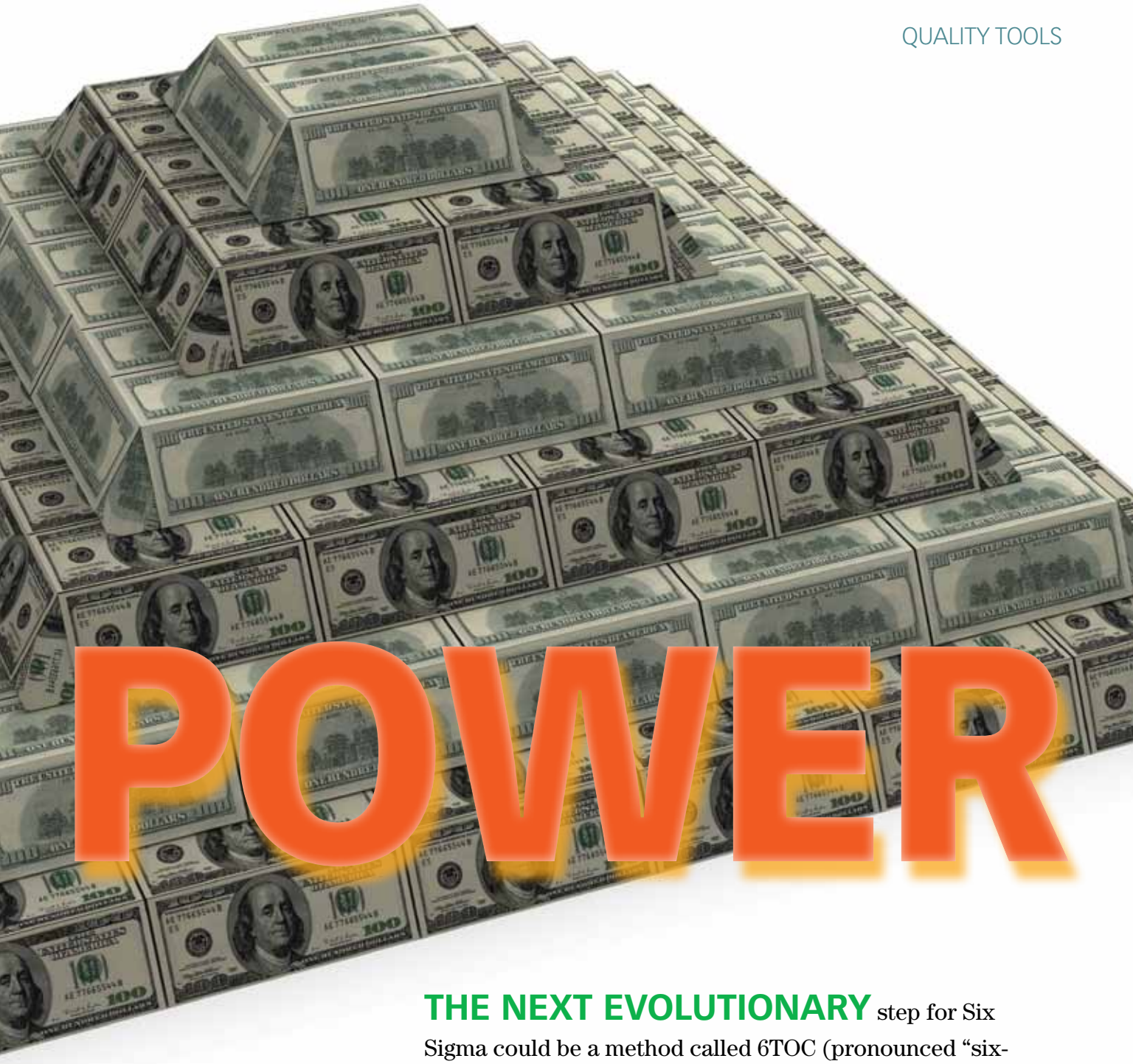
Pyramid

by Todd Creasy

In 50 Words Or Less

- 6TOC combines lean Six Sigma (LSS) and the theory of constraints (TOC) for bottom-line benefits.
- The method's metrics pyramids and communications allow organizations to retain gains and monitor benefits.
- 6TOC goes beyond factory floors or points of sale to reduce constraints, defects, waste and variation.

Get **bottom-line results** by combining **LSS** and the **theory of constraints**



POWER

THE NEXT EVOLUTIONARY step for Six Sigma could be a method called 6TOC (pronounced "six-tock") that combines principles of lean Six Sigma (LSS) with the theory of constraints (TOC).

While using the tools common to lean and Six Sigma methods, 6TOC constructs a systemwide improvement process that aims to produce measurable, line-of-sight, bottom-line benefits; an organizational metrics pyramid; and a management and employee communication system for retaining gains and monitoring performance.

Discussing Six Sigma's emphasis on variation reduction, lean's focus on waste removal and TOC's interest in constraint management, one author wrote, "Many process improvement methodologies appear to conflict with each other or at least downplay the contribution of other methodologies."[1] Rather than choosing one over the other, 6TOC looks for synergy among the methods.

Six Sigma has migrated from improving manufacturing processes to project management, change management, culture change, teaming and other goals.[2] 6TOC may help Six Sigma practitioners fashion these and other concepts together, producing a holistic system that eliminates or reduces constraints while enhancing flow and reducing defects, waste and variation.

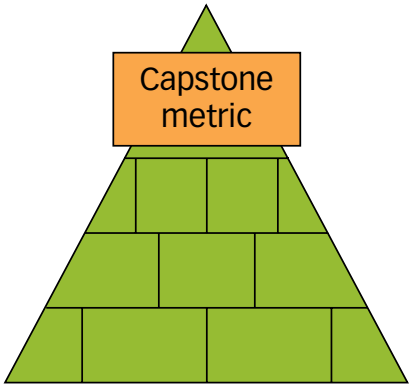
I have found the results of 6TOC applied in process manufacturing and construction management environments to be impressive. But, before we discuss the details of the 6TOC system, a brief discussion of its forerunners will be helpful and can be found in the online sidebar, "Predecessors of 6TOC," at www.qualityprogress.com.

6TOC's capstone metric

Each of the improvement methods described so far has its commonalities with the others and general criticisms. However, I believe complementary aspects of each can be combined to produce a powerful improvement opportunity. I agree with the comment that "to achieve maximum performance improvement … lean, Six Sigma and other approaches should be brought together as a part of a holistic improvement method."[3]

6TOC is best initially understood by envisioning a pyramid containing several empty cells with a single capstone at the top (see Figure 1). That capstone represents the single metric that has the greatest capability of predicting success within your organization. As Jeff Immelt, president and CEO of General Electric, said, "Every initiative needs a metric."[4]

Metric pyramid / FIGURE 1



If initiatives need a metric, shouldn't a company as well? While not arguing for a single metric mind-set, I maintain that continuation of complementary metrics is important. But there is one metric in most organizations that possesses a stronger likelihood of predicting success above all others.

According to Peter Drucker, "Profit is not the explanation, cause or rationale of business behavior and business decisions, but the test of their validity."[5] We need an indicator that has a strong association with a firm's profitability.

In the popular book *Good to Great* by Jim Collins, several great companies were discussed and compared with those of lesser status.[6] One of the great companies was Walgreens. According to Collins, Walgreens found the one metric that was used to measure the success of work and ideas—revenue per customer visit.

Looking through that prism, activities of all the management and hourly personnel were considered. Generally speaking, if the results in either group did not increase revenue per customer visit, then those activities were rethought, revised or removed. This one lens through which management viewed the organizational landscape was credited with helping Walgreens increase market share and profitability.

6TOC begins with a clear understanding and consensus of what the organizational metric should be. Differing from Six Sigma or LSS—with metrics that can be buried deep within the organization, a process or a value stream—the 6TOC metric should have direct line-of-sight visibility to organizational success or failure, which is usually measured at the bottom line.

This metric should be senior management's most monitored and communicated metric and the one least likely to become a victim of managerial manipulation. Think in financial terms such as revenue per sales order, operating income per payroll hour and revenue per share.

This one metric is the capstone metric in the 6TOC pyramid. There should be unity across divisions and departments on the metric's identity, its calculation definition and, ultimately, on operating tactics that will improve the metric. Consider tying some of senior management's—and others'—incentives to this metric.

