Putting Best Practices to Work

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QP

QUALITY PROGRESS

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SALARY SURVEY

VOLUME 42/NUMBER 12

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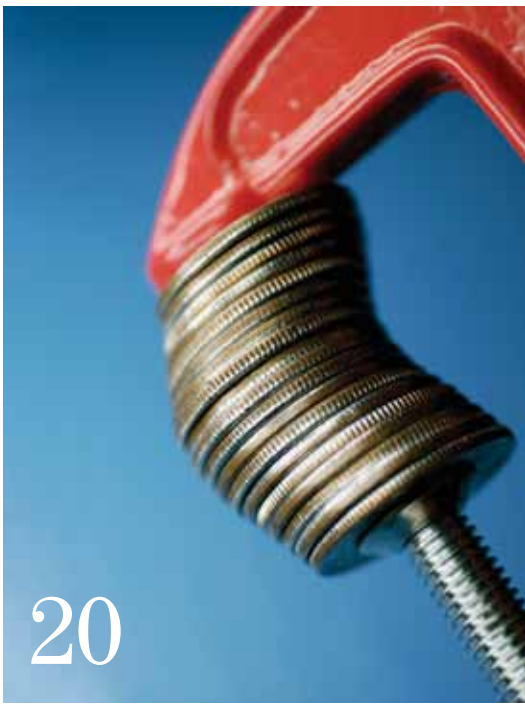

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NEXT MONTH

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Advice on keeping your job, staying relevant at work and building your career.

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A primer on social networking for today's quality professional.

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Still Growing

Salaries rise despite recession

I STAND CORRECTED. Contrary to my own predictions about this year's salary survey, the average salary of U.S. quality professionals showed a bump—from $81,064 to $83,442.

Good news, yes, but there is also some less positive news among this year's results. About 4% of this year's survey respondents (there were 9,072 total) said they were unemployed. Of those, 60.7% said they were unemployed because their positions had been eliminated. (Find more statistics on the unemployed respondents on p. 23.)

This suggests a correlation with another alarming trend: shrinking quality departments. Slightly more than one-third of the currently employed respondents indicated their quality departments have shrunk (part 1, section 14 at www.qualityprogress.com). Of those, nearly 80% indicated their companies had experienced layoffs.

Companies are also cutting back on raises: 38% of respondents said they did not expect one this year, compared to 11.2% who said the same thing in 2008 and only 7.6% in 2007.

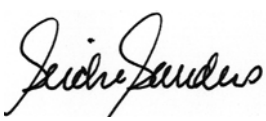
On the brighter side, quality-related jobs are still some of the best to have, according to a recent article by *Money* magazine and PayScale.com. The report ranked three quality-related jobs in its top 50 list of careers with great pay and high growth prospects. Quality control engineer, manufacturing engineer and quality assurance manager came in at Nos. 37, 38 and 48, respectively. Read more in Keeping Current, p. 15. The full report can be found at http://money.cnn.com/magazines/moneymag/bestjobs/2009/snapshots/1.html.

QP's annual salary survey is the most comprehensive of its kind, giving quality professionals data to gauge their own career paths, compare themselves to their peers and decide what steps might lead to a bigger salary.

This year, don't miss the insights and helpful bits of advice straight from the mouths of quality professionals that are scattered throughout the salary survey, which begins on p. 20. Online sections can all be found at www.qualityprogress.com/salarysurvey.

Also, remember the entire survey is accessible year-round under Tools & Resources on QP's website. Survey results from previous years can also be found there, as well as links to other career-related information.

The survey itself—like any survey—can always be improved. If you have ideas on what we could do to make the survey more useful or accurate, please send them to me at editor@asq.org. QP



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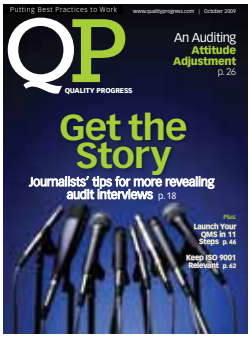

Given the emphasis on auditing-related topics in the October issue of QP, it reminded me of a thought I had regarding the peculiarity of auditing. I think the following description of auditing is fair, though I admit it does not account for the actual activities and potential value of auditing:

When an audit is performed, a person enters an organization for some period of time and is, for the most part, a relative stranger to those within the organization. Indeed, to some, that person's lack of familiarity with the organization and its people is crucial and contributes to the objectivity of auditing.

So, what is the task of these strangers? They are supposed to confirm that what you were doing when they weren't around to really see it happening was what you should have been doing according to some criteria. Surely, this is an odd way for optimal communication to occur.

It is not my intent to denigrate auditing or auditors. I have been trained as an ISO 9000 (TickIT) auditor, as well as in Capability Maturity Model (CMM) and CMM Integration assessment, I worked on the ISO 15504 process assessment standard, and I was trained in a compatible assessment method to that standard.

I have performed audits from the perspective of an internal auditor or someone brought into a company to use auditing or assessment very specifically for process improvement, so I understand what auditing requires. It just strikes me, as I said, as an odd way to reach the truth about a situation.

Scott Duncan
Columbus, GA

Feeling used

Except for the programmable logic control (PLC) descriptions, the article "Moving Right Along" (October 2009, pp. 40-45) has merit. As for the PLC part, I find it amusing. However, it shows the disconnect between machinery manufacturers and end users.

I have been on both sides of the fence, mostly with machinery manufacturing. Being a controls engineer with a bachelor's degree in electrical engineering, I never could understand how end users look at a control function so simply.

They have no clue what is happening underneath and why it must be that way. To them, it's a simple task. This is the problem. End users simply want to offload the task to a manufacturer designing a machine for their use, yet they don't even know what they want.

If the studies in this article were used and practiced by end users in factories, then everyone's jobs would be better and more efficient. Instead, original equipment manufacturers get vague standards, poor explanations and little input. The end user knows his or her product best. Instead, the equipment is designed and approved, and later the end user says, "I never envisioned it like that," or asks, "Why is that taking so long?"

For once, I would like to see a factory team take the time to study what they really want and need. The end users don't need to know how to program, but they at least need to be able to say what they want and why. Unfortunately, it's not something they want to spend time on.

Mike Korkowski
Antioch, IL

EXPERTANSWE

Continuous debate

The words "continual" and "continuous" are often used interchangeably. But, when either is placed in front of the word "improvement" and used to describe the expectations of your management system, it's important to know the difference and understand the requirements involved with each.

To get a better understanding of what this means to your organization, we posed the following question to quality management system (QMS) and environmental management system (EMS) experts, as well as members of the International Organization for Standardization's (ISO) U.S. Technical Advisory Groups (TAG) responsible for the development of the QMS and EMS standards: Is there a difference between continual and continuous, and what does it mean to either a QMS or EMS?

General observations

The first thing to note is that both words appear among the QMS and EMS standards. Lloyd D. Brumfield, quality assurance engineering specialist for MSX International/Ford Customer Service Division and member of *The Informed Outlook* editorial advisory board, made a few observations:

"The QS-9000 first, second and third editions use the word continuous numerous times but never use the word continual. The ISO standard uses the word continual, but never continuous. The words continual, continuous improvement and continuing suitability are found in ISO 9001:1994, ISO 9002:1994, ISO 9003:1994, ISO 14001:1996 (Figure 1 system model, 3.1 and 4.2.b) and 4.1.3 of the Society for Automotive Engineering's AS 9000:1997.

"The ISO 14001:1996 definition of continual improvement says it is the 'process of enhancing the EMS to achieve improvements in overall environmental performance in line with the organization's environmental policy.' A note states, 'The process need not take place in all areas of activity simultaneously.'"

So, what do experts in quality and environmental management have to say about the appearance of the words, and how should they be interpreted?

Environmental perspective

Why did the developers of ISO 14001 use continual rather than continuous to describe the expected rate of improvement for an EMS? According to Suzan Jackson, business manager of environmental services for Excel Partnership Inc. and an EMS consultant, "The authors of the ISO 14001 standard chose continual quite deliberately instead of continuous to describe the type of improvement required within the EMS.

"According to the dictionary, continuous means 'continuing without interruption,' while continual means 'steadily recurring.' It would have been unreasonable and impractical to expect every organization to be constantly improving their EMS, 'without interruption.'

"On the other hand, 'steadily recurring' improvement is a reasonable expectation for every EMS. Continual improvement of the EMS means there should be evidence the EMS is improving over time—that the overall trends should show improvement, even if there are incidents or times when improvement isn't always occurring. This is an achievable expectation for any organization with an EMS."

Joe Cascio, chairman of the U.S. TAG ISO/Technical Committee (TC) 207, concurs with Jackson. In response to this topic, Cascio and his organization, Global Environment & Technology Foundation, described continual improvement as an ongoing process that is required even after the organization reaches "a desired level of performance." In addition, Cascio points out that the organization must show progress. Failure to show progress or intent causes the system to be deemed ineffective.

Quality perspective

A slightly different opinion was provided by those in the quality arena. Jack West, chairman of U.S. TAG TC 172 said, "I think most would say it is best to use continual rather than continuous. On the other hand, with regard to the QMS, I do not think there is any intended difference."

West shared Cascio and Jackson's understanding that "using the term 'continuous' means that improvement is actually happening at every instant in time, something that is very likely impossible. For this reason, it is likely that the word 'continual' has come into wide use; it seems to recognize the inherently incremental nature of improvement.

"From a practical point of view, improvement does tend to be the result of discrete actions or projects, so 'continual' is a better word to use. It is the word of choice in the ISO 9000 family for the same reasons that Sue Jackson points out." West believes, however, that "in common usage, the terms [continual and continuous] have identical meanings."

Kathy Hinton, president of Sunrise Consulting, stated, "I can honestly say I have never heard them used differently. In my experience, the two words are used interchangeably, with the same meaning." According to West, Hinton's understanding and use of the terms is highly acceptable. Hinton's experience has probably been the

experience of others trying to work with and around the terminology.

The terminology's future

Which term will be used in the future? Brumfield pointed out that the term continual was used in ISO 9001:2000.

"In reviewing ISO/CD 2 9001:2000, I noticed the words 'continuing' and 'continual' instead of 'continuous' in elements 5.1, 5.5.1 and 5.7," he said. "In ISO/CD 2 9000:2000 element 3.11, continual improvement refers to the actions taken to enhance the features and characteristics of products and/or increase the effectiveness and efficiency of processes used to produce and deliver them. Improvements are continual and not considered to provide final solutions."

It is acceptable to many to use continual and continuous interchangeably. The ISO standards specifically chose to use the term "continual improvement" because the developers understood it is impossible for improvement to occur uninterrupted.

Based on Cascio and Jackson's response, continual improvement is required in an EMS and should occur over a period of time; however, the organization is only expected to show consistent progress, not continuous or uninterrupted improvement. Regardless of the flexibility being provided by the EMS standard, however, ISO 14001 registration is not a shield from the long and dreaded arm of the law, and noncompliances will continue to be subject to government sanctions.

The bottom line is that an EMS and a QMS should show a consistent progression toward improvement, with nonconformances being addressed quickly and effectively. Therefore, regardless of which of the two words you place in front of the word "improvement," the most important things to remember are that improvement should be an ongoing process, nonconformances should be dealt with immediately, and perfection is an endless pursuit, with many possible rewards along the way.

Compiled by Jack West and Charles Cianfrani

Get set

Q: When you're using time-stamped data and other discrete and continuous variables from other sources, what resource is best to help understand how to set up a 30-second timestamp data set? The 30-second facet isn't the key characteristic. What I need to know is how to take data from other sampling rates while integrating event codes.

Randall Krueger
Visalia, CA

A: There are two kinds of events to consider: discrete and continuous. Discrete events have a category associated with them, such as a call failure code, which assigns a number to a certain type of call. For example, 3 indicates a successful call, while 4 indicates a dropped call (see Table 1). Continuous events have a numerical value, such as uplink signal strength (see Table 2).

To create a data set that has one row per sector per 30 minutes, you simply count the events for each discrete event in a given sector during that 30-minute interval. You can also add columns for absolute change in count and percentage change in count for each kind from the previous 30-minute period.

For continuous events, you simply take the minimum, maximum and average during the time period. You can also add absolute change or percentage change from the previous period. The result is one column for each discrete event value and three columns for each continuous event (see Table 3).