When finalizing the capstone metric, work needs to be done to ensure the determination of the processes most influential to that metric. If products per labor hour were selected as the capstone metric, the manufacturing process could be easily identified as the most obvious process affecting that metric. While true, the manufacturing process is a complex combination of

The **6TOC metric** should have direct line-of-sight visibility to **organizational success or failure.**

multiple paths converging to produce the critical path or chain that produces all final products.

Through the lens of volume flow improvement, examination of that chain's links will yield areas of improvement that are referred to as constraints or bottlenecks. Once the bottlenecks are identified, they are placed in descending order of negative influence on the capstone metric.

Keep in mind that at this stage of the project evolution, subject matter experts influence this ranking exercise, and opinions may vary. Reaching consensus and validating theories through data collection and analysis is advantageous but not always possible.

Process chain review

Now that a list of significant bottlenecks has been constructed in descending fashion, the team should examine the chain in process-flow form from beginning to end and should segment the chain—or value stream—into logical, functional phases (see Figure 2). I suggest no more than four phases in most situations.

This segmenting improves the project's manageability, places and focuses the team's project within the critical chain, and affords an opportunity for small gains to create momentum propelling the team forward. Once the chain is segmented, identify the phases in which each of the bottlenecks occurs. In most instances, your focus will begin in earnest with the phase that contains the bottleneck with the most negative impact.

Before moving to the next phase, bottlenecks within the original phase should be resolved. In some cases, dependencies among phases may require examination of multiple phases to relieve a bottleneck of its constraining effects. This approach builds on the approaches of Six Sigma, with its emphasis on cost of poor quality, and of TOC, which recommends working bottlenecks in descending order regardless of where they exist in the chain.

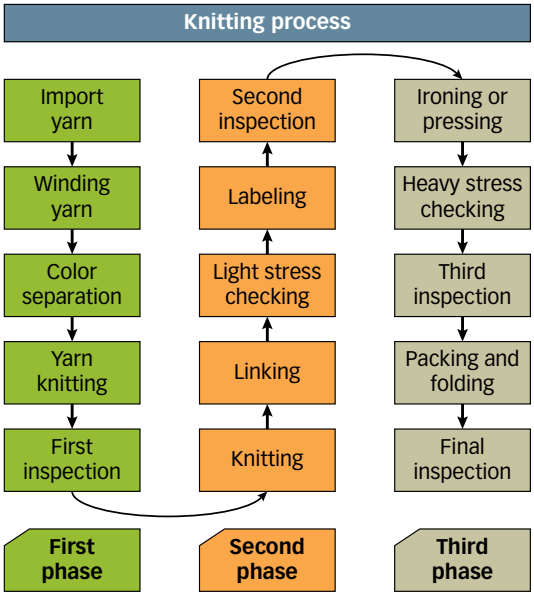
Continuing to work within the phase that contains the most troublesome bottleneck, the investigative team should seek to understand the maximum output of that phase. In other words, if all things ran perfectly, if no equipment or personnel were underutilized and all materials were present when needed, at what volume could that portion of the chain—or phase—produce?

Within 6TOC, the maximum volume a process can optimally achieve is called "process capable." This is derived from Joseph M. Juran's definition: "What the process can do under certain conditions."[7] A common approach to begin determining process capable is to ask the plant supervisor or foreman how much can be produced on a good day.

With some additional data gathering and analysis, process capable can be derived. Once process capable is derived, the real-time production for that portion of the process is then measured and referred to as "process actual." By gathering a relevant sample of current production, process actual can be established.

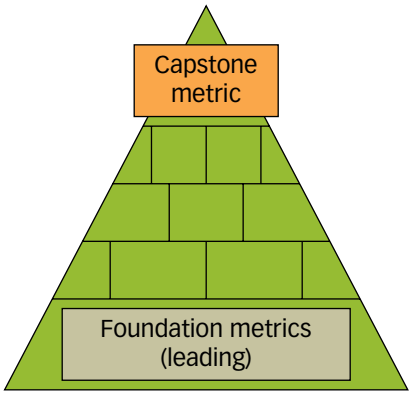
Through improvement initiatives, the team's goal is simply to improve process actual to the level of process capable—thereby increasing volume in that segment of the chain.

Example of functional phases / FIGURE 2



Foundation of metrics pyramid

FIGURE 3



When matching capable with actual, lean tools (such as cycle times) are used to improve speed and reduce inventory. Six Sigma tools (such as correlation) are used to ferret out cause and effect relationships in the quest to establish a leading metric that will predict that portion of the manufacturing chain's success. This metric, and others yet to be created, are key and form the foundation of the metrics pyramid (see Figure 3).

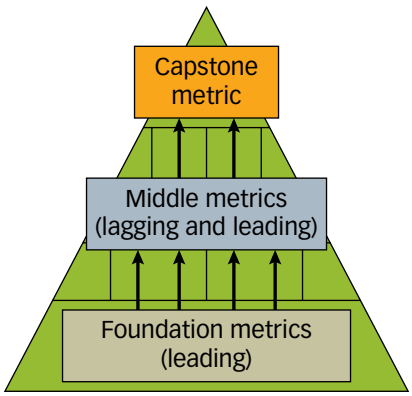
These metrics are leading in nature and point upward to a performance metric of another specific function, with combined influences having a significant impact on the capstone metric. In some instances, a control chart, with its upper and lower control limits, can take the place of a metric within the pyramid.

Middle metrics

Once the bottlenecks are relieved and process capable equals process actual within that phase, it's time to move forward to the phase that contains the next significant constraints. Six Sigma and lean tools are again employed in the investigative process to speed production and determine associations, trends and relationships between inputs and outputs. This 6TOC improvement process continues through the entire chain until the capstone metric begins to move in the right direction and achieves the goal desired by senior management.

Middle metrics

FIGURE 4



How is the foundational layer of leading metrics bridged to the capstone metric? The connection is relational in that the processes measured by the leading metrics feed other processes within the production chain that ultimately feed the capstone metric.

The capstone metric could be an organization's revenue per product. Each department (purchasing, staging, pressing and machining, for example) within the company has its own set of leading metrics that, if combined with the other departments, will ultimately impact the capstone metric.

Metrics that lag the company's foundational metrics but lead the capstone metric occupy the spaces between the two and are called middle metrics. Middle metrics can serve two purposes: They act as lagging metrics for processes feeding them and as leading metrics for departments, units or other functional areas in which they reside.

When considering these organizational metrics in pyramid form, consider a baseball team. Each batter has a batting average, which serves as that batter's performance metric at home plate. The team also has a batting average that is the average of all the players' batting averages. The team batting average serves as the middle metric between each player's batting average and the number of team wins—the capstone metric.

Middle metrics concern themselves with total department operations at the company. The summation of all middle metrics for all departments moves the needle for the company's capstone metric (see Figure 4).

Communicating the pyramid

Juran taught the concept of placing employees in a state of control by doing three things:

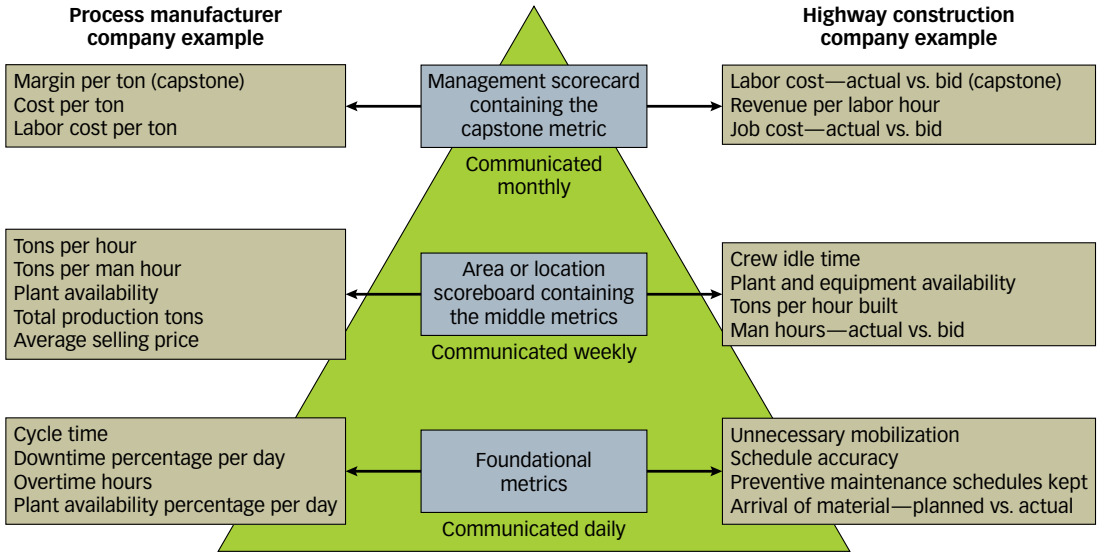
1. Inform the employees of your goal.
2. Tell them how they are performing toward that goal.
3. Give them the autonomy to make changes to positively affect their performance.[8]

Unfortunately, efficient, informative management communication is often an oxymoron. 6TOC can help bridge the communication gap from management to operators by producing a communication plan that enables your employees to stay in a state of control.

Examine Figure 5, noting that several communication media are employed that announce leading and lagging process results that ultimately influence the capstone metric. These various forms of communication serve as signals toward ultimate capstone movement, either positive or negative. Their continuous communication allows for proactive decision making and cause and effect analysis before monthly, quarterly or yearly results are published. Once functioning, their ease of use should not be managerially taxing.

While I found the implementation of 6TOC in both the process manufacturing and construction management industries to be successful, practitioners need to

Forms of communication / FIGURE 5



"Metrics Pyramid" copyright pending.

realize the vital importance of senior management support as well as accountability from those performing the actual work.

It is imperative that the participants understand the link between the metrics in the pyramid and that management reviews the performance of the middle metrics as often as possible—at least weekly—while the foundational metrics are reviewed daily.

The approach from management should be supportive and coaching in style, but demanding of accountability in orientation. Participants need to fully understand the importance of their commitment—not just compliance—to the 6TOC system.

Frankly, some participants may not be able to make the jump up from story-based management—and its frequent underperformance and frustration—to metrics-based orientation and a proactive management style. Some difficult personnel decisions may loom. With 15 to 35% production improvements possible and significant cost reductions likely, however, those decisions may be justified.

The discussions comparing the value-adding ability of lean, Six Sigma, LSS, TOC and other methods must rise to the next level to showcase their complementary elements.

"Partisans for Six Sigma maintain the key to better performance is the reduction of process variation. Adherents of lean question the wisdom of reducing the variation in a process that is inherently wasteful," according to Ronald Snee and Roger Hoerl.[9] Both add value. Our goal should be to use each within a system to surgically improve a company from top to bottom.

Since the seminal work of Frederick Winslow Taylor, industry has been seeking improvement ideas that lead to the holy grail of better results with the same or fewer resources employed.

The 6TOC system may be the next step in allowing managers and process investigators to combine Six Sigma, lean and TOC to reach the next rung on the evolutionary improvement ladder. QP

REFERENCES

1. Dave Nave, "How to Compare Six Sigma, Lean and the Theory of Constraints," *Quality Progress*, 2002.
2. John Goodman and Jon Theuerkauf, "What's Wrong With Six Sigma," *Quality Progress*, January 2005.
3. Ronald D. Snee and Roger W. Hoerl, "Integrating Lean and Six Sigma—a Holistic Approach," *Six Sigma Forum Magazine*, 2007.
4. Thomas Stewart, "Growth as a Process," *Harvard Business Review*, June 2006, p. 62.
5. Peter F. Drucker, *Management: Task, Responsibilities and Practices*, Harper & Row, 1974.
6. Jim Collins, *Good to Great*, Harper Collins, 2001.
7. Joseph Juran, *The Quality Handbook*, McGraw-Hill, 1999.
8. Ibid.
9. Snee, "Integrating Lean and Six Sigma—a Holistic Approach," see reference 3.

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BY JOSEPH D. CONKLIN

It's a Marathon, Not a Sprint

Building a successful statistical model takes place in stages

SIX SIGMA PRACTITIONERS like their successes swift, large and final. Nature and circumstance, however, are rarely that kind. Normally, success is secured one step at a time. Given enough persistence and flexibility, putting these steps together can create a sizable and significant victory in the war against defects.

This point applies to the use of statistical models, popular items in the Six Sigma toolkit. Statistical models are equations derived through statistical techniques that relate the outputs of a process to its important inputs. Constructed properly, they are frequently useful for diagnosis and improvement. In any given application, however, the first statistical model is rarely the last or best one.

Consider the case of a metal deposition process in which an important alloy is layered on a metal substrate in an acid bath.

For simplicity, assume a single layer.[1] The key output is the thickness of the deposit. A minimum thickness is required to ensure the proper performance of the component the substrate is eventually inserted into.

A specially chartered team of engineers and technicians is studying the process, with the goals of reducing variation and fine tuning the key input levels for best effect. The initial strategy includes using linear regression[2] to build a statistical model based on using historical process data.[3] In the first attempt, the team relates

> "In any given application, the first statistical model is **rarely the last or best one.**"

the thickness of the deposit to the three inputs of pH, catalyst concentration and tank pressure. The data for the first-stage model are the 50 observations in Table 1.[4]

Running the data through the regression program of the MS Excel data analysis tool pack yields the data in Table 2.[5] The values in the coefficient column (except for the intercept) are multiplied by the inputs to predict the output. In equation form, our first stage statistical model is thickness = 70.9653 + (0.2350*pH) + (0.2959*catalyst) – (0.0875*pressure). We are looking for coefficients that are statistically significant.

A coefficient is statistically significant if it's reasonable to conclude its true value is something other than zero. A coefficient with value zero renders the associated input variable meaningless for affecting the output.

The column in Table 2 labeled standard error measures the uncertainty in the estimate of the true value of the corresponding coefficient. We prefer low values for the standard error—the lower the value the more certain we are.[6]

The column labeled t statistic is the result of dividing coefficient by standard error. This puts the measurement of the uncertainty of all the coefficients on the same scale. Comparisons between coefficients become easy to make. Under the standard assumptions of the linear regression technique, the t statistic results follow a well-known statistical distribution of the same name.[7]

The column labeled p value helps us conclude whether a coefficient is statistically significant. In that case, the p value result will be close to zero. The possible results for p value range from zero to one. There is no universal rule to say how close to zero the p value has to be before concluding a coefficient is significant.

The greater the consequences of a wrong decision, in general, the closer to zero the p value must be. Many possible cut-off values exist. In practice, the cut-off value is almost always less than or equal to 0.10. We will use 0.10 as the cut-off value for this example. If the value for the p value is less than 0.10 for a given row, we will conclude the coefficient is statistically significant.[8] By this standard, the statistically significant inputs from stage one are catalyst and pressure.

Watch for signs

The signs of the significant inputs are informative. They tell the team, other

things being equal, that an increase in catalyst is associated with a positive increase in thickness. A decrease in pressure is also associated with an increase in thickness.[9]

The positive coefficient for catalyst makes sense to the team. To the limit that the bath can absorb it, more catalyst speeds up the reaction in the tank, and that leads to a faster deposition rate. The team members are puzzled to see no significant coefficient for pH. The theory of the process says this should have a positive effect on thickness. The significant coefficient on pressure was expected, but the sign is in the wrong direction. The team expects higher pressure to be associated with higher thickness, not lower.

Because the first-round model leaves some questions unanswered, the team proceeds to a second round. The team decided to expand the number of variables by two: tank temperature and tank voltage. Theory and experience suggest these ought to be important. A new data set of 50 observations is collected. The values appear in Table 3 (p. 48). A second run through the MS Excel regression program produces the coefficients shown in Table 4 (p. 49).

In equation form, the second stage statistical model is thickness = 4.1963 + (0.0814*pH) + (0.1636*catalyst) — (0.0438*pressure) — (0.4042*temperature) + (0.4245*voltage). All the input variables except pH have significant coefficients.

The lack of statistical significance for pH bothers the team. Voltage is statistically significant and positive—the results conform with theory and practice. It is no surprise to see pressure still significant and temperature enter the model as significant, but the individual signs seem wrong. Increased pressure or temperature should be associated with increased thickness.

Questions remain

The model confirms some expectations but raises new questions or leaves some old questions unanswered. This is not unusual when building statistical models.

The team debates what to do in the next stage. Some members propose that pressure and temperature do not act as independent variables.

They tend to move in the same direction: Higher pressure is associated with higher temperature, and lower pressure is associated with lower temperature. In other words, temperature and pressure are correlated.

Including correlated inputs in a statistical model can lead to confusing coefficients. The team wonders whether the joint effect of temperature and pressure explains changes in thickness.