Mark Johnson
Professor, department of statistics
University of Central Florida
Orlando, FL

Discrete event / TABLE 1

Sector ID	Timestamp	Call failure code
2114	2008-04-02 23:11:22	3
2114	2008-04-02 12:01:22	4

Continuous event / TABLE 2

Sector ID	Timestamp	Uplink
2114	2008-04-02 23:11:22	32.2
2114	2008-04-02 12:01:22	28.3

Data set / TABLE 3

Sector ID	Timestamp	Call failure code 03 count	Call failure code 04 count	Minimum uplink	Maximum uplink	Average uplink
2114	2008-04-02 23:30:00	192	12	22.3	33.8	31.2

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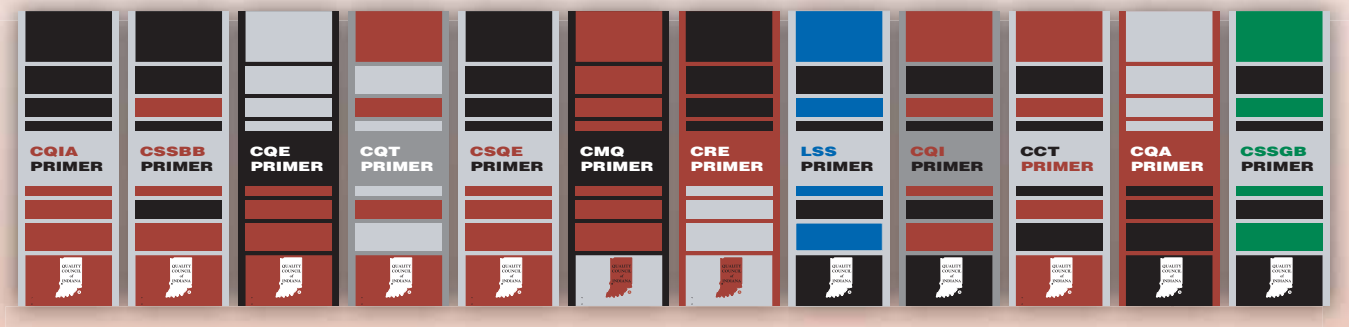

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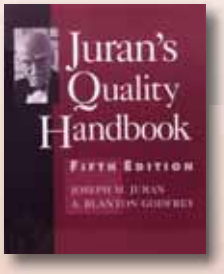

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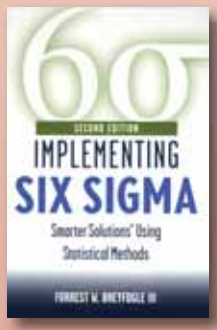

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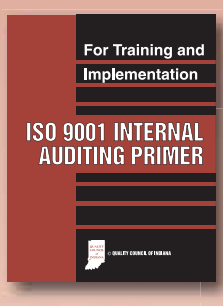

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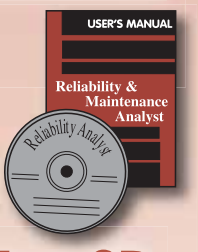

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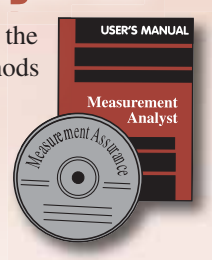

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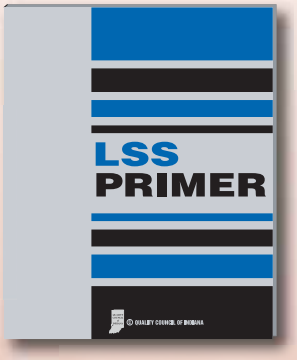

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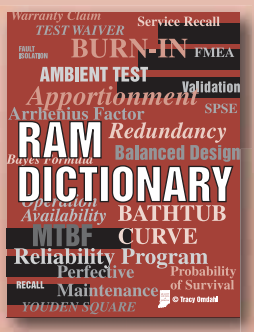

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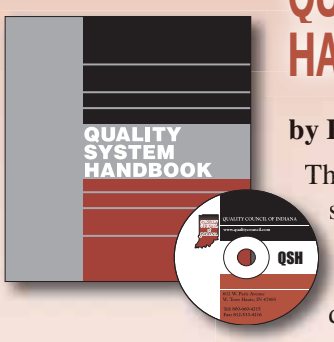

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AVIATION

Lost in Translation

Outsourced maintenance has airlines feeling some turbulence

The grumbles have grown, but for the most part, airline passengers have gone along with the recent cutbacks in services, from tighter seating quarters to luggage fees. That's because, at the very least, they could count on the plane arriving at its destination in one piece. But a trend that began to take hold in the early 2000s may put that assurance in jeopardy.

Prior to 2002, airlines based in the United States handled most of their own maintenance. Around that time, bankruptcy became a distinct possibility for several airlines, and cost cutting ensued. So airlines began looking for alternatives to the approximately $100 per hour—including overhead and other expenses—they spent on union mechanics in their own shops. The airlines discovered they could save 50% by using independent, nonunion firms and as much as 66% by outsourcing to developing countries, such as Panama.[1]

In 2003, airlines outsourced maintenance 34% of the time. Four years later, that number surged to 71%. During the same period, outsourcing to foreign companies jumped from 7% to 19%.[2] But, what airlines are realizing now is that the money saved by the practice is heading back out the door due to equipment failures and the heavy fines that follow.

On March 7, 2008, the Federal Aviation Administration (FAA) fined Southwest Airlines $10.2 million for myriad violations that included knowingly flying more than three dozen aircraft that didn't receive mandatory inspections for structural damage. Less than a week later, the airline pulled four Boeing 737s from service after discovering possible fuselage cracks.[3] And, four months after that, a Southwest 737 was forced to make an emergency landing in Charleston, WV, after a foot-long hole opened in the fuselage.[4]

The Dallas-based airline is not the only one in the friendly skies to deal with these not-so-friendly conditions. In January 2009, a US Airways plane that had been overhauled at Aeroman—an El Salvador-based repair company—cut its flight path short when the pressure seal around the main cabin door began to fail.[5] Then, in October, the airline was fined $5.4 million by the FAA for operating potentially unsafe aircraft.

The FAA also dinged United Airlines $3.8 million for making more than 200 flights with a Boeing 737 that had two towels jammed into the oil sump area to cover openings instead of the protective coverings that should have been in place.[6]

The FAA claims the diminishing use of in-house maintenance shouldn't matter because of its steadfast oversight of third-party providers. The Department of Transportation's Office of Inspector General called these claims into question in a 2008 report, which, among other things, said:

- "Air carriers are only requested to report their top 10 substantial maintenance providers. As a result, the system provides only limited data for FAA to use in targeting inspections."
- "Over a three-year period … inspectors for an air carrier inspected only four of 15 substantial maintenance providers." And a "major foreign engine repair facility" went uninspected "until five years after FAA approved this facility for carrier use."

(continued on p.14)

NT

HEALTHCARE

UP TO $800 BILLION WASTED EACH YEAR IN U.S. HEALTHCARE

The U.S. healthcare system wastes between $505 billion and $800 billion each year, according to a recent report by Thomson Reuters.

The report highlights several key areas of inefficiency in the U.S. healthcare system, including:

- Unnecessary care, such as the overuse of antibiotics and lab tests, to protect against malpractice exposure makes up 37% of healthcare waste.
- Fraud makes up 22% of the wasted expenditures, or up to $200 billion a year in fraudulent Medicare claims, kickbacks for referrals for unnecessary services and other scams.
- Administrative inefficiency and redundant paperwork account for 18% of waste.
- Medical mistakes account for $50 billion to $100 billion in unnecessary spending each year, or 11% of the total.
- Preventable conditions such as uncontrolled diabetes cost $30 billion to $50 billion a year.

"America's healthcare system is indeed hemorrhaging billions of dollars, and the opportunities to slow the fiscal bleeding are substantial," according to the report, completed by Thomson Reuters' vice president for healthcare analytics.

SOURCE

Fox, Maggie, "Healthcare system wastes up to $800 billion a year," Reuters, Oct. 26, 2009, www.reuters.com/article/newsOne/idUSTRE59P0L320091026?(case sensitive).

HEALTHCARE

STUDY: QUALITY OF CARE IN U.S. RANKS BEHIND OTHER COUNTRIES

Despite spending more on healthcare than other developed countries, the United States lags behind on important measures of access, quality and use of health IT, according to an international study released last month.

The study by the Commonwealth Fund, a private health policy group, surveyed more than 10,000 primary care physicians in 11 countries and found the United States is also behind in terms of access to care and the use of financial incentives to improve the quality of care. In other countries, national policies have sped the adoption of such innovations.

The majority of U.S. physicians (58%)—by far the most of any country surveyed—said their patients often have difficulty paying for medications and care. Half of U.S. doctors surveyed said they spend substantial time dealing with the restrictions insurance companies place on patients' care.

Only 46% of U.S. doctors use electronic medical records, compared with more than 90% of doctors in Australia, Italy, the Netherlands, New Zealand, Norway, Sweden and the United Kingdom.

The Commonwealth Fund called on the United States to learn from other countries (Australia, the Netherlands and New Zealand in particular) with "national payment and information system policies focused on primary care."

"The findings underscore the extent to which national policies matter," said Cathy Schoen, senior vice president for research and evaluation of the Commonwealth Fund.

SOURCES

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2010 ASQ WORLD CONFERENCE

FORD CEO TO SPEAK AT WORLD CONFERENCE

Alan Mulally, the president and CEO of Ford Motor Co., will keynote next year's ASQ World Conference on Quality and Improvement, May 24-26 in St. Louis.

Mulally, formerly the executive vice president of Boeing Co., has been at the helm of Ford since 2006. The quality-minded leader has been credited with keeping the automaker competitive during the current recession and finding ways to control costs, gain market share and increase production.

Mulally is scheduled to lead off the conference Monday, May 24. The next day, Robert Stephens, founder and chief inspector of the Geek Squad, is scheduled to appear. The Geek Squad is North America's largest technology support company.

Terry Jones, the founder and former CEO of Travelocity.com, one of the largest travel companies in the world, will speak Wednesday, May 26.

For conference updates, visit http://wcqi.asq.org.

(continued from p.12)

- At repair stations that did not receive timely inspections, "problems existed, such as untrained mechanics, lack of required tools and unsafe storage of aircraft parts."[7]

Even at FAA-approved facilities, such as Aeroman, mechanics relay stories of dangerous maintenance practices. Among the anecdotes are supervisors who order the use of improper parts to speed up turnaround time and mechanics who can't read repair manuals printed in English. When FAA inspections do occur, they're done with enough advance notice that the facility can cover up unsafe conditions or practices.[8]

Not every airline is on board with the outsourcing trend. American Airlines, for instance, relies on its 6,000 mechanics in Tulsa, OK, to keep its fleet up to snuff. And it does so despite its mechanics making four times as much as their counterparts south of the border. How? According to company representatives, American's turnaround time is about half that of foreign competitors, parts can be repaired rather than replaced, and the mechanics and management meet every week to discuss performance and how both groups can improve.[9]

That doesn't mean American hasn't experienced its own problems, though. In March 2008, its MD-80 fleet joined Delta and United on the ground because the airlines failed to perform routine inspections of crucial wire bundles in certain aircraft.[10] And, in September of this year, it was revealed American had been under FAA investigation for several months due to questions surrounding the fasteners the airline uses on the bulkheads of a few MD-80 planes. A month later, the FAA expanded its inquiry after preliminary findings revealed 16 MD-80s flew for months despite substandard repairs to their bulkheads.[11]

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—Brett Krzykowski, assistant editor

ONLINE ONPAPER

QUICK POLL RESULTS

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

Here are the numbers from a recent Quick Poll:

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

- The economics of quality. 50%
- Developing a strategy of hands-on management. 19%
- Supply and purchasing. 16.6%
- Product development. 7.1%
- Training and human resources development. 7.1%

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

"What's the most effective way to get a raise?"

- Pursue more certifications.
- Pursue education and training.
- Become more flexible at work.
- Take on more projects.

ASQ

LEAN SIX SIGMA CONFERENCE SET

ASQ's 10th annual ASQ Lean and Six Sigma Conference is slated for March 8-9, 2010, at the Pointe Hilton Tapatio Cliffs in Phoenix.

The conference, titled "Delivering Global Value and Excellence through Lean and Six Sigma," features a lineup of keynote speakers who represent diverse backgrounds and bring a variety of messages that stem from approximately 40 years of combined lean and Six Sigma experience. Speakers include:

- Rob Bryant, vice president, global infrastructure services process improvement, lead Master Black Belt, lean and Six Sigma, Computer Sciences Corp.
- Forrest Breyfogle, founder and CEO, Smarter Solutions
- Roger W. Hoerl, manager, applied statistics lab, General Electric.
- Ronald Snee, founder and president, Snee Associates.

For more information, call ASQ at 800-248-1946, or visit www.asq.org/conferences/six-sigma/index.html.

CAREERS

THREE QUALITY JOBS MAKE TOP 50 LIST

Money magazine and PayScale.com, a company that tracks wages, have ranked three quality-related jobs in their top 50 list of careers with great pay and high growth prospects.

Quality control engineer came in at No. 37, manufacturing engineer at No. 38 and quality assurance manager at No. 48.

In addition, business process/management consultant ranked No. 4 in terms of future growth.

The top five jobs overall were systems engineer, physician assistant, college professor, nurse practitioner and IT project manager.

For more information on the survey, which appeared in the November issue of *Money*, visit http://money.cnn.com/magazines/moneymag/bestjobs/2009/index.html.

DATEINQUALITYHISTORY

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

Dec. 8, 1765

Eli Whitney, an American inventor who became famous during the Industrial Revolution for developing the cotton gin, was born on this date in Westborough, MA.