An easy way to check this is to expand the model with a new term that is the product of pressure and thickness.

First-stage model—regression program data / TABLE 2

	Coefficient	Standard error	*t* statistic	*p* value
Intercept	70.9653	4.5555	15.5779	0.0000
pH	0.2350	0.1631	1.4407	0.1564
Catalyst	0.2959	0.0714	4.1437	0.0001
Pressure	-0.0875	0.0293	-2.9863	0.0045

50 observations

TABLE 1

Thickness	pH	Catalyst concentration	Tank pressure
69.38	9	29	145
68.92	9	23	103
68.70	4	34	109
64.30	5	23	150
73.72	8	35	103
71.97	5	36	146
76.40	4	31	118
65.79	2	26	122
70.20	5	40	146
67.41	3	26	141
68.94	9	24	138
69.91	1	36	140
76.04	7	34	112
72.98	6	37	109
72.54	8	28	114
70.09	6	22	118
78.75	6	39	107
67.23	2	31	105
72.28	7	22	105
72.24	5	35	124
67.37	9	21	126
74.00	6	31	123
71.80	10	32	119
75.81	8	31	102
74.60	4	27	117
67.99	7	32	129
70.34	6	36	125
65.61	7	24	126
69.87	8	28	109
68.89	2	34	117
75.85	7	36	106
68.43	6	22	131
73.09	9	27	124
69.08	8	39	105
77.26	8	39	115
69.83	3	32	147
68.06	2	36	141
72.07	10	32	135
70.15	7	31	130
66.40	9	28	144
73.30	9	30	109
67.58	1	29	130
75.20	4	28	138
65.39	5	21	126
76.25	7	40	128
66.55	7	24	118
69.12	2	25	110
68.84	7	38	145
64.85	5	26	130
69.92	10	39	124

50 observations—second-stage model / TABLE 3

Thickness	pH	Catalyst concentration	Tank pressure	Tank temperature	Tank voltage
68.26	5	35	119	88	236
73.36	7	32	108	84	235
70.27	6	35	140	89	239
62.99	5	27	129	87	227
66.61	7	25	123	86	230
70.08	7	26	103	82	230
70.42	7	29	118	81	235
72.74	10	26	113	86	243
70.54	7	26	148	86	237
72.04	7	26	134	89	247
72.68	9	38	125	90	242
74.44	10	33	148	86	245
67.50	5	27	147	83	234
71.91	8	31	126	84	236
72.81	6	36	117	87	243
71.46	9	26	102	89	239
66.48	7	34	116	90	233
76.83	4	40	127	83	244
73.28	7	31	140	86	243
72.50	4	31	139	82	243
77.11	7	36	134	85	246
72.04	9	24	105	83	234
68.56	10	22	109	87	235
75.04	8	38	125	81	240
68.35	10	34	132	81	228
66.42	7	29	111	88	233
72.71	9	22	112	82	244
70.66	9	27	122	81	239
76.63	2	38	103	83	250
74.17	9	37	144	81	245
62.35	3	24	108	88	226
70.00	5	33	135	83	236
68.67	7	30	143	83	237
71.39	6	23	122	87	244
76.35	6	39	106	84	244
77.20	4	39	119	84	248
71.21	6	33	140	87	243
72.51	2	21	101	87	244
65.11	3	29	127	88	230
69.36	2	34	118	82	227
69.65	7	35	125	84	231
67.77	2	30	149	85	231
71.55	10	25	123	87	245
72.95	5	33	110	81	234
69.29	3	38	124	84	232
66.90	7	37	141	88	231
66.16	7	23	131	83	228
69.49	2	32	115	82	228
67.97	8	39	108	82	226
67.10	4	28	106	83	226

The data for stage two are augmented with this cross product. The values for the cross product are shown in Table 5 (p. 49). Fitting a third-stage model with the augmented data set produces coefficients shown in Table 6.

In equation form, the third-stage statistical model is thickness = 107.3334 + (0.0854*pH) + (0.1538*catalyst) – (0.8878*pressure) – (1.6257*temperature) + (0.4275*voltage) + (0.0100*pressure*temperature). In the third stage, all the inputs that were significant in the second are also significant. The coefficient for the product of pressure and temperature is positive and significant. When the joint effect of pressure and temperature is accounted for in the model, the impact on thickness is what theory and experience predicts should happen.

The lack of significance for pH remains a mystery. Perhaps this variable is not significant because of some special but yet unobserved feature of the production environment. Maybe some variable missing from the model overrides or counteracts the effect of pH. Perhaps the effect of pH is through interaction with another variable. Maybe pH has a statistically significant effect in the third stage model, but it is too small compared to the measurement error for thickness.

At the end of the third stage, the team has some unanswered questions but also some clues about how to proceed. A designed experiment involving a more complex model capable of examining a wider array of possible interactions between inputs looks appealing.[10]

Depending on the importance attached to clearing up the mystery of the nonsignificance of pH, a more precise system for measuring thickness may be needed.

The team should put forth its most reasoned proposals for stage four, pursue the needed resources and, as with most other teams in the model building busi-

Second-stage model regression program data / TABLE 4

	Coefficient	Standard error	*t* statistic	*p* value
Intercept	4.1963	8.1508	0.5148	0.6092
pH	0.0814	0.0793	1.0267	0.3102
Catalyst	0.1636	0.0360	4.5485	0.0000
Pressure	-0.0438	0.0133	-3.2844	0.0020
Temperature	-0.4042	0.0691	-5.8495	0.0000
Voltage	0.4245	0.0282	15.0715	0.0000

Third-stage model regression program data / TABLE 6

	Coefficient	Standard error	*t* statistic	*p* value
Intercept	107.3334	55.1608	1.9458	0.0582
pH	0.0854	0.0771	1.1070	0.2744
Catalyst	0.1538	0.0353	4.3524	0.0001
Pressure	-0.8878	0.4469	-1.9866	0.0534
Temperature	-1.6257	0.6500	-2.5010	0.0163
Voltage	0.4275	0.0274	15.5887	0.0000
Pressure × temperature	0.0100	0.0053	1.8893	0.0656

50 observations—third-stage model / TABLE 5

Y	Tank pressure × tank temperature
68.26	10,472
73.36	9,072
70.27	12,460
62.99	11,223
66.61	10,578
70.08	8,446
70.42	9,558
72.74	9,718
70.54	12,728
72.04	11,926
72.68	11,250
74.44	12,728
67.50	12,201
71.91	10,584
72.81	10,179
71.46	9,078
66.48	10,440
76.83	10,541
73.28	12,040
72.50	11,398
77.11	11,390
72.04	8,715
68.56	9,483
75.04	10,125
68.35	10,692
66.42	9,768
72.71	9,184
70.66	9,882
76.63	8,549
74.17	11,664
62.35	9,504
70.00	11,205
68.67	11,869
71.39	10,614
76.35	8,904
77.20	9,996
71.21	12,180
72.51	8,787
65.11	11,176
69.36	9,676
69.65	10,500
67.77	12,665
71.55	10,701
72.95	8,910
69.29	10,416
66.90	12,408
66.16	10,873
69.49	9,430
67.97	8,856
67.10	8,798

ness, expect a little more of the truth to reveal itself on the gradual path to ultimate success.

The tale of overnight, complete victory will occur on TV or in the movies before it happens on the production floor. QP

REFERENCES AND NOTES

1. In practice, a process will have more than one important output. Improving and optimizing processes with multiple outputs is beyond the scope of this article. For details on methods for optimizing multiple outputs, see Raymond H. Myers and Douglas C. Montgomery's *Response Surface Methodology: Process and Product Optimization Using Designed Experiments*, second edition, John Wiley, 2002.
2. Linear regression and its variants are a common and powerful technique for building statistical models. For more details, see Norman R. Draper and Harry Smith's *Applied Regression Analysis,* third edition, John Wiley, 1998.
3. If the process is in the early design or pilot stages, the source of the historical data may be a designed experiment. For more details, see Douglas C. Montgomery's *Design and Analysis of Experiments,* sixth edition, John Wiley, 2005. If the process has been running for some time, the historical data may reside in the plant's quality information system. In this case, the success of the model building exercise depends on how well quality practices—effective operator training, regular equipment maintenance, clearly written procedures—are carried out.
4. The data in Tables 1, 3 and 5 are coded.
5. The table is reformatted from the original layout for clarity of presentation.
6. For a precise definition and formula for standard errors of regression coefficients, see Draper and Smith's *Applied Regression Analysis* (see note 2).
7. For more details on *t* distribution, see Rudolph J. Freund and William J. Wilson's *Statistical Analysis,* second edition, Academic Press, 2002.
8. The value of the cutoff should be decided in advance of estimating the statistical model.
9. The coefficient of an input variable in a statistical model measures the change to be expected in the output variable per unit change in the input, leaving all other input variables unchanged.
10. For examples, see the Myers and Montgomery, *Response Surface Methodology: Process and Product Optimization Using Designed Experiment* (see note 1).

JOSEPH D. CONKLIN is a mathematical statistician at the U.S. Department of Energy in Washington, D.C. He earned a master's degree in statistics from Virginia Tech and is a senior member of ASQ. Conklin is an ASQ certified quality manager, quality engineer, quality auditor and reliability engineer.

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Joseph D. Conklin has written many 3.4 per Million columns since 2004, covering topics such as testing prediction models, design of experiments and measurement system analysis. Visit www.qualityprogress.com to find his past work.

2010 ASQ World Conference on Quality and Improvement

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Focus Areas

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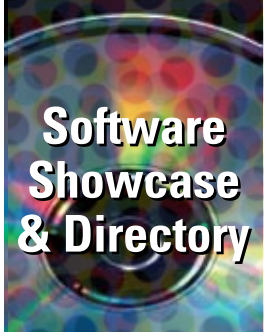
ASQ's software directory & BUYER'S GUIDE

TOP TEN TIPS

Searching for the best quality software for your needs can be a daunting task—where do you even begin? It's crucial to find the solution that best fits your business needs but that also integrates seamlessly with your current systems. These are, without a doubt, difficult choices. With that in mind, ASQ presents its Annual Software Directory and Buyer's Guide, a one-of-a-kind resource to help make your research—and your decision—easier. With tons of informative listings on the top vendors, you might find yourself referring to it year-round.

Vendors' Top 10 tips for making the right software choice:

1. Ask other ASQ members for their feedback and referrals.
2. Get all stakeholders involved and make a comprehensive checklist of your requirements. Differentiate what you must have and what you would like in a perfect world.
3. List all the programs with which the software must interface to ensure they work together.
4. Get a free trial of the software so you can try it firsthand.
5. Ensure that the software company has good training and customer service.
6. Fully understand the cost and determine any hidden or extra costs like consulting fees.
7. Get a list of references.
8. Find out how long they have been in business and what new products have been developed.
9. Try calling the support line with a question or two.
10. Keep and refer to ASQ's Software Directory and Buyer's Guide and tell them you heard about them from ASQ.



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SOFTWARE REVIEW

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The StatSoft Web site (www.statsoft.com) provides not only in-depth information about the broad line of STATISTICA solutions, but also an award-winning Electronic Statistics Textbook. Information can be found to assist users in understanding a broad selection of cutting-edge methods to meet their data analysis needs. They can also visit any of the 24 StatSoft offices around the world.

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Are You Recession Proofed?

You're probably more valuable than you realize

OVER THE YEARS, I have observed that organizations seem to make cuts in two specific areas when economic times are tough. The first department cut is safety, and the second is quality.

What's worse is that if an organization doesn't have a safety department, then the first to go is quality.

You probably know fellow quality professionals who have been laid off because companies had to cut back during these uncertain times. While it obviously doesn't make sense to reduce safety or quality, unfortunately that's what some companies do.

Wake-up call

It is surprising to me that quality professionals are often caught off guard by this phenomenon. Have they never seen it happen before? Wake up and smell the coffee. Remember the recession back in 2002-2003 and many other downturns in business cycles? We have been through this before.

Changing times require us to change along with it. I'm not talking about a wholesale reinvention of yourself. Just look in the mirror and see where you add value to your organization.

As quality professionals, we are supposed to be customer focused and have a continuous improvement focus. Then why don't we always see our employer as a customer of our education, skills, experience and (gasp) competence? Why don't we continuously make ourselves more valuable to our employers?

I believe quality professionals have so much more to offer in other areas of our organizations, but we just don't recognize these attributes:

- What marketing group wouldn't want someone on its team who has excellent problem-solving skills, is customer focused and has knowledge of statistics?
- What production function wouldn't want a team player who practices continuous improvement and knows how to use all sorts of tools that can stabilize variation, identify problems, propose and implement solutions, and eliminate the root cause?
- Some of the soft skills we possess could help a customer service department improve customer satisfaction.
- I bet purchasing could use someone knowledgeable in acceptance sampling and auditing.
- The knowledge picked up on the job could be used to train or teach others.

List all your skills

If you think you might be on the bubble jobwise or need to change things in your career, try looking beyond your life in the quality department. When organizations hire employees, they look for skills a quality professional already has and practices every day.

Use your next 10-minute break to start a list of skills you have acquired while performing the duties of a practicing quality professional.

Here are some examples to get started: project management, Pareto analysis, team building, measurement and metrics, and effective meeting facilitation. Work on your list twice a day for five days, and I bet you will have a list much longer than you think possible. Shoot for a minimum of 50 skills.

Now, look around. What other areas in your organization do you think could use these skills? In what other areas have you considered working some day?

Have you ever thought about approaching your boss and saying, "You know, I love a challenge, and I was wondering what it would take for me to use my skills to help out other areas in our company." Then, go to the leader in the area in which you are interested in working and ask the same question.

Is it risky to ask these questions? Maybe. They might say, "Just do your own job and don't worry about others." They might not understand your valuable skills and think you are trying to take over their projects.

Could these efforts be the best move you ever made? Absolutely!

Don't get caught off guard. Make yourself so valuable to your organization that there is no way they would let you get away. You might even get a promotion or, better yet, a raise. QP

ANTHONY MANOS is a catalyst with Profero Inc. in Frankfort, IL. He earned an MBA in entrepreneurial studies at the University of Illinois in Chicago. Manos is a senior member of ASQ and an ASQ certified mechanical inspector and quality technician.

BY J.P. RUSSELL

Gauge Audit Program Value

Internal programs must provide real benefits

TODAY'S ORGANIZATIONS need to be agile and responsive to the changing requirements in private and public business sectors. Properly directed, internal audit program resources can help an organization stay focused and uncover new improvement opportunities.

Unfortunately, the effectiveness of many audit programs is limited to counting findings or other simplistic measures. Effective audit programs, however, should provide insight and support the organization's objectives. But some organizations are not even sure how to gauge the effectiveness of their audit program.

At first glance, gauging the effectiveness of your internal audit program may seem easy. If you have accomplished your objectives, the audit program is effective. But as you start to list the organization's, department's and audit program's objectives, things start to get fuzzy. What methods will you use, and what measures do you need to monitor?

Note that while this column is about internal audit programs, the same techniques can be applied to any department or function simply by changing names and examples.

After a few minutes of scratching your head, you may be tempted to go back to counting audits conducted, nonconformities issued and closed corrective actions as your key performance indicators (KPI)—but please resist.

Effectiveness of the audit program should be of interest to audit managers and auditor team members: managers, because they should be making the right decisions to continually improve the internal audit function and auditors because they will be asked for their input and agreement on the performance parameters by which they will be judged.

Effectiveness

Gauging the effectiveness of an internal audit program can be complicated. We want what we do to be effective, but sometimes we are not sure what effective means or how to determine it.

The dictionary definitions for effectiveness are too numerous and too vague for application in a technical field. In 1995, in *After the Quality Audit*, I explained that the effectiveness of a system or process is based on two components: process and product.[1]

The system or process is effective in two circumstances:

1. When it achieves the desired result that is consistent with organizational objectives (the product).
2. When the process is capable, efficient and consistent with objectives (the process).

For example, adding three inspection steps to achieve the desired quality output may achieve the output objective (the product) but would make the process less efficient and perhaps less capable. There must be a proper balance between the two components (product and process). This means the end does not justify the means.

In 2000, ISO 9000 added a definition for the word "effectiveness to its vocabulary: the extent to which planned activities are realized and planned results achieved. In an elegant manner, it combined the two components' processes (planned arrangements) and product (results achieved). Knowing what effective means is important because effective processes lead to an effective and successful organization.

As you can see, the number of audits conducted or corrective action requests closed are not adequate KPIs of the effectiveness of the internal audit program. Counting audits addresses only the process and not the outcome (product).