Whitney is also credited with influencing modern manufacturing by introducing a uniformity system. When Whitney was awarded a government contract in 1798 to produce 10,000 muskets, he did it with interchangeable parts that were similar in fit and function. This allowed for random selection of parts in the assembly of the muskets.

Whitney's approach influenced manufacturing processes throughout the next century. Quality partially meant defining ways to objectively verify that the new parts would match the original parts or design. Exact replication was not always necessary, practical, cost effective or measurable.

Whitney ran his firearms factory near New Haven, CT, until he retired in 1820. He died Jan. 8, 1825.

SOURCE

Folaron, Jim, "The Evolution of Six Sigma," *Six Sigma Forum Magazine*, August 2003, p. 38.

Who's Who in Q

NAME: Denis Leonard.

RESIDENCE: Bozeman, MT.

EDUCATION: A doctorate in business and management from the University of Ulster at Jordanstown in Northern Ireland.

INTRODUCTION TO QUALITY: While pursuing his engineering degree, Leonard was introduced to quality by Joe Gunning at the University of Ulster. Gunning became Leonard's role model, and his view of quality and its potential impact inspired Leonard.

CURRENT JOB: President, Business Excellence Consulting.

PREVIOUS EXPERIENCE: Quality manager, Veridian Homes in Madison, WI, where he helped lead the company to the National Housing Quality Gold Award in 2006.

ASQ ACTIVITIES: Leonard is a senior member of ASQ and is involved in many activities, including chair of the Quality Management Division's (QMD) quality management forum review board, member of QMD's technical committee for the Baldrige criteria, member of the ASQ Quality Press standing review board, ASQ World Conference on Quality and Management technical reviewer and member of the Feigenbaum Medal Committee.

OTHER ACTIVITIES/ACHIEVEMENTS: Leonard is a fellow of the Chartered Institute of Quality in the United Kingdom. He is also an assessor for the Northern Ireland Quality Award, a judge for the Wisconsin Forward Award and the lead judge for the National Housing Quality Award.

RECENT HONOR: Leonard received first place in this year's U.S. World Standards Day Paper Competition.

PUBLISHED: Leonard is the co-author of *The Executive Guide to Understanding and Implementing the Baldrige Criteria* (ASQ Quality Press, 2007). He has also contributed to *Quality Progress* and *Quality Management Forum*.

FAVORITE WAYS TO RELAX: Reading, hiking and spending time with family.

FAMILY: Wife, Mary, an assistant professor at Montana State University.

QUALITY QUOTE: Learning from his father, who always took great pride in his workmanship, Leonard believes, "Your work is a reflection of you—whatever that work happens to be. Leave work you can be proud of and strive to make a difference."

KEEPINGCURRENT

ASQNEWS

WATSON RECEIVES DEMING PRIZE
Gregory Watson (left, below), past ASQ president (2000-2001), has been awarded the Deming Distinguished Service Award for Dissemination and Promotion by the Union of Japanese Scientists and Engineers.

CENTURY CLUB RECIPIENT Hesam Aref Kashfi (right, above), the president of the Iranian Society of Quality Managers, recently received ASQ's Century Club Award for sponsoring more than 100 new ASQ members. Watson presented the award to Kashfi recently. Kashfi also received the 2009 Harrington-Ishikawa Quality Professional Medal from the Walter L. Hurd Foundation recently. The award is presented by the Asia Pacific Quality Organization.

NEW PUBLICATION In January, ASQ's Education Division will launch a peer-reviewed publication, *Quality Approaches in Higher Education,* an online-only supplement for the *Journal for Quality and Participation*. Its focus is to actively engage the higher education community in discussions related to continuous improvement and quality in higher education. For more information or to submit an article, visit www.asq.org/divisions-forums/edu/index.html.

WORDTOTHEWISE

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

Takt time

Derived from the German word *taktzeit*, which translates to cycle time. The rate of customer demand, *takt* time is calculated by dividing production time by the quantity of product the customer requires in that time. *Takt* is the heartbeat of a lean manufacturing system.

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

CAPITOL Q

ASQ representatives recently met with the Senate's newly formed Government Performance Task Force, which wants to learn more about successful cost-cutting measures in public and private sectors … Following up on ASQ's forum on healthcare IT prior to the House of Representatives' 21st Century Healthcare Caucus, ASQ met with officials from the Office of the National Coordinator for Health IT last month to continue dialogue on healthcare reform and offer ASQ's expertise.

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

Mr. Pareto Head

BY MIKE CROSSEN

OBITUARY

ACKOFF, OPERATIONS RESEARCH PIONEER, DIES AT 90

Russell L. Ackoff, a man many knew as the dean of the systems-thinking community and a pioneer in the realm of operations research, died Oct. 29 at the age of 90 from complications following hip replacement surgery.

Unlike many in his field, Ackoff's educational background was rooted in philosophy, a discipline for which he received a doctorate from the University of Pennsylvania in 1947. That foundation was shared by C. West Churchman, his colleague at Case Institute of Technology and a co-author of *Introduction to Operations Research*. That seminal work, published in 1957, is widely accepted as the most influential early textbook on operations research.

In the book, the pair, along with fellow author E.L. Arnoff, threw the spotlight on the increased segmentation of management responsibilities. Their way of correcting the problem was operations research, which identified "the best decisions relative to as large a portion of total organizations as possible"—a view consistent with systems thinking.[1]

That focus on systems thinking permeated his career, including the 1972 work with Frederick E. Emery, *On Purposeful Systems*, which related the discipline to human behavior. Later, Ackoff offered his views on the advent of systems thinking, which he attributed to the work done by philosophers, mathematicians and biologists in the 1940s.

In this new approach, Ackoff said, "a system is more than the sum of its parts; it is an indivisible whole. It loses its essential properties when it is taken apart. The elements of a system may themselves be systems, and every system may be part of a larger system."[2]

Eventually, Ackoff became disillusioned with operations research, which he claimed was "narrow and inward-looking," and was limited by an increased emphasis on mathematics.[3] This led to his rejection of operations research in favor of identifying himself with systems thinking.

His work in the field was far-reaching and even infiltrated the White House under President Bill Clinton, who relied on Ackoff as a consultant at the White House Communications Agency as it implemented systems thinking during its redesign.[4]

Yet, despite his many contributions, Ackoff waved off the very notion of being tabbed a guru. As he said, "gurus encourage followers who do things their way. I am an educator … I encourage others to go out and adapt these ideas … to do whatever is going to be the most effective solution for them."[5]

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SHORTRUN

EACH YEAR, NEARLY 50% of potential medication errors are caught before making it to the patient. Of those potential errors, 87% are intercepted by nurses. A recent study—which focused on identifying the costs and implications of medication errors by examining work environments and nurse staffing situations—found that nurses take seven routine steps in the name of medication safety. To read more of the study, visit www.healthleadersmedia.com.

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2009 QP SALARY SURVEY

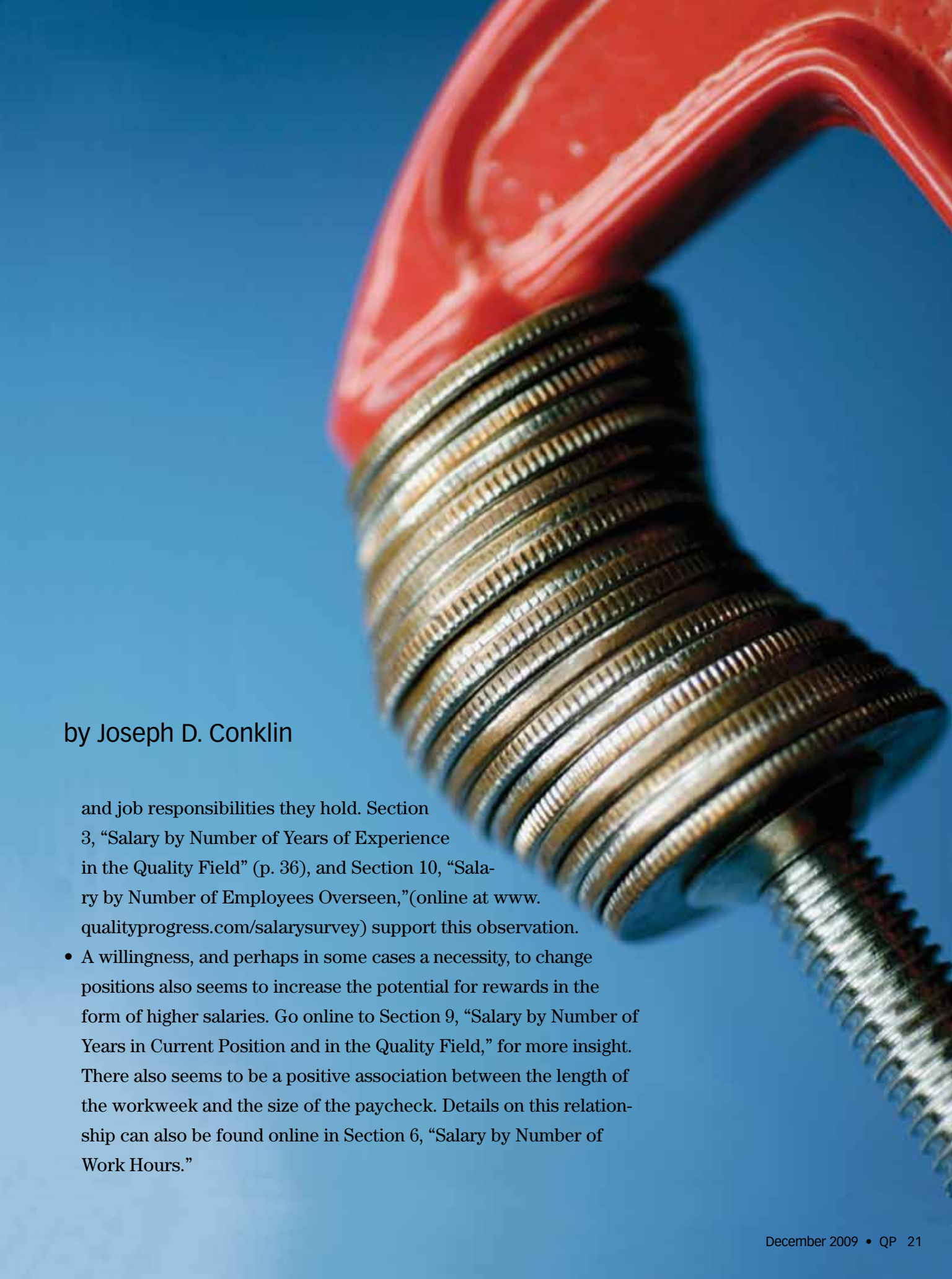
Holding Steady

Many still **on the path to rewards** during rocky times

QP'S ANNUAL SALARY SURVEY is interesting in good times and even more so in lean times. My observations for the 2009 version fall into three categories: profiles of success, limits of the survey and some questions QP readers might ask themselves to reflect on their own career development.

The survey's results can be instructive, as they tend to reflect popular portraits of success in the quality profession. Several aspects of those profiles stand out:

- In these current economic straits, the overall profession, or at least a significant portion of it, is holding its own and reaping above-average rewards in many cases. Note the overall average salary of $83,442 for U.S. respondents. Last year, the average salary for U.S. respondents was $81,064. Clearly, we are facing challenges and are not defeated by them.
- In terms of reward, the experience that quality professionals bring to their jobs seems to matter, but not as much as the levels of education they have reached



by Joseph D. Conklin

and job responsibilities they hold. Section 3, "Salary by Number of Years of Experience in the Quality Field" (p. 36), and Section 10, "Salary by Number of Employees Overseen,"(online at www.qualityprogress.com/salarysurvey) support this observation.

- A willingness, and perhaps in some cases a necessity, to change positions also seems to increase the potential for rewards in the form of higher salaries. Go online to Section 9, "Salary by Number of Years in Current Position and in the Quality Field," for more insight. There also seems to be a positive association between the length of the workweek and the size of the paycheck. Details on this relationship can also be found online in Section 6, "Salary by Number of Work Hours."

- The more recent professional certifications have proliferated, but they have not dislodged the older, more traditional ones. See Section 4, "Salary by ASQ and RABQSA International Certification" (p. 43), for more related information.

Career development questions / TABLE 1

1. How well do I know my strengths?
2. How well do I know what matters to my customers?
3. How often do I seek feedback on my work?
4. How current are my skills and training?
5. How is my industry changing, and how does that affect my job?
6. Are there any new projects I can take on to improve my skills?
7. Who are the best leaders in the company, and what can they teach me?
8. Can my current skills carry over to any other industries?
9. Do I want to do the same things five years from now as today?
10. How wide is my circle of contacts who can give me good advice?

Leadership development questions / TABLE 2

1. How well do I know the strengths of my coworkers?
2. How well do I communicate the needs of our customers?
3. Am I willing to provide constructive feedback to people?
4. Can I indentify when people need new training to be more productive?
5. Do I model the behavior I want in a boss?
6. How well do I work with the other departments mine depends on?
7. Without my leadership, does my department keep doing the same thing or something else?
8. Could I let people have input on the big budget and policy decisions?
9. Can I identify the talent my department needs to do better?
10. What are the top two or three things my department needs to do better?