ALL ABOUT AUDITING

For other feature articles and Standards Outlook columns by J.P. Russell about adding value to quality audits, go to www.qualityprogress.com.

Audit program objectives

Audit program performance indicators should be based on objectives that reflect the audit program mission and organizational objectives and goals. The organizational or function objectives and goals are the big picture of where you want to be one to five years from now.

Not all objectives are equally important to the organization or audit program. The objectives that avoid the greatest risks and identify the greatest opportunities for improvement are the most important.

For this column, I am going to lump objectives and goals into three groupings:

1. Alpha group: critical for the organization or function to operate. Top management wants to know if the organization adheres to all applicable standards to ensure critical licenses and certifications will be retained.
2. Bravo group: necessary for day-to-day management.
3. Charlie group: required for advancement and growth.

The Alpha-Bravo-Charlie order is not necessarily the order of importance of the individual organization's objective or goal.

Just counting the number of audits or corrective actions closed is not adequate.

Sample audit program objectives / TABLE 1

Survival
Alpha group objectives • Assurance that a state of readiness exists regarding compliance to statutory, regulatory and contractual requirements. • Setting objectives that address significant risks to the organization. Risks may be associated with safety, quality, environment, security or finance.
The present
Bravo group objectives • Adherence to customer requirements. Customers may be internal or external. • Adherence to management system and certification requirements. • Support of the organization operation model and concept. This could include commercial intentions or resource allocations for nonprofits. • Assurance that management objectives or priorities address business and operational risks to the organization, such as failing to stay competitive. This may include control of costs. • Maintenance of supplier and outsourcing base requirements.
The future
Charlie group objectives • Improve the effectiveness and efficiency of the management system and organization. • Determine management objectives and priorities for advancement of the organization such as lowering expenses, implementing opportunities for improvement or introducing new services or products. • Implement processes to ensure sustainability. • Integrate needs of interested parties that will advance the achievement of organization goals. • Validate the management system design to ensure it is capable of meeting current and future needs.

Your organization probably already has groupings of some kind. Table 1 shows some examples of audit program objectives adapted from ISO 19011,[2] clause 5.2.1.

You have auditing objectives, but because internal audits are a service for internal customers, you should also consider internal customer objectives when performing the service. For example, if you are a licensed barber or beautician, should you cut someone's hair how you think best, or should you consider your customer's objectives as you perform your professional duties?

If you are conducting second-party supplier audits and have good relationships with your suppliers, you may want to be aware of their objectives relevant to the product or service they provide.

For third-party certification audits, you may need to verify that the auditee organization has objectives that are promulgated throughout the organization, but you do not need to consider them as part of the audit purpose. It may be good business to do so, however.

Independent third-party auditors from governmental agencies need not be concerned with auditee organization objectives as long as the organization complies with statutory and regulatory requirements. However, some regulatory agencies believe that auditee objectives improve ongoing compliance, as well as effectiveness.

Strategies

Once you know the objectives, you, as the manager, or your management team can develop strategies to achieve the

audit program objectives. The strategies will be based on the type of organization, the organizational culture and resources. Some of the strategies may be simply to formalize what you are already doing.

If there was an objective to continually improve, some audit program strategies and tactics may include:

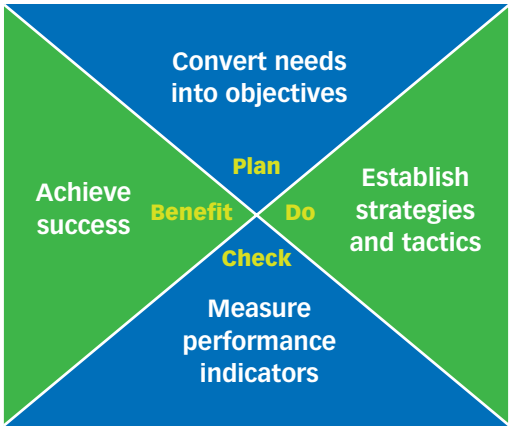
- Developing a process to collect complaints or feedback from audit program customers (auditee, audit program manager, stockholders, top management, function managers and supervisors). By collecting feedback, audit program management can learn what works and what doesn't work, as well as identify customer needs.
- Adding value by reviewing department or area objectives as part of audit preparation and including them in the audit statement of purpose for that department or area when appropriate.
- Identifying and reporting completed corrective actions that improved or changed the system or process.
- Upgrading auditor competency for observing and reporting performance issues.
- Verifying claimed improvements by organization functions and reporting findings to top management.
- Implementing real-time audit reporting using mobile technology.

Another objective may be to maintain continuous compliance using fewer resources, with audit program strategies or tactics that could include:

- Reducing resources used to audit areas demonstrating continuous compliance by decreasing audit frequency or conducting mini audits supported by independently supported data (compliance indicators based on performance).
- Establishing a network of audit advisors for areas needing assistance to comply based on past results.
- Implementing a program to schedule audits based on changes in processes or key personnel to identify and prevent noncompliances by external auditors.
- Identifying situations in which outsourcing is a more cost-effective alternative than in-house oversight.
- Establishing and implementing an e-audit program.

We have discussed the first two steps (plan and do) of the success quadrangle (see Figure 1) . Next, we need to establish performance measures that will result in the successful achievement of the objectives.

The success quadrangle / FIGURE 1



KPIs

Now that you have determined how to achieve objectives and goals, it is time to develop KPIs to ensure you stay on track. KPIs should be quantifiable measurements that are agreed to beforehand.

A KPI may be to achieve milestones during the implementation of a feedback program. Another one may be to maintain a 95% internal customer satisfaction rating for the audit program. A KPI for ongoing compliance could be to have no serious findings from external auditing organizations—just minor findings requiring remedial action with no system problems.

Process performance indicators may be the monitoring of internal complaints related to delivery of the service, redoing things or meeting agreed-on commitments.

Some desirable performance indicators, including the following examples, are less quantifiable:

- Do corrective action plans address the fundamental cause (not the symptom)?
- Do they contain real root causes?
- Were plans on time?
- Are solutions realistic (viable considering the environment)?
- Is the timetable for change reasonable?

For these less-quantifiable indicators, you might grade corrective action plans based on a marking scheme similar to those for essay tests, with a 100% grade matching all expectations.

This same technique could be used to improve the effectiveness of audit reports. For example:

- Do audit reports link findings to objectives or customer requirements?
- When possible, are findings quantified and analyzed?
- Is report terminology appropriate for the users of the report?
- Are attachments, examples, diagrams or images used to improve report effectiveness?
- Are unfamiliar terms defined?

Once you have established your performance indicators, be prepared to change them when objectives change.

Everyone involved in the audit program (auditors, staff, supervisors) should be focused on meeting or exceeding KPIs. You can post the KPIs in conference rooms, the lunch room and on the company intranet or website to keep everyone informed of your progress.

Additional ideas for audit program

strategies and performance indicators can be found in the latest edition of *After the Quality Audit*.[3]

Effective and efficient

An effective internal audit program is one that achieves its objectives via processes that are capable and efficient. It is about doing it right the first time and being lean. You will need output measures and process measures to verify the audit program is effective and efficient.

The audit function provides a valuable service for the organization. As with any service, it should be done right and professionally. Operate as if you were competing with other audit organizations and could lose the business. What value-added services does your audit program offer? What innovations are planned for future services? Can you demonstrate that you address your customer needs?

Many managers and executives have low expectations of audit programs. Many view audit programs as the cost of doing business to ensure compliance to regulations. Once audit program managers can demonstrate the effectiveness of how the audit program supports the organization's objectives, managers will start to see that audit program verification services can add value beyond compliance to the law.

Auditors represent an independent set of eyes supporting the insight that is needed in our fast-paced world economy. We need to ensure we are putting solved problems behind us and are continually advancing our organizations to optimize their chances of success. QP

REFERENCES

1. J.P. Russell, *After the Quality Audit*, ASQ Quality Press, 1995.
2. *ANSI ISO/ASQ QE19011S, Guidelines for Management System Auditing*—U.S. version with supplemental guidance added, ASQ, 2008.
3. J.P. Russell, After the Quality Audit: Closing the Loop on the Audit Process, ASQ Quality Press, 2000.

J.P. RUSSELL is president of J.P. Russell & Associates in Gulf Breeze, FL, and managing director for QualityWBT Center for Education. He is a fellow of ASQ, an ASQ-certified quality auditor, voting member of the American National Standards Institute/ASQ Z1 committee, a member of the U.S. technical advisory group for International Organization for Standardization technical committee 176 and member of the Standards Engineering Society. Russell is the author of several ASQ Quality Press books, including Internal Auditing Basics *(second edition),* ISO Lesson Guide 2008 *(third edition) and* Process Auditing Techniques, *and editor of the* ASQ Auditing Handbook *(third edition).*

QP TOOLBOX

Flaw detector system ▸

Olympus has introduced the iXU 2.1 software for the OmniScan iX industrial ultrasonic flaw detector system designed for high-speed nondestructive industrial component testing. The revised software includes shortcut keys and touch-screen features.

The time-corrected gain curve allows up to 32 points and negative values, and combines a linear material attenuation function. An added immersion ruler simultaneously monitors the water column and its position in relation to the material.

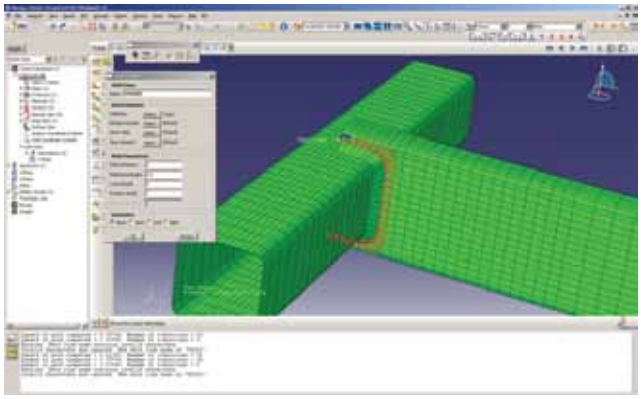
Additional features include a degree scale for scan axis, an external pace-trig mode, increased digitalization frequency and improved stability and performance.

Call: 781-419-3900; e-mail: meindert.anderson@olympusndt.com.

Structural stress method ▾

Dassault Systèmes' Verity structural stress method for Abaqus simulates realistic structural stress in welded joints and other connections. It enables engineers to predict a consistent stress characterization for welded joints in industrial applications, such as pressure vessels, piping, storage tanks, offshore platforms and construction equipment.

In addition to welded joints, the Verity structural stress method can also be applied to structures with geometric notches, such as adhesive joints, mechanically fastened joints, electronic packages and manufacturing notches that exhibit stress concentrations due to loading.



The method has been adopted in the American Society of Mechanical Engineers (ASME) Division 2 Code and API 579/ASME FFS-1 Codes for Fitness-for-Service assessments based on allowable stress methods and plastic collapse loads.

In the nuclear power industry, Verity helps engineers evaluate weld performance of mission-critical components and systems, such as pressure vessels to reduce maintenance and physical inspection. In the oil and gas industry, benefits include improved operational availability of physical systems including pipelines and offshore structures.

Call: 401-272-1510; visit: www.simulia.com.

Energy saving switch

D-Link has released a "green" managed switch—the D-Link green 16-port managed gigabit switch DGS-3200-16.

D-Link's green technology automatically detects a device link status and reduces the power usage of ports that are not

linked. When detecting if a link is down, the DGS-3200-16 can save up to 14.28% in power usage without sacrificing network performance.

The DGS-3200-16 switch includes a fan with heat sensors that maintain the device's temperature for optimum performance. The fan turns off automatically and turns on when the system's operation temperature reaches or surpasses 95°F to reduce noise pollution and energy consumption.

Call: 714-885-6000; visit: www.dlink.com.

Data loggers ▼

Dickson's stainless steel case data loggers are ideal for monitoring temperatures in the hot and wet conditions of many industrial processing operations and inventory storage areas.

The Takes-the-Heat Watertight Temperature Data Loggers (HT 200) and Piercing Probe Models (HT 220/HT 225) feature

watertight, food grade, HACCP and FDA-compliant stainless steel cases.

They are also temperature resistant up to 257°F, have reinforced probes in HT 220 and HT 225 models, contain user replaceable 1-year batteries and are USB-enabled for high-speed data downloading.

Call: 630-543-3747; visit: www.dicksondata.com.

Trending digital multimeter ▲

The Fluke 289 industrial trending digital multimeter (DMM) has multiple features specifically designed for industrial technicians.

The Fluke 289 DMM provides the usual measurement functions, such as V A/C, V D/C, ohms, capacitance, A A/C and A D/C. For all of these, the user can have the meter monitor a circuit while the technician is busy elsewhere.

For example, a technician can set up the meter to record A/C voltage on a circuit of concern and then exercise loads at a remote location on that circuit. Returning to the meter, the user can then view a Trend-Capture display of the circuit's performance during the exercise. Other features include a low pass filter and an info button.

Call: 800-443-5853; visit: www.fluke.com.

Camera system ▼

Toshiba Teli America's camera model CS8581QF is a remote-head FireWire camera system designed for high-speed industrial imaging from a camera able to fit in small mounting spaces.

The CS8581QF offers 133 frames per second (FPS) at full 640 x 480 resolution, as well as partial scan modes that top 430 FPS.

The CS8581QF is comprised of a remote head camera and a central control unit that can be mounted up to 2 meters apart from each other and connected by a cable.

This makes it ideal for movement applications in which the remote head is mounted on the end of a robot arm or a positioning stage.

Call: 949-770-8354; visit: www.toshiba-teli.com.

QP REVIEWS

Appreciative Inquiry Handbook

David L. Cooperrider, Diana Whitney and Jacqueline M. Stavros, Berrett-Koehler Publishers, 2008, 454 pp., $49.95 (book).

Peter Drucker said, "The ageless essence of leadership is to create an alignment of strengths in ways that make a system's weaknesses irrelevant." David L. Cooperrider and his team make this possible with the use of appreciative inquiry (AI), which designs strategic change initiatives and allows organizations to reshape the future by focusing on its core strengths.

The AI process begins with the organization deciding what to learn about. Next, the discovery activity uncovers the core strengths of the company. Then comes the dreaming stage to help envision what could be. This leads to design—finding or identifying ways to create the desired future state. The final stage is delivery, in which team members talk about how to sustain the change. The process can loop back to discovery as required.

Typically, problem solving breaks things into pieces, and what results is a fragmented corrective action that is a Band-Aid, not a preventive action. AI starts by focusing on the ideal and finds roots in what is already good about the organization. Employees from many departments are engaged in the process, ensuring that everyone is actively pulling for the desired outcome during implementation.

The AI process works because the employees focus on what is good about their work. This becomes an invitation for people to engage in building the kind of organization they want. AI helps employees see the need for change that drives the exploration for new and better solutions.

This book is an outstanding guide for the leaders of change. The elements of AI are explained clearly for the novice, and a wealth of learning tools and resources are included. It should be required reading for everyone in senior and executive management.

Reviewed by John J. Lanczycki Jr.
Creative Planners
West Springfield, MA

A Complaint Is a Gift

Janelle Barlow and Claus Moller, Berrett-Koehler Publishers, 2008, 273 pp., $19.95 (book).

This is not just a book about how to deal with complaints. It serves as a how-to guide for taking the first step to building a customer-oriented organization.

The book is divided into three parts. In the first section, the authors state that although we might not like to receive negative feedback, customers who complain directly to us are giving us a gift. Moreover, the authors explain the importance of using complaint handling as a strategic tool (one of the least expensive marketing tools) and a way to define what customers want.

The second part of the book shows how to put what the authors call the gift strategy into practice. It begins by explaining the gift formula, an eight-step response to complaining customers.

The last section, which is new to this edition, deals with the personal side of complaints and urges individuals to use complaints they receive as a tool for personal development.

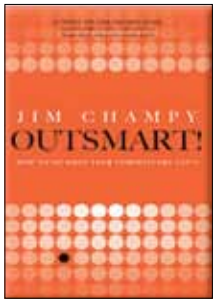
The main strengths of the book are that it is well organized and written in a very enjoyable style. It contains plenty of real examples that ease the understanding of the concepts. Each chapter concludes with a set of discussion questions about complaints and what you or your organization can do about them.

The book has only one weakness in that it could have been a bit shorter. Despite that, I highly recommended it to everyone, especially those who are frequently in contact with customers. In fact, it should be mandatory reading for anyone charged with handling complaints.