- While some of job titles with higher salaries include highly technical ones, (such as reliability engineer or vice president), other job titles such as consultant suggest the possibility of other paths to reward. Section 1, "Salary by Job Title" (p. 28) and Part 2 of the salary survey, which is devoted to self-employed consultants and found online, offer details on this observation.
- The correlation between higher salaries and higher costs of living has positive implications with regard to how some organizations value acquiring and maintaining talent in our profession. Section 13, "Salary by Geographic Location," offers comparisons of salaries in the United States, and Canada and addresses the cost of living factor.

Inherent limitations

The *Quality Progress* Salary Survey is the most comprehensive survey available on the salaries of quality professionals and practitioners. However, like many surveys of this kind, it has limitations.

For instance, a survey in which individuals volunteer to participate creates limitations of self selection. With a 15% response rate, you should not expect a random, representative cut of ASQ members. In my experience as a survey statistician, I expect the following limitations with such a survey, especially given a subject such as salary:

1. The lowest and highest salary levels will be underrepresented. People with low salaries may be unwilling to disclose their information, and those with high salaries may have privacy concerns (although a promise of anonymity can somewhat lessen this).
2. The unemployed and underemployed may be underrepresented for the same reasons as people who are employed but with low salaries—they are unwilling to disclose their information. If respondents indicated they were unemployed, they were excluded from the results.
3. The most interested, engaged and experienced members of the quality profession will be overrepresented.
4. While those at the very highest salary levels may be underrepresented, the average salaries of the participants will tend to exceed the average of a random representative sample.

Are you satisfied?

The paths to rewards suggested by the survey profile boil down to three questions: What do I know? How well can I lead? How well do I adjust to change?

In light of the survey's findings, for employees interested in taking their careers to the next level, some questions for self reflection are offered in Table 1. For those desiring management and leadership positions in the quality field, they can reflect on another set of questions in Table 2.

The 2009 salary survey suggests some of the old wisdom about expanding your training, responsibility and willingness to change jobs still applies. By itself, the survey can't provide all the new wisdom that future enlightenment and prosperity requires. I trust that professional organizations such as ASQ will continue to invest in the programs and resources that will deliver such wisdom to its members. QP

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, engineer, auditor and reliability engineer.

TRYING TO RECOVER FROM THE RECESSION

Due to the significant effects on employment from the economy, this year's QP Salary Survey asked those who indicated they were unemployed several additional questions. Survey respondents were asked a set of questions about their unemployment experiences and their plans to rejoin the workforce.

A total of 375 survey-takers—4.1% of the total 9,072 survey respondents—indicated they were unemployed at the time they took the survey. Of those:

- 64.9% said they had been unemployed less than six months.
- 29.5% had been employed by their company in their most recent position one to three years before they lost their job.
- 9.8% had been in their positions for more than 20 years when they lost their jobs.
- 60.7% were unemployed because their positions had been eliminated. Others indicated they left of their own will because their companies closed or relocated.
- 28.8% had most recently been managers. Others indicated they had most recently been quality engineers (20.9%) or directors (7.7%).
- 95.1% said they were pursuing work, and 90.1% said they were pursuing work in quality.

The respondents also shared what they have done to improve their marketability and the chances of being hired. This includes:

- Earning certifications, such as ASQ's certified quality technician and manager of quality/organizational excellence.
- Networking, especially by joining professional organizations and using social media, such as LinkedIn.
- Training in disciplines such as Six Sigma and project management.
- Pursuing education, including master's degree programs.

Many offered advice to their peers:

- "Diversify your capabilities to remain a valuable member of the organization; build and maintain your professional peer network; work hard and don't let conditions prevent you from doing your best work; keep good savings for possible unemployment."
- "Attend all the seminars and courses available in your field. Take at least one course or seminar every year. Don't rock the boat with management on small things."
- "Be adaptable and flexible. Keep aware of what is going on in the company, and make yourself prepared and educated (either structured or self-educated) in areas that will make you more valuable to your company."
- "Become lifelong learners, and stay on top of your profession. Provide exceptional service, and exceed your supervisor's expectations."
- "Go the extra mile every day. Work like your job depends on your performance. Take nothing for granted. Always ask the question, 'What more can I do for you today?' Then do it."
- "Hold fast to your ethics—you have to live with yourself forever, not the company. This may not keep you employed where you are currently, but if your values and the company's values are not aligned, you really don't belong there anyway."
- "Strive for continuous improvement in your life. Do not allow yourself to become stale. If you feel stagnant, then reevaluate your goals—personal and work-related. Write them down, know them and see a difference."
- "Stay up to date with quality in general by taking courses or pursing certifications. Your current job—should it go away—may not leave you very marketable."

—Nicole Adrian, contributing editor

Lingering Effects

Response rate reflects recession

by Karen Bemowski

LIKE ALMOST EVERYONE, quality professionals are feeling the effects of the economic recession. In all, 4.9% of respondents to QP's 23rd annual salary survey indicated they are unemployed, retired or laid off, as Table 1 shows. This number was 1.2%, 1% and 0.8% in the past three years, respectively.

Of the 281 respondents who haven't worked in the last six months, 94.7% said it was because they have been unemployed rather than being retired. Of the 136 respondents who haven't worked for more than six months, 80.1% indicated it was because they were unemployed.

The recession is affecting quality professionals in other ways. This year's survey also included the question, "What steps has your organization taken as a result of the economic recession?" Respondents could select any of the following that applied:

- Furloughs.
- Hiring freezes.
- Layoffs.
- No bonuses.
- Pay cuts.
- Salary freezes.

Almost 85% indicated their organizations took one or more of these steps, as Figure 1 shows. The top three steps reported were hiring freezes (56%), layoffs (52.4%) and salary freezes (46%). No bonuses (29.7%), pay cuts (15%) and furloughs (14.7%) weren't reported as often.

Collecting the data

To get as many survey responses as possible, QP sent e-mail invitations to U.S. and Canadian ASQ members who opted to receive e-mail messages from ASQ. Those members who were listed as retired or unemployed weren't included.

In all, 58,614 e-mails were sent, and 214 were undeliverable, giving an adjusted sample size of 58,400. A small percentage of unsolicited responses was received from posting the survey on the QP website. Overall, QP obtained a total of 9,072 responses, giving a total response rate of 15.5% (9,072/58,400).

Of the 9,072 responses, 8,626 were usable and fell into one of the six employment status groups in Table 1. The 446 responses were not used because they were incomplete. To be included in the survey, regular employees needed to provide a salary and a job title, and self-employed consultants needed to provide a daily rate, hourly rate or gross earning.

The data from the 7,869 full-time and part-time regular employees and the 62 regular employees who also work as self-employed consultants were used to create the 20 sections in "Part 1. Regular Employee Results." The data from the 230 self-employed consultants and the 62 regular employees who also work as self-employed consultants were used to produce the four sections in "Part 2. Self-Employed Consultant Results."

Except for the information provided here, the salary survey report doesn't discuss data from the people who are unemployed, retired or laid off.

The vast majority of those who participated in the survey work in the United States and Canada. Because there were few respondents from other countries, only a few sections in the salary survey report include

Employment status of respondents / TABLE 1

	Count	Percentage
Full-time regular employee	7,869	91.2
Part-time regular employee	48	0.6
Regular employee who is also a self-employed consultant	62	0.7
Self-employed consultant	230	2.7
Unemployed, retired or laid off within the last six months	281	3.3
Unemployed, retired or laid off longer than six months	136	1.6

Table 1 includes results for: x Full-time employees, x Part-time employees, x U.S. employees, x Canadian employees, x International employees

Note: Percentages may not equal 100% due to rounding.

results from this group, which is labeled as "International." Sections 13 and 24 discuss the countries represented in this group. You can find out whether a table or figure includes international results by glancing at the information boxes below the graphics.

In addition to specifying whether a table or figure includes results from international, U.S. and Canadian respondents, this box specifies whether it includes results from full-time respondents and part-time respondents. Some boxes provide additional informative notes.

Of the 24 sections in the salary survey results, 19 are online only and can be found at www.qualityprogress.com under the tab "Tools and Resources." The website also includes the entire survey report in PDF format, which you can download. In case you're not familiar with the statistical terms and job titles in these sections, we've included them here.

Statistical terms

Here is a brief description of the statistical terms used in the survey report:

- **Minimum salary:** The minimum salary is the lowest salary reported in that particular group.
- **Maximum salary:** The maximum salary is the highest salary reported in that particular group.
- **Standard deviation:** Standard deviation is a measure of dispersion around the mean. In a normal distribution, 68% of cases fall within one standard deviation of the mean and 95% of cases fall within two standard deviations. For example, if the mean salary is $70,000 with a standard deviation of $15,000, 95% of the cases are between $40,000 and $100,000 in a normal distribution.
- **Count:** The count is the number of respondents in that particular group.
- **Mean salary:** The mean salary is the average salary for that particular group.
- **Median salary:** The median salary is the 50th percentile—that is, the salary at which half the cases fall above and half fall below. If there is an even number of cases, the median is the average of the two middle cases.

Job titles

Here are the suggested definitions for the job titles used in the 2009 survey. Some of the definitions were compiled by an HR expert and have been revised throughout the years. Based on respondent feedback, they will continue to be analyzed and revised periodically. All definitions are intended only as a guide:

- **Analyst:** Initiates and coordinates quality-related data from production, service or process improvement activities and reports these data using statistical techniques.
- **Associate:** Involved in quality improvement projects but not necessarily full time. Does not necessarily have primary responsibility for traditional quality management, assurance or control activities.
- **Auditor:** Performs and reports on internal or external quality system audits.
- **Black Belt:** Six Sigma or quality expert. Often a full-time team leader, responsible for implementing process improvement projects within the business to drive up customer satisfaction levels and business productivity.
- **Calibration technician:** Tests, calibrates, maintains and repairs electrical, mechanical, electromechanical, analytical and electronic measuring, recording and indicating instruments and equipment for conformance to established standards.

Number of steps taken as a result of the economic recession / FIGURE 1

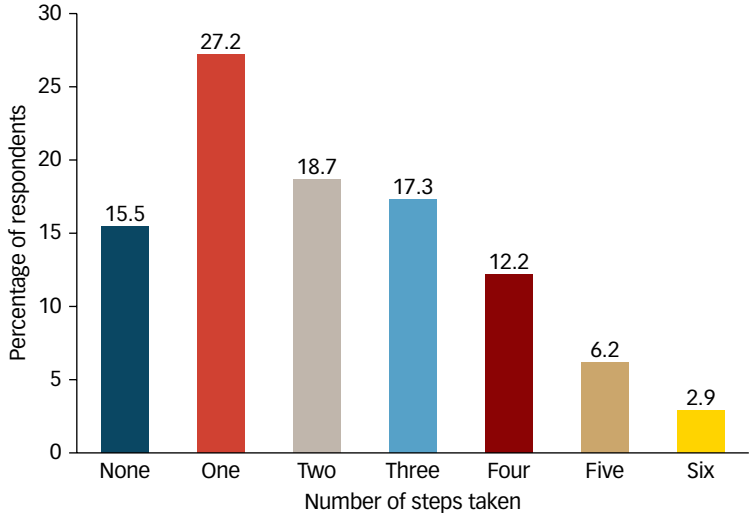


Figure 1 includes results for: x Full-time employees, x Part-time employees, x U.S. employees, x Canadian employees, _ International employees

Note: Percentages may not equal 100% due to rounding.

Steps include: furloughs, hiring freezes, layoffs, no bonuses, pay cuts and salary freezes.

• **Champion:** Business leader or senior manager who ensures resources are available for quality training and projects and is involved in project tollgate reviews. Often an executive who supports and addresses Six Sigma organizational issues.

• **Consultant:** Provides advice, facilitation and training on the development, administration and technical aspects of an organization's quality improvement efforts at any or all levels. Has expertise in some or all aspects of the quality field. At the forefront of changes in his or her field. This person can be from outside the organization or can be an employee of the organization.

• **Coordinator:** Collects, organizes, monitors and distributes information related to quality and process improvement functions, possibly including but not limited to compliance to and documentation of quality management standards, such as ISO 9001. Typically generates reports using computer skills and distributes those reports to various users in the organization or among customers and suppliers.

• **Director:** Oversees all aspects of the organization's quality or business improvement efforts, such as developing and administrating the program, training and coaching employees, and facilitating change throughout the organization. Responsible for establishing strategic plans, policies and procedures at all levels so quality improvement efforts will meet or exceed internal and external customers' needs and expectations.

• **Educator/instructor:** Instructs or trains others on quality-related topics, tools and techniques. This person may be an employee of an organization or teach in a university or college setting.

• **Green Belt:** Operates in support of or under the supervision of a Six Sigma Black Belt, analyzes quality problems and is involved in quality improvement projects. Has at least three years of work experience.

• **Inspector:** Inspects, audits and reports on materials, processes and products using variable or attribute measuring instruments and techniques to ensure conformance with the company's quality standards.

• **Manager:** Ensures the administration of the organization's quality, process or business improvement efforts within a defined segment of the organization. Might be responsible for dealing with customers and suppliers on quality or performance issues. Typically has people reporting directly to him or her.

• **Master Black Belt:** Six Sigma or quality expert responsible for strategic implementations within the business. Qualified to teach other Six Sigma facilitators the methods, tools and applications in all functions and levels of the organization. A resource for using statistical methods to improve processes.

• **Process/manufacturing/project engineer:** Performs engineering work to evaluate manufacturing processes or performance improvement projects for optimization. Duties also may include the development of processes to ensure that quality, cost and efficiency requirements are met.

• **Quality engineer:** Designs, installs and evaluates quality assurance process sampling systems, procedures and statistical techniques. Designs or specifies inspection and testing mechanisms and equipment. Analyzes production and service limitations and standards. Recommends revision of specifications. Formulates or helps formulate quality assurance policies and procedures. May conduct training on quality assurance concepts and tools. Interfaces with all other engineering components within the organization and with customers and suppliers on quality-related issues.

• **Reliability/safety engineer:** Uses principles of performance evaluation and prediction to improve the safety, reliability and maintainability of products and systems. Plans reliability tests and conducts analyses of field failures. Develops and administers reliability information systems for failure analysis and performance improvement.

• **Software quality engineer:** Applies quality principles to the development and use of software and software based systems. Designs and implements software development and maintenance processes. Designs or specifies test methods for software inspection, verification and validation.

• **Specialist:** As the primary assignment, performs a specific quality related function within the organization's quality program. Examples include management representative, statistician and testing expert. Has re-

Total Package
All sections printed in this issue of *Quality Progress* are also available in the online report in PDF format at www.qualityprogress.com/salarysurvey.

ceived direct training or has been performing the activity for a number of years. Shows a high degree of skill performing that specific activity.

• **Supervisor:** Administers the company's quality improvement efforts within a defined department. Has direct reports that implement some aspect of the policies and procedures of the quality functions.

• **Supplier quality engineer/professional:** Responsible for all quality improvement issues related to vendors and suppliers of materials, products or services used in development or manufacture. Assesses potential new suppliers. Works with suppliers to develop and improve the entire supply chain. May be involved in purchasing.

• **Technician:** Performs basic quality techniques, possibly including calibration, to track, analyze and report on materials, processes and products to ensure they meet the organization's quality standards.

• **Vice president/executive:** Establishes the direction for the development and administration of the organization's quality improvement efforts. Consults with peers on the attitudes and practices of quality throughout the organization to develop an environment of continual improvement in every aspect of the organization's products and services. Acts as a champion for quality. QP

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SALARY SURVEY TABLE OF CONTENTS

Note: All sections printed in this issue of *Quality Progress* are also available in the online report in PDF format at www.qualityprogress.com/salarysurvey.

New Kids on the Block

THIS YEAR'S SALARY survey includes two new job titles: calibration technician and Green Belt (GB). Both groups are at the lower end of the pay scale—with average salaries of $54,151 and $65,679, respectively. The overall average salary of all the U.S. respondents who work full time is $83,442.

The full-time calibration technicians and full-time GBs in the United States earn, on average, less than the overall average salary, as Figure 1 shows. The fact that these two groups earn less isn't surprising, though. In the case of calibration technicians, the average salary of a comparable position—technicians—is also at the low end of the pay scale, as Figure 2 (p. 30) shows. Although there isn't a comparable position for GBs, you'd expect them to earn less than Black Belts (BB), given that GB is the first level in Six Sigma training and Black Belt is the second level.

You might think that this reasoning is invalid if you look at the numbers in Figure 3, which breaks down salaries by job title for Canadian respondents. According to this bar chart, GBs earn a higher average salary ($83,000) than BBs ($79,271). If you compare the GB entries in Tables 1 (United States) and 2 (Canada, p. 31), however, you'll notice there are 34 respondents who noted they were GBs in the United States and only two respondents who said they were GBs in Canada. The higher the number of respondents, the better it represents the surveyed population.

New job titles compared to overall average for U.S. respondents / FIGURE 1

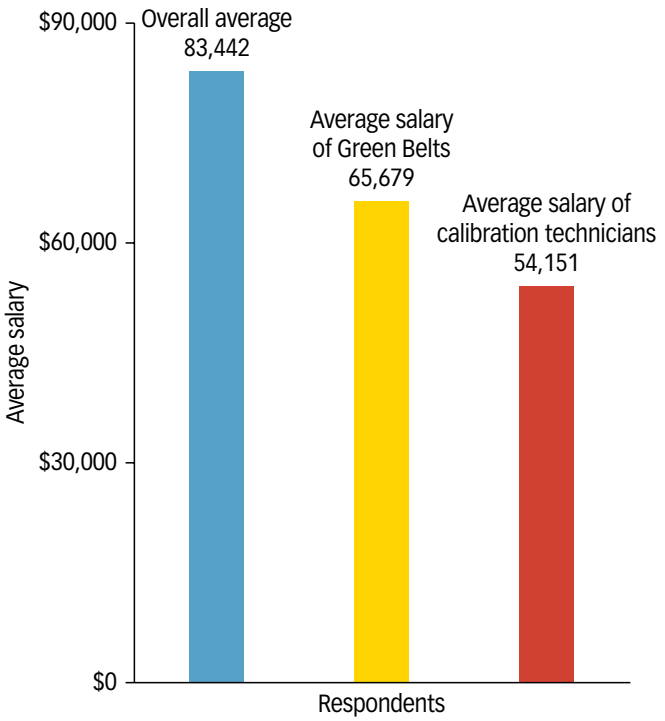


Figure 1 includes results for: x Full-time employees, _ Part-time employees, x U.S. employees, _ Canadian employees, _ International employees

Money Talks

What do you like best about working in quality?

"Quality is ever-changing and not the same thing all the time. It gives you challenges and you can actually see your results when you identify something that is out of control."

Julie A. Hart
BASF
Chemist

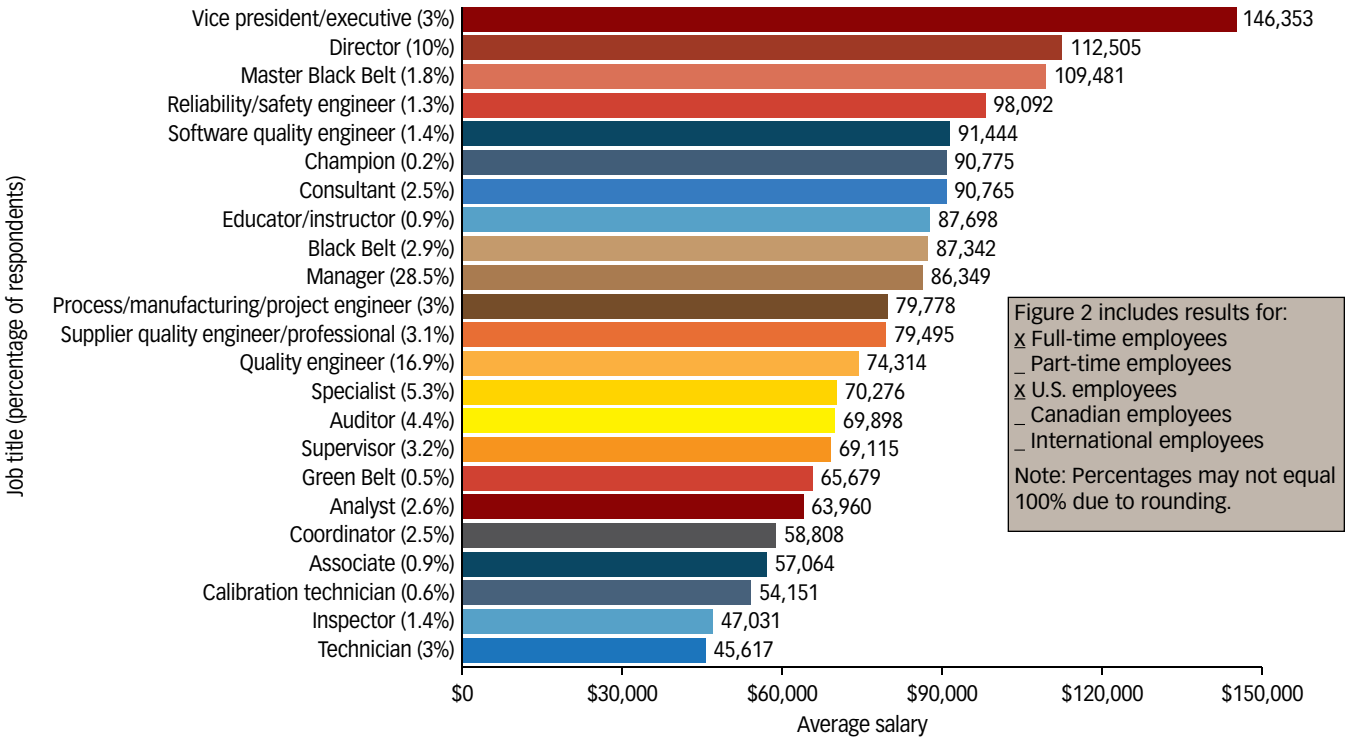
Salary by job title for U.S. respondents / TABLE 1

	Minimum	Maximum	Standard deviation	Count	Mean	Median
Full-time employees						
All full-time employees	$15,940	$518,781	$32,140	7,454	$83,442	$80,000
Analyst	23,000	130,000	20,762	194	63,960	60,000
Associate	21,000	115,400	20,943	67	57,064	53,850
Auditor	15,940	160,000	23,990	327	69,898	67,000
Black Belt	42,000	150,000	20,955	219	87,342	87,000
Calibration technician	29,500	75,228	12,221	41	54,151	52,000
Champion	50,000	132,000	20,636	18	90,775	88,980
Consultant	27,500	180,000	28,993	190	90,765	90,000
Coordinator	27,000	150,000	22,803	186	58,808	54,230
Director	40,000	225,000	31,471	746	112,505	110,000
Educator/instructor	22,000	200,000	38,563	68	87,698	80,000
Green Belt	33,000	106,000	18,137	34	65,679	64,750
Inspector	19,000	145,000	18,598	107	47,031	43,000
Manager	22,568	182,000	25,078	2,128	86,349	84,000
Master Black Belt	33,000	201,000	24,988	132	109,481	106,000
Process/manufacturing/ project engineer	30,000	150,000	21,298	221	79,778	79,500
Quality engineer	24,000	186,000	19,256	1,262	74,314	72,100
Reliability/safety engineer	47,097	207,000	25,937	96	98,092	95,000
Software quality engineer	42,640	137,000	21,034	105	91,444	90,000
Specialist	30,700	200,000	24,415	392	70,276	67,000
Supervisor	20,000	203,000	23,922	240	69,115	65,500
Supplier quality engineer/ professional	22,000	146,000	18,860	232	79,495	78,535
Technician	19,728	107,000	12,694	222	45,617	44,000
Vice president/executive	60,000	518,781	61,652	227	146,353	135,000
Part-time employees						
All part-time employees	$1,900	$120,000	$28,826	57	$53,205	$50,000
Analyst	40,000	70,000	21,213	2	55,000	55,000
Associate	16,000	60,000	31,113	2	38,000	38,000
Auditor	39,960	95,000	19,648	8	58,120	49,000
Consultant	20,000	120,000	31,366	10	77,760	83,000
Coordinator	31,200	32,256	747	2	31,728	31,728
Director	35,000	100,000	30,804	4	76,750	86,000
Educator/instructor	20,000	110,000	33,349	6	47,167	39,000
Green Belt	25,000	25,000	—	1	25,000	25,000
Manager	35,000	90,000	23,936	4	61,250	60,000
Process/manufacturing/ project engineer	25,000	37,900	9,122	2	31,450	31,450
Quality engineer	15,000	86,000	25,602	5	52,814	52,534
Software quality engineer	30,000	65,000	24,749	2	47,500	47,500
Specialist	23,100	60,000	17,370	4	42,525	43,500
Technician	1,900	26,000	10,511	4	17,144	20,338
Vice president/executive	20,000	20,000	—	1	20,000	20,000