Reviewed by Martín Tanco
Tecnun (University of Navarra)
San Sebastian, Spain

Outsmart! How to Do What Your Competitors Can't

Jim Champy, FT Press, 2008, 162 pp., $22.99 (book).



This is a short book generated from Darwinian mode research Jim Champy has done for organizations that have experienced a minimum of 15% annual growth for at least three years.

Although Champy mentions one well-known company—Smith and Wesson—many of the organizations he has worked with are not as recognizable—Shutterfly, Sonicbids and Smartpak, to name a few. He defines best-practice strategies organizations should adopt, including the ability to be quick, flexible and ready to adapt to the

market. He also covers more traditional attributes: intelligence, experience and business sense.

Champy is excellent at capturing the essence of each company's success in just a few pages. Of the eight vignettes, six are 16 pages each, and two are 19 pages. At the end of each chapter, he lists a few questions that can spark creativity to help you generate your own ideas.

In one of the chapters, Champy tells of how Sonicbids was formed to solve a problem local musicians had when trying to market their skills and link with customers who needed small-event entertainers. The market was huge, but the average unit cost was small, so it had been neglected by the traditional agents. Sonicbids recognized that, and it has grown to serve 10,000 promoters and 120,000 musicians, charging small fees on a large scale.

The epilogue highlights the following lessons that support Champy's approach: ambition matters, intuition reigns, focus prevails, customers rule, calm enables, innovation lives, culture drives and everyone plays.

This book lends itself to readers who travel often, because each chapter is a standalone study that reinforces best-practice strategies.

Reviewed by Bill Baker
Speed to Excellence
Santa Fe, NM

The FDA and Worldwide Quality System Requirements for Medical Devices

Amiram Daniel and Ed Kimmelman, ASQ Quality Press, 2008, 336 pp., $95 list, $57 member (second edition, book).

This book is a revision of a 10-year-old compendium. It follows the same format as the original but provides updated comments on the requirements and guidance given in the U.S. Food and Drug Administration's (FDA) quality system regulation published in 1996, ISO 13485:2003, ISO/TR 14969:2004, and portions of the Food, Drug and Cosmetic Act.

The authors attempt to provide a single place to compare the quality system practices required by the most widely used standards for producing medical devices—and they succeed.

The pages for each chapter are tabbed for easy navigation, and there is a very helpful index if the chapter titles do not allow for easy searching. Risk management, quality management system process interactions and a short section on future FDA activities are integrated into the discussions. The only ways to substantially improve this book would have been to include a searchable CD-ROM and a dictionary of acronyms.

While the book deals with subject matter that can be dry at times, it will be useful to anyone in medical device production who wants to improve their current practices or anyone who is thinking about getting into the industry.

Even though the actual standards must be used as the absolute authority, this book is an excellent guidance tool and will rapidly become one of the most page-worn volumes on your bookshelf.

Reviewed by Marc A. Feldman
Solvay Chemicals Inc.
Houston

RECENT RELEASES

Customer Satisfaction Planning

Thomas T. Hirata, CRC Press, 107 pp., $39.95 (book).

Lean-Six Sigma for Healthcare

Greg Butler, Chip Caldwell and Nancy Poston, ASQ Quality Press, 208 pp., $72 list, $43 member (second edition, book and CD-ROM).

Root Cause Analysis

Duke Okes, ASQ Quality Press, 182 pp., $45 list, $27 member (book).

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❍ Analyst	❍ Contractor	❍ Inspector	❍ Owner	❍ Six Sigma Green Belt	❍ Technician
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Six Sigma Forum Magazine	$45.00	$65.00#	$70.00	❍ $_____
Journal of Quality Technology	$30.00	$51.00#	$49.00	❍ $_____
Software Quality Professional	$45.00	$65.00#	$70.00	❍ $_____
Quality Management Journal	$50.00	$80.00#	$74.00	❍ $_____
Quality Engineering	$34.75	$51.25#	$51.25	❍ $_____
Technometrics	$30.00	$30.00#	$30.00	❍ $_____
The Journal for Quality and Participation	$45.00	$65.00#	$70.00	❍ $_____

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QP CALENDAR

To receive information or to register for ASQ Education Courses, contact Learning Offerings, ASQ, 600 N. Plankinton Ave., Milwaukee, WI 53203; call 800-248-1946 or 414-272-8575; fax 414-272-1734; or visit www.asq.org.

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16-17 **5th Annual Product Safety and Liability Conference**. Milwaukee. Call Randall Goodden at 262-594-5198 or e-mail randygoodden@yahoo.com.

20-24 **Coordinate Metrology Systems Conference**. Louisville, KY. Call the Coordinate Metrology Society at 425-802-5720 or visit www.cmsc.org.

21 ASQ Education Course. **Lean Kaizen: A Simplified Approach to Process Improvements—Virtual Course**.

21-23 **Principles and Practices of Performance Improvement**. Washington, D.C. Call the International Society for Performance Improvement at 301-587-8570 or visit www.ispi.org.

22-23 ASQ Education Course. **Measuring Process and Organizational Performance—Virtual Course**.

AUGUST

6 ASQ Education Course. **Quality Cost Principles—Virtual Course**.

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18-20 **Lean and Six Sigma in Service and Transactional Environments Conference**. Chicago. Call Worldwide Conventions and Business Forums at 800-959-2652 or visit www.wcbf.com/quality/5095.

19 ASQ Education Course. **Getting Started with Lean Six Sigma in a Small to Midsize Enterprise—Virtual Course**.

19-21 **Canadian Quality Congress**. Vancouver. Call the registration secretariat at 604-822-1050 or e-mail registration@housing.ubc.ca.

24-28 ASQ Education Course. **Auditor/Lead Auditor Training for ISO 13485**. St. Louis.

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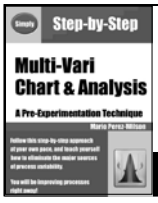
SAVE THE DATE

If you'd like your event included in QP Calendar, submit information at least three months in advance to bkrzykowski@asq.org. Non-ASQ organizations may list one event per issue.



Easy as 1, 2, 3 (4, 5)

A simple visual aid can help keep crucial information at hand

AT ONE TIME or another, we have all used mnemonic devices or memory aids. These are the short rhymes, cute sayings or visual cues that help us recall various facts we would ordinarily need to Google to jog our memory.

Many of our memory aids were learned in grade school or high school. They have stayed with us, tucked away in our long-term memory for years. For example, in an effort to improve our spelling aptitude, we all learned this catchy phrase: "I" before "E" except after "C."

Visual memory aids are also very useful. For example, we can use our five fingers to remember the five major sections of the ISO 9001 standard.

Thumbs up

Start with the thumb. Think of this as the strongest of the five fingers. It is the broadest digit and is absolutely critical to providing total hand function. Try lifting any object without the thumb, and you will quickly discover it is nearly impossible.

Equate the thumb to the first major section of the standard—the quality management system (QMS). The QMS, like the thumb's role as part of the hand, is a strong element and provides the foundation necessary for the other main elements to function well.

The index finger is a memory aid for the second major section of the standard—management responsibility. We often think of management as a directing body. As a result, many of us have images of executives pointing their index fingers as they clarify various issues. In addition, you can visualize a conductor leading an orchestra with an outstretched index finger.

In both cases, the pointed index finger can symbolize commitment, planning, direction, authority and communication, all of which are key components of the management responsibility section of the standard.

Stuck in the middle

Next, the middle finger can serve as a reminder for the third major section of the standard—resource management.

A review of the resource management section of the standard includes references to infrastructure or human resources. When you take a look at the middle finger, it is the tallest finger on the hand. Therefore, it can be a memory aid that represents the buildings and the employees inside them.

Then there is what many of us call the ring finger. The fact that most married people wear a ring—a man-made product—on this finger reminds us of product realization, which is the fourth major section of the ISO 9001 standard.

Small reminder

The little finger is the smallest, weakest finger. Known as the pinky, this finger must work harder than the others. Any guitar player knows that holding a string down on a fret with the little finger is quite difficult and only becomes easier as it is strengthened through practice or improvement. Thus, the littlest finger reminds us of the fifth major section—measurement analysis and improvement.

As with all mnemonic devices, however, there are exceptions. After all, along with the rule of "I" before "E" except after "C" comes this addendum: or when sounding like "A" as in "neighbor" and "weigh."

Our five-finger visual aid works well for organizations in certain countries, including the United States. But each finger may have a different meaning in another culture, so the system would need to be adapted to fit. QP

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