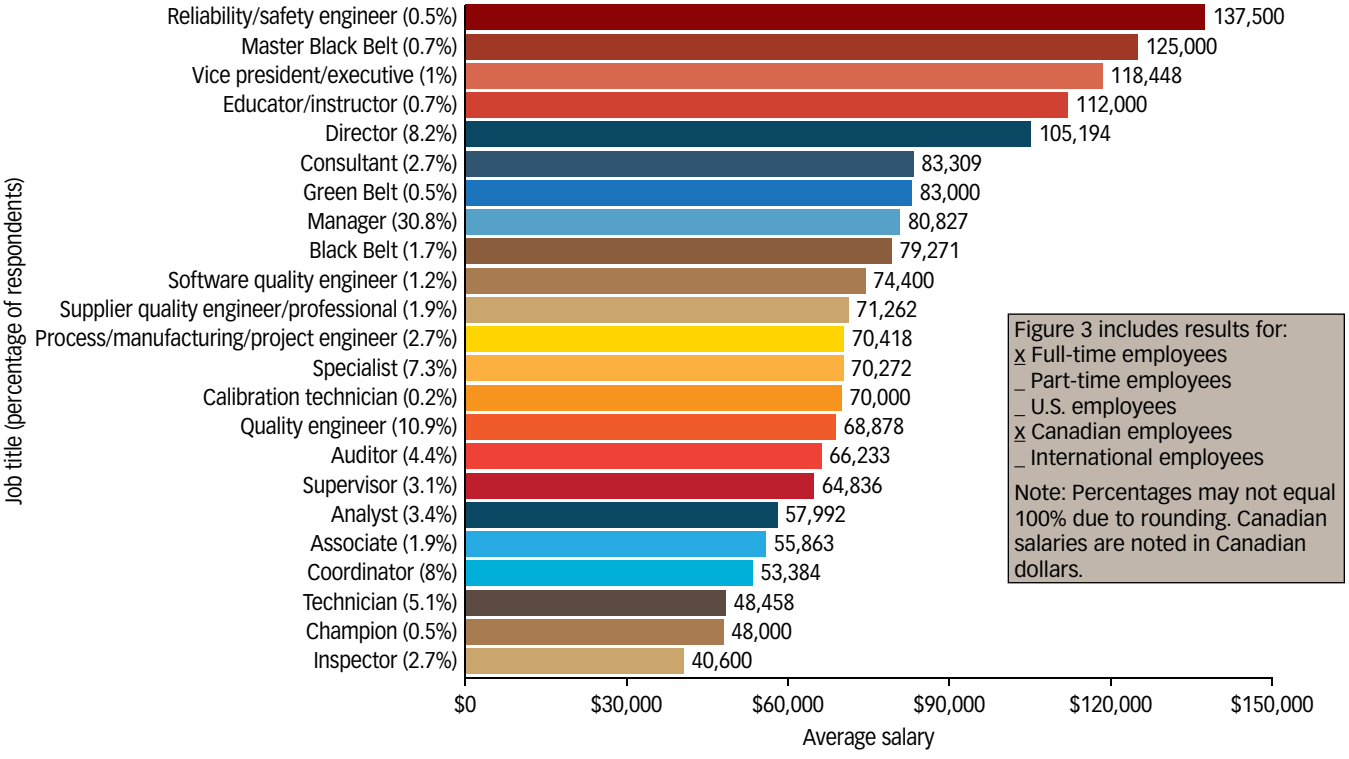
Table 1 includes results for: x Full-time employees, x Part-time employees, x U.S. employees, _ Canadian employees, _ International employees

Note: Job titles in which there were no respondents aren't included.

Salary by job title for U.S. respondents / FIGURE 2



Salary by job title for Canadian respondents / FIGURE 3



Salary by job title for Canadian respondents / TABLE 2

	Minimum	Maximum	Standard deviation	Count	Mean	Median
Full-time employees						
All full-time employees	$23,000	$200,000	$25,927	413	$73,968	$70,000
Analyst	28,800	80,000	13,388	14	57,992	60,500
Associate	40,000	87,400	16,823	8	55,863	53,250
Auditor	35,000	120,000	22,194	18	66,233	63,500
Black Belt	65,000	100,500	10,750	7	79,271	76,900
Calibration technician	70,000	70,000	—	1	70,000	70,000
Champion	30,000	66,000	25,456	2	48,000	48,000
Consultant	52,000	120,000	20,686	11	83,309	84,000
Coordinator	31,500	80,000	13,155	33	53,384	50,000
Director	59,000	150,000	18,892	34	105,194	101,000
Educator/instructor	82,000	134,000	26,907	3	112,000	120,000
Green Belt	81,000	85,000	2,828	2	83,000	83,000
Inspector	27,000	63,000	12,242	11	40,600	35,360
Manager	34,500	135,000	18,748	127	80,827	80,000
Master Black Belt	105,000	150,000	22,913	3	125,000	120,000
Process/manufacturing/ project engineer	30,000	160,000	35,346	11	70,418	60,000
Quality engineer	38,000	139,000	19,589	45	68,878	65,000
Reliability/safety engineer	75,000	200,000	88,388	2	137,500	137,500
Software quality engineer	55,000	86,000	11,971	5	74,400	78,000
Specialist	42,000	155,000	22,536	30	70,272	68,500
Supervisor	35,000	84,000	15,434	13	64,836	68,865
Supplier quality engineer/ professional	45,000	105,000	22,930	8	71,262	65,500
Technician	23,000	80,500	12,503	21	48,458	50,000
Vice president/executive	38,790	185,000	60,306	4	118,448	125,000
Part-time employees						
All part-time employees	$29,000	$64,000	$13,609	5	$43,800	$40,000
Auditor	29,000	40,000	7,778	2	34,500	34,500
Coordinator	64,000	64,000	—	1	64,000	64,000
Educator/instructor	50,000	50,000	—	1	50,000	50,000
Specialist	36,000	36,000	—	1	36,000	36,000

Table 2 includes results for:
x Full-time employees,
x Part-time employees,
_ U.S. employees,
x Canadian employees,
_ International employees

Note: Job titles in which there were no respondents aren't included. Canadian salaries are noted in Canadian dollars

Money Talks

What will define the future of quality, in your eyes?

"In my eyes, the future of quality will be defined through senior management. Their buy-in and enforcement is crucial to the success of quality in an organization."

Erin Van Duzee
Quality assurance manager, IT services
New Brunswick Department of Health

West is Best for Salaries

IN THE UNITED STATES, the highest-paying region for quality professionals is the Pacific, according to the survey. The average salary in this region is $93,676, which is 12.3% higher than the national average salary, as Figure 1 shows. (The national average salary is the average salary of all the full-time employees in that country.)

Offsetting the Pacific region's high average salary, however, is the high cost of living in the five states making up that region (see Figure 2). When you rank the 50 states plus Washington, D.C., by their cost of living indexes, Hawaii, California and Alaska rank No. 1, No. 3 and No. 5, respectively. And the other two states—Oregon and Washington—are in the second quartile.

The cost-of-living indexes in Figure 2 were calculated from the second quarter 2009 Cost of Living Indexes (COLIs) compiled by the Council for Community and Economic Research (C2ER). This council calculates COLIs for cities and metropolitan areas that voluntarily collect information on the cost of groceries, housing, utilities, healthcare and other items.

The state indexes in Figure 2 are an average of the COLIs for the participating areas in each state. Note that C2ER doesn't provide COLIs for U.S. territories, which is why Figure 2 doesn't include cost of living indexes for Puerto Rico and Guam. For more information about COLIs, see C2ER's website at http://coli.org.

In Canada, the highest-paying region for quality professionals is Newfoundland and Labrador. As Figure 3 (p. 34) shows, the average salary for this region is $94,875, which is 28.3% higher than the national average salary of $73,968.

Tables 1 (United States, p. 34) and 2 (Canada, p. 35) break down regional and provincial salaries by job title. You can find even more geographic-specific information on salaries in the United States and Canada in Section 13 of the online survey package at www.qualityprogress.com. This section breaks down salaries by:

- U.S. states and job title.
- U.S. metropolitan areas and job title.
- Canadian metropolitan areas and job title.

Section 13 also includes salary information from countries other than the United States and Canada.

Review **Section 13, Salary by Geographic Location** online for more specific breakdowns of salaries by states and regions.

Access the complete report at www.qualityprogress.com/salarysurvey.

Comparison of salaries in U.S. regions / FIGURE 1

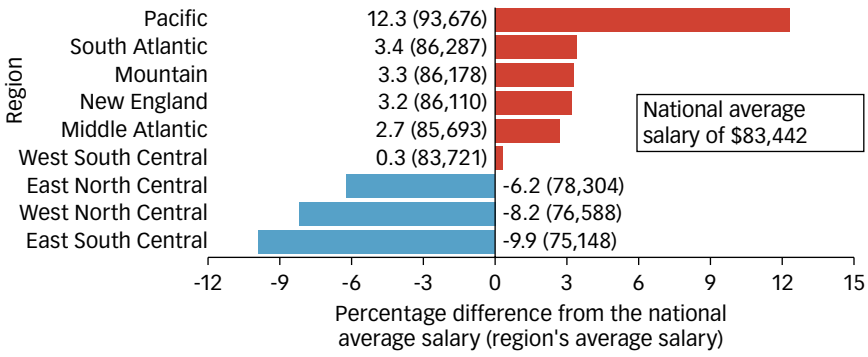


Figure 1 includes results for: x Full-time employees, _ Part-time employees, x U.S. employees, _ Canadian employees, _ International employees

Note: The percentages were calculated using the formula: [(Regional average salary – national average salary)/national average salary] × 100.

Percentage of respondents and cost of living by state / FIGURE 2

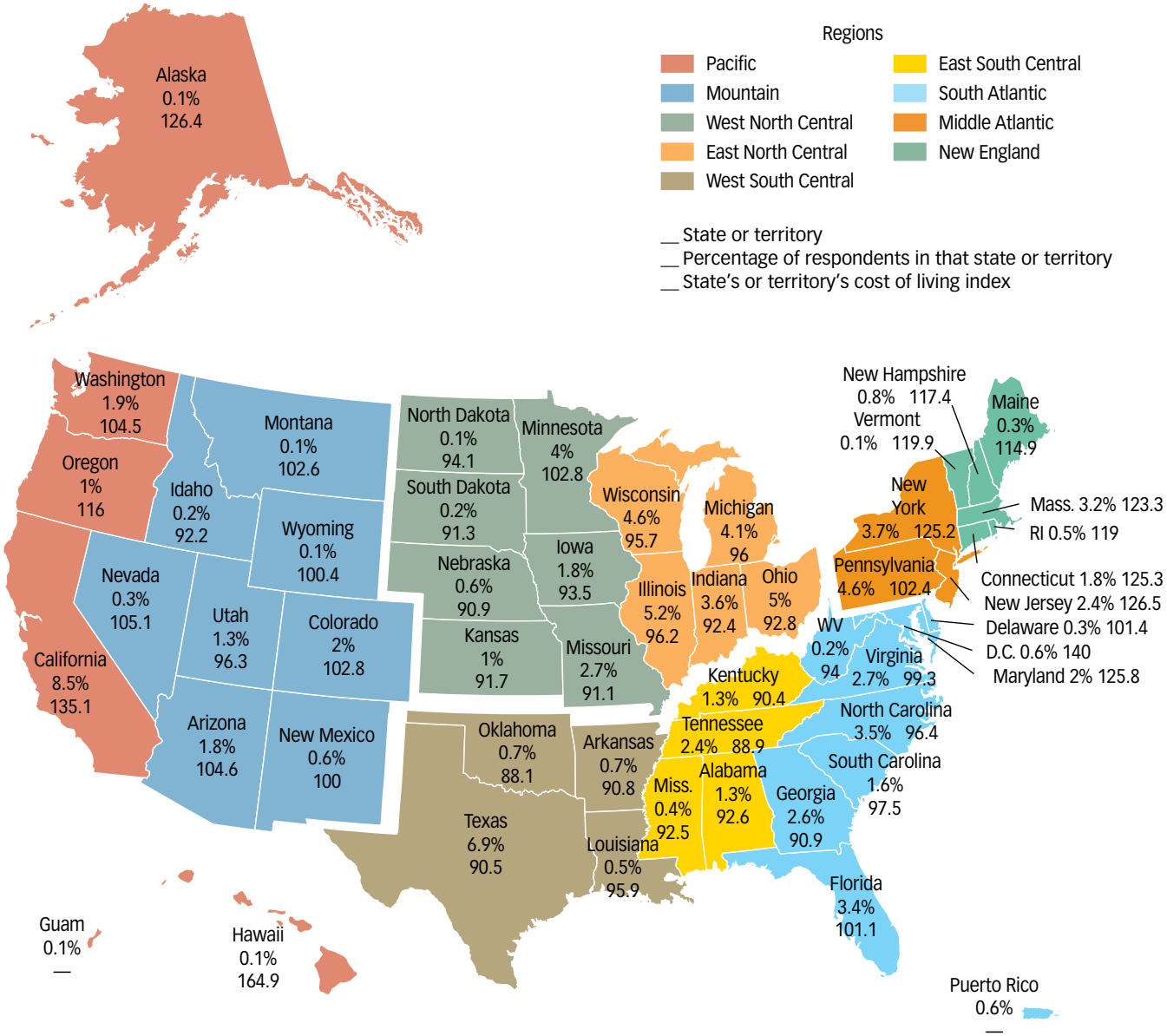


Figure 2 includes results for: x Full-time employees, x Part-time employees x U.S. employees, _ Canadian employees, _ International employees

Note: Percentages may not equal 100% due to rounding. Cost of living indexes weren't available for the two U.S. territories.

Comparison of salaries in Canadian provinces / FIGURE 3

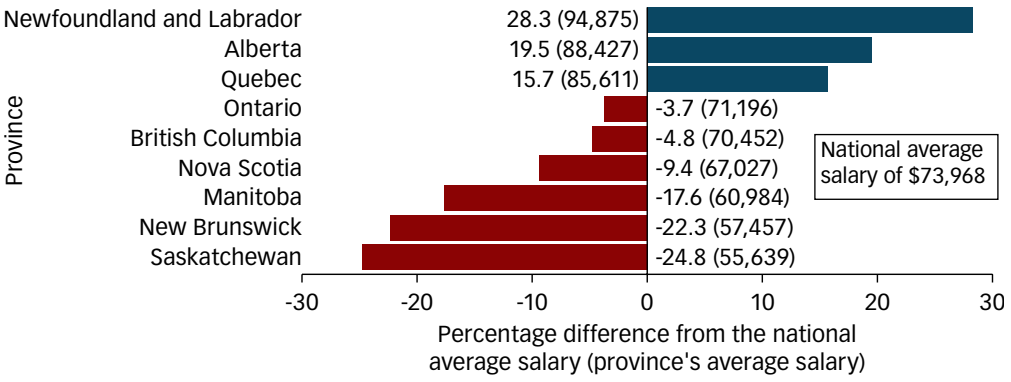


Figure 3 includes results for: x Full-time employees, _ Part-time employees, _ U.S. employees, x Canadian employees, _ International employees

Note: Provinces in which there were no respondents aren't included. Canadian salaries are noted in Canadian dollars. The percentages were calculated using the formula: [(Regional average salary – national average salary)/ national average salary] x 100.

Salary by U.S. region and job title / TABLE 1

	Pacific	Mountain	West North Central	East North Central	West South Central	East South Central	South Atlantic	Middle Atlantic	New England
All respondents	$93,676[846]	$86,178[470]	$76,588[772]	$78,304[1,643]	$83,721[693]	$75,148[389]	86,287[1,239]	$85,693[790]	$86,110[500]
Analyst	67,986[20]	66,800[15]	62,000[21]	60,481[36]	63,241[16]	62,133[12]	67,804[46]	65,399[13]	60,065[8]
Associate	58,389[9]	52,500[5]	52,900[8]	49,509[11]	51,850[5]	59,819[6]	63,655[12]	54,500[7]	71,332[3]
Auditor	77,016[46]	69,315[20]	60,645[29]	64,739[57]	69,171[38]	55,283[17]	73,027[53]	72,168[40]	80,034[17]
Black Belt	93,549[21]	91,059[19]	73,400[19]	85,530[57]	86,553[19]	73,848[8]	93,340[42]	89,796[21]	85,706[10]
Calibration technician	56,692[5]	46,833[3]	61,250[4]	56,250[8]	48,800[5]	65,076[3]	55,500[6]	48,667[3]	43,000[2]
Champion	113,000[2]	78,500[2]	88,400[2]	132,000[1]	88,980[2]	105,000[1]	96,667[3]	61,000[3]	85,000[1]
Consultant	96,027[21]	98,474[7]	83,825[26]	81,438[29]	94,020[15]	86,240[10]	96,680[40]	95,630[21]	85,121[14]
Coordinator	86,067[11]	53,203[10]	56,959[26]	52,670[47]	62,121[17]	47,722[8]	56,553[29]	61,604[14]	67,333[20]
Director	122,521[110]	110,891[36]	100,728[68]	106,825[141]	112,277[67]	101,593[27]	112,085[135]	115,024[100]	124,510[54]
Educator/instructor	127,800[5]	105,429[7]	74,640[4]	76,315[13]	62,229[7]	102,333[3]	83,443[15]	105,300[8]	73,333[3]
Green Belt	53,000[2]	72,000[1]	57,500[2]	66,188[8]	70,929[7]	66,333[3]	71,300[7]	51,000[2]	64,000[1]
Inspector	52,349[15]	49,250[6]	36,658[15]	47,447[15]	45,607[14]	36,667[6]	52,267[12]	45,043[14]	46,240[7]
Manager	97,050[230]	89,219[123]	82,716[177]	80,021[537]	86,950[227]	81,301[102]	88,721[357]	86,107[227]	91,322[129]
Master Black Belt	119,889[9]	100,632[9]	108,813[9]	106,968[31]	108,349[13]	92,598[6]	114,648[26]	117,365[16]	100,591[10]
Process/ manufacturing/project engineer	81,868[25]	87,941[17]	81,482[22]	78,909[42]	75,254[30]	81,683[12]	82,674[33]	76,475[21]	78,711[14]
Quality engineer	82,595[141]	81,204[83]	72,886[161]	68,018[278]	79,070[83]	68,452[78]	75,854[173]	72,930[131]	75,734[116]
Reliability/safety engineer	110,187[13]	104,560[12]	93,211[15]	100,139[12]	101,811[12]	93,600[5]	96,615[16]	74,362[5]	87,083[6]
Software quality engineer	100,389[18]	89,402[19]	79,883[3]	77,578[16]	84,734[12]	92,700[3]	105,093[22]	76,763[8]	98,500[4]
Specialist	78,938[41]	68,436[26]	68,616[37]	65,742[82]	83,324[31]	68,881[27]	69,371[71]	71,558[45]	61,838[27]
Supervisor	75,529[30]	68,909[13]	63,737[30]	73,228[45]	70,048[23]	73,678[18]	63,476[49]	70,269[20]	65,043[11]
Supplier quality engineer/professional	90,067[26]	83,208[12]	72,049[32]	73,470[61]	79,935[23]	73,111[9]	79,794[31]	82,854[18]	93,627[19]
Technician	46,390[21]	53,551[11]	45,321[38]	43,177[59]	40,922[13]	40,302[15]	50,919[27]	45,293[22]	49,492[13]
Vice president/ executive	169,064[25]	155,407[14]	128,697[24]	140,061[57]	123,107[14]	122,166[10]	157,319[34]	152,667[31]	155,000[11]

Table 1 includes results for: x Full-time employees, _ Part-time employees, x U.S. employees, _ Canadian employees, _ International employees

Note: Small numerals indicate the number of responses.

2009 QP SALARY SURVEY

More than 60% of the Canadian respondents work in Ontario, making it the **most highly represented province in the survey.** They earn an average salary of $71,196.

Salary by province and job title / TABLE 2

	British Columbia	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	Newfoundland and Labrador	New Brunswick	Nova Scotia
All respondents	$70,452[36]	$88,427[45]	$55,639[9]	$60,984[11]	$71,196[246]	$85,611[39]	$94,875[4]	$57,457[6]	$67,027[13]
Analyst	73,500[2]	72,000[1]	—	51,125[2]	53,205[8]	65,000[1]	—	—	—
Associate	66,000[1]	87,400[1]	—	43,250[2]	50,000[2]	53,500[2]	—	—	—
Auditor	41,000[2]	—	—	—	64,092[13]	82,000[1]	—	75,000[1]	—
Black Belt	—	76,900[1]	—	—	80,300[5]	76,500[1]	—	—	—
Calibration technician	—	—	—	—	70,000[1]	—	—	—	—
Champion	—	66,000[1]	—	—	—	—	—	—	30,000[1]
Consultant	73,000[1]	—	—	—	84,339[10]	—	—	—	—
Coordinator	58,000[2]	55,800[4]	58,500[2]	50,000[1]	54,573[20]	—	—	38,000[1]	38,000[2]
Director	97,800[2]	111,333[6]	—	100,000[1]	101,247[15]	113,411[8]	—	—	93,500[2]
Educator/instructor	82,000[1]	—	—	—	127,000[2]	—	—	—	—
Green Belt	—	85,000[1]	—	—	81,000[1]	—	—	—	—
Inspector	49,000[3]	—	—	—	38,194[7]	—	—	32,240[1]	—
Manager	74,627[11]	89,406[17]	73,500[2]	66,267[4]	81,868[71]	81,055[10]	87,750[2]	66,500[3]	71,833[6]
Master Black Belt	—	—	—	—	127,500[2]	120,000[1]	—	—	—
Process/ manufacturing/project engineer	92,000[1]	53,000[1]	52,000[1]	—	49,920[5]	84,000[2]	—	—	—
Quality engineer	77,250[4]	77,267[3]	—	—	64,124[31]	71,125[4]	139,000[1]	—	73,675[2]
Reliability/safety engineer	—	200,000[1]	—	—	—	75,000[1]	—	—	—
Software quality engineer	81,000[1]	79,000[2]	—	—	66,500[2]	—	—	—	—
Specialist	73,000[1]	102,000[4]	50,000[1]	67,000[1]	63,907[20]	77,333[3]	—	—	—
Supervisor	79,000[1]	65,000[2]	—	—	61,096[9]	84,000[1]	—	—	—
Supplier quality engineer/professional	84,000[1]	—	—	—	53,032[3]	81,750[4]	—	—	—
Technician	50,000[1]	—	44,918[3]	—	47,991[16]	—	65,000[1]	—	—
Vice president/ executive	38,790[1]	—	—	—	145,000[3]	—	—	—	—

Table 2 includes results for: x Full-time employees, _ Part-time employees, _ U.S. employees, x Canadian employees, _ International employees

Note: Provinces in which there were no respondents aren't included. Small numerals indicate the number of responses. Canadian salaries are noted in Canadian dollars.

Experience Fattens the Wallet

WITH 63.7% OF ALL the respondents having more than 10 years of experience in quality, it's safe to say that most quality professionals come to work each day with a lot of experience tucked under their belts.

For instance, 66.7% of calibration technicians indicated they've been in the quality field more than 10 years, as Figure 1 shows. However, Green Belts fall on the low end when it comes to experience: The majority (73%) have been working in the quality field 10 or fewer years.

The more experience you have, the more cash you'll have in your wallet. For example, in the United States, respondents with:

- More than 20 years of quality experience earn an average of $94,029.
- 10.1 to 20 years of quality experience earn an average of $84,722.
- 10 or fewer years of quality experience earn an average of $73,271.

Similarly, in Canada, respondents with:

- More than 20 years of quality experience earn an average of $90,690.
- 10.1 to 20 years of quality experience earn an average of $75,832.
- 10 or fewer years of quality experience earn an average of $67,329.

Even when you break down the years of quality experience into smaller groupings, the trend of having salaries increase as years of quality experience increase is still evident, as Figures 2 (United States) and 3 (Canada) show. Using these smaller groups, Tables 1 (United States, p. 38) and 2 (Canada, p. 41) break down respondents' salaries by job title and number of years in the quality field.

Years of experience in quality for calibration technicians and Green Belts / FIGURE 1

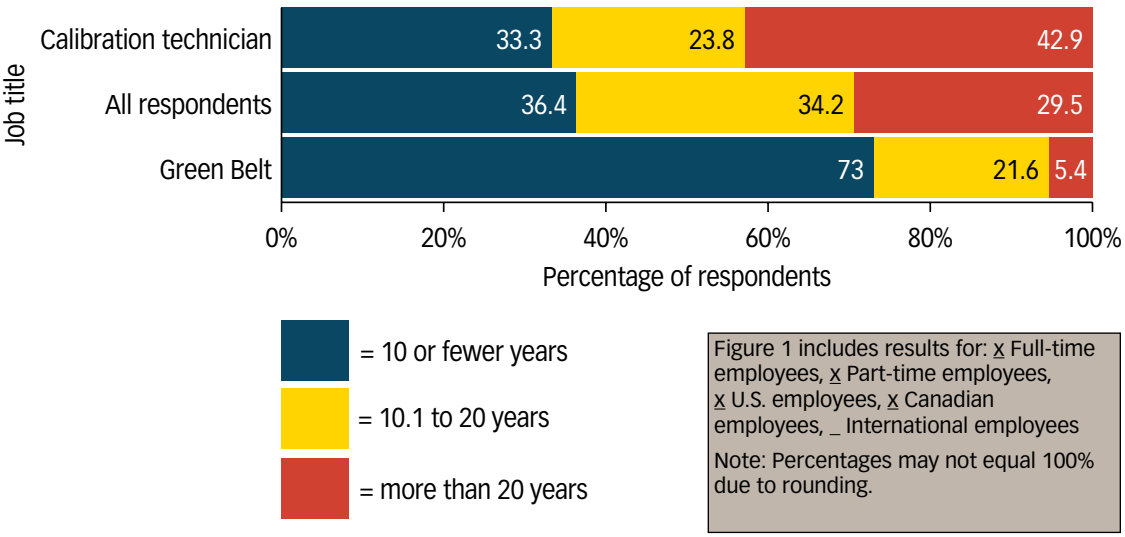


Figure 1 includes results for: x Full-time employees, x Part-time employees, x U.S. employees, x Canadian employees, _ International employees

Note: Percentages may not equal 100% due to rounding.

Salary by number of years of experience in quality for U.S. respondents / FIGURE 2

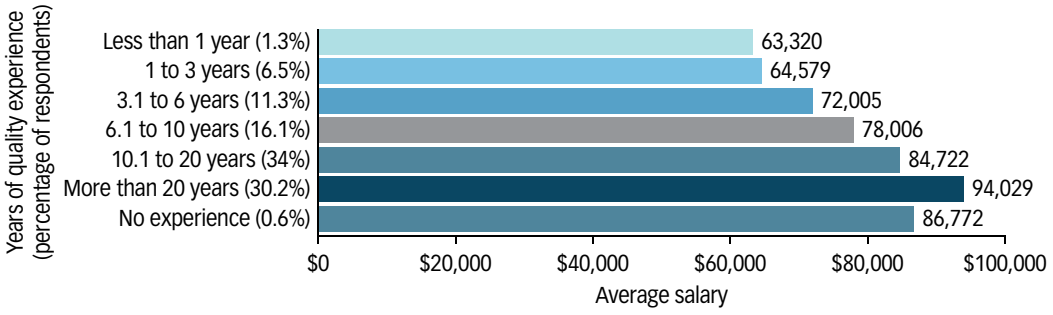


Figure 2 includes results for: x Full-time employees, _ Part-time employees, x U.S. employees, _ Canadian employees, _ International employees

Note: Percentages may not equal 100% due to rounding.

Salary by number of years of experience in quality for Canadian respondents / FIGURE 3

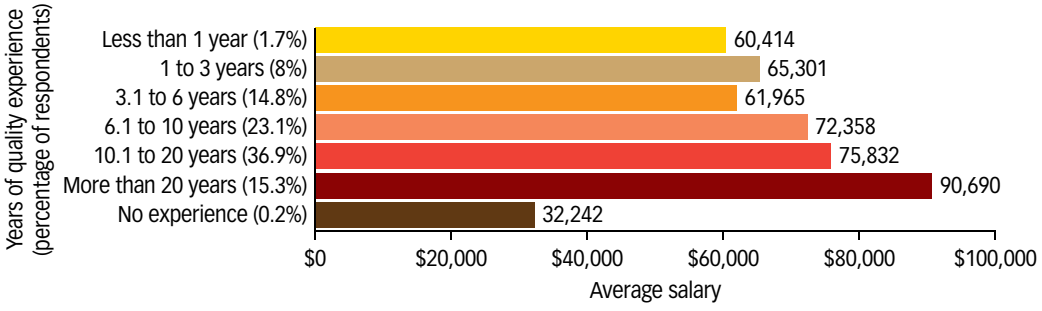


Figure 2 includes results for: x Full-time employees, _ Part-time employees, _ U.S. employees, x Canadian employees, _ International employees

Note: Percentages may not equal 100% due to rounding.

In the United States, **managers with more than 20 years of quality experience** earn, on average, $4,657 more than managers with 10.1 to 20 years of quality experience and **$10,095 more than managers with 10 or fewer** years of quality experience.

Salary by number of years of experience in quality and job title for U.S. respondents / TABLE 1

		Minimum	Maximum	Standard deviation	Count	Mean	Median
Analyst	Less than 1 year	$40,000	$130,000	$30,066	8	$60,600	$50,000
	1 to 3 years	32,000	97,785	15,232	33	54,309	51,000
	3.1 to 6 years	33,000	113,008	19,628	35	60,517	56,100
	6.1 to 10 years	43,500	118,500	18,576	36	67,319	67,500
	10.1 to 20 years	23,000	125,000	21,995	53	68,081	68,000
	More than 20 years	30,000	123,300	22,088	26	69,242	65,000
	No experience	32,000	80,000	25,146	3	60,333	69,000
Associate	Less than 1 year	$25,700	$60,000	$15,515	5	$46,840	$55,000
	1 to 3 years	33,500	55,161	7,859	19	43,572	43,000
	3.1 to 6 years	21,000	76,000	16,276	12	48,396	50,000
	6.1 to 10 years	36,000	98,500	17,963	11	66,464	65,000
	10.1 to 20 years	40,000	115,400	22,703	13	77,415	75,000
	More than 20 years	50,000	89,000	13,794	6	70,333	71,000
	No experience	21,000	21,000	—	1	21,000	21,000
Auditor	Less than 1 year	$43,000	$58,000	$10,607	2	$50,500	$50,500
	1 to 3 years	30,000	105,000	16,370	25	58,036	59,800
	3.1 to 6 years	15,940	100,000	17,089	48	58,110	56,611
	6.1 to 10 years	22,000	116,000	20,145	69	67,149	68,000
	10.1 to 20 years	26,525	155,000	24,900	108	73,055	70,000
	More than 20 years	29,000	160,000	27,304	72	80,080	79,000
	No experience	60,000	80,000	14,142	2	70,000	70,000
Black Belt	Less than 1 year	$44,000	$137,245	$39,964	4	$82,811	$75,000
	1 to 3 years	42,000	134,000	23,624	35	78,695	72,000
	3.1 to 6 years	43,600	140,000	20,841	42	82,769	76,775
	6.1 to 10 years	52,000	129,000	18,722	39	87,042	87,000
	10.1 to 20 years	48,290	135,000	18,408	61	90,959	92,200
	More than 20 years	62,000	150,000	17,854	35	97,747	94,500
	No experience	65,000	65,000	—	1	65,000	65,000
Calibration technician	1 to 3 years	$41,000	$41,000	—	1	$41,000	$41,000
	3.1 to 6 years	29,500	60,000	13,912	5	47,100	50,000
	6.1 to 10 years	40,000	70,000	13,372	5	57,600	60,000
	10.1 to 20 years	34,000	75,000	15,237	10	52,800	49,000
	More than 20 years	45,000	75,228	10,221	18	56,610	55,500
	No experience	52,000	56,700	3,323	2	54,350	54,350
Champion	Less than 1 year	$110,000	$110,000	—	1	$110,000	$110,000
	1 to 3 years	82,000	85,000	2,121	2	83,500	83,500
	3.1 to 6 years	101,181	120,000	13,307	2	110,591	110,591
	6.1 to 10 years	65,000	132,000	27,815	5	90,200	75,000
	10.1 to 20 years	50,000	106,000	22,916	5	89,160	94,800
	More than 20 years	68,000	87,960	10,392	3	79,653	83,000
Consultant	Less than 1 year	$60,000	$60,000	—	1	$60,000	$60,000
	1 to 3 years	32,000	102,000	23,758	12	68,783	64,500
	3.1 to 6 years	35,000	132,500	24,853	22	78,105	75,000
	6.1 to 10 years	45,000	135,000	22,711	34	85,125	84,750
	10.1 to 20 years	30,000	160,000	27,334	60	95,520	94,000
	More than 20 years	27,500	180,000	32,467	59	99,359	98,000
	No experience	75,000	79,000	2,828	2	77,000	77,000

Table 1 includes results for: x Full-time employees, _ Part-time employees, x U.S. employees, _ Canadian employees, _ International employees

Note: Categories in which there were no respondents aren't included.

Salary by number of years of experience in quality and job title for U.S. respondents / TABLE 1 (CONTINUED)

		Minimum	Maximum	Standard deviation	Count	Mean	Median
Coordinator	Less than 1 year	$29,000	$46,000	$7,064	4	$36,375	$35,250
	1 to 3 years	27,000	98,000	17,473	23	49,888	45,000
	3.1 to 6 years	30,160	88,800	15,491	31	52,321	50,000
	6.1 to 10 years	29,000	115,000	22,608	32	58,733	52,000
	10.1 to 20 years	28,000	110,000	17,528	64	58,190	55,500
	More than 20 years	37,000	147,000	30,604	29	73,407	65,831
	No experience	90,000	90,000	—	1	90,000	90,000
Director	Less than 1 year	$55,000	$150,000	$52,202	3	$90,000	$65,000
	1 to 3 years	40,000	150,000	28,052	21	93,400	97,000
	3.1 to 6 years	46,500	185,000	32,473	46	101,877	100,000
	6.1 to 10 years	53,000	190,000	29,381	89	109,848	109,000
	10.1 to 20 years	40,000	212,000	31,939	287	111,627	110,357
	More than 20 years	46,000	225,000	30,447	296	116,987	115,000
	No experience	150,000	184,000	24,042	2	167,000	167,000
Educator/ instructor	1 to 3 years	$42,000	$98,000	$28,589	3	$66,667	$60,000
	3.1 to 6 years	50,000	133,000	21,503	11	75,193	72,000
	6.1 to 10 years	60,000	123,000	22,361	7	87,000	85,000
	10.1 to 20 years	48,000	199,000	40,597	19	90,047	71,000
	More than 20 years	22,000	200,000	46,338	25	96,938	90,600
	No experience	43,000	103,000	33,546	3	64,333	47,000
Green Belt	Less than 1 year	$47,000	$55,000	$5,657	2	$51,000	$51,000
	1 to 3 years	42,000	85,000	13,501	10	56,500	53,000
	3.1 to 6 years	50,000	90,000	12,793	10	70,360	70,050
	6.1 to 10 years	52,000	80,000	15,885	3	61,667	53,000
	10.1 to 20 years	33,000	106,000	25,035	7	70,357	70,000
	More than 20 years	80,000	105,000	17,678	2	92,500	92,500
Inspector	Less than 1 year	$40,000	$40,000	—	1	$40,000	$40,000
	1 to 3 years	25,126	52,000	8,264	13	36,053	35,000
	3.1 to 6 years	24,000	78,000	17,469	12	42,547	41,000
	6.1 to 10 years	28,000	59,000	8,619	22	44,207	43,000
	10.1 to 20 years	19,000	102,000	19,030	29	47,312	42,000
	More than 20 years	25,000	145,000	24,250	29	55,912	51,000
Manager	Less than 1 year	$50,000	$122,500	$24,985	14	$71,429	$65,000
	1 to 3 years	27,000	150,000	24,448	84	73,929	69,500
	3.1 to 6 years	30,000	156,000	24,027	170	82,506	80,000
	6.1 to 10 years	22,568	150,000	23,281	318	81,900	82,000
	10.1 to 20 years	27,500	165,000	24,498	800	86,294	84,650
	More than 20 years	30,000	182,000	25,540	725	90,951	87,084
	No experience	42,000	157,000	33,682	10	91,000	84,500
Master Black Belt	1 to 3 years	85,320	101,000	7,069	4	90,805	88,450
	3.1 to 6 years	72,000	158,700	22,916	14	102,266	99,000
	6.1 to 10 years	33,000	190,000	25,301	30	107,190	105,000
	10.1 to 20 years	60,590	190,000	24,234	39	111,492	109,500
	More than 20 years	65,000	201,000	26,789	44	113,287	115,984
	No experience	108,000	108,000	—	1	108,000	108,000
Process/ manufacturing/ project engineer	Less than 1 year	$39,000	$94,544	$19,047	6	$58,128	$53,000
	1 to 3 years	45,000	91,000	14,073	20	71,471	74,500
	3.1 to 6 years	35,000	110,000	18,958	42	72,375	73,500
	6.1 to 10 years	30,000	150,000	20,160	44	76,800	76,250
	10.1 to 20 years	46,000	150,000	21,607	54	84,575	81,500
	More than 20 years	40,000	140,000	21,961	46	88,430	87,250
	No experience	50,000	118,821	20,180	9	88,780	86,500

Salary by number of years of experience in quality and job title for U.S. respondents / TABLE 1 (CONTINUED)

		Minimum	Maximum	Standard deviation	Count	Mean	Median
Quality engineer	Less than 1 year	$40,000	$100,000	$16,729	20	$62,312	$65,500
	1 to 3 years	24,000	90,000	11,895	94	62,787	64,000
	3.1 to 6 years	34,424	150,000	17,493	166	69,130	68,000
	6.1 to 10 years	31,000	122,000	17,811	184	72,500	73,500
	10.1 to 20 years	24,000	136,000	17,885	423	75,216	73,000
	More than 20 years	37,500	186,000	21,495	374	79,967	78,000
	No experience	96,700	96,700	—	1	96,700	96,700
Reliability/safety engineer	Less than 1 year	$88,000	$95,000	$3,109	4	$91,500	$91,500
	1 to 3 years	59,000	91,000	22,627	2	75,000	75,000
	3.1 to 6 years	47,097	132,000	23,276	11	82,571	80,000
	6.1 to 10 years	62,000	135,000	20,470	14	90,567	85,500
	10.1 to 20 years	55,000	207,000	28,411	29	95,544	90,000
	More than 20 years	63,000	192,000	24,501	34	109,261	105,000
	No experience	114,000	125,000	7,778	2	119,500	119,500
Software quality engineer	Less than 1 year	$69,000	$85,000	$11,314	2	$77,000	$77,000
	1 to 3 years	44,000	120,000	27,172	5	77,600	75,000
	3.1 to 6 years	60,500	96,000	14,195	5	74,421	70,000
	6.1 to 10 years	49,000	126,900	18,396	23	86,300	88,000
	10.1 to 20 years	45,000	137,000	20,347	45	91,748	90,000
	More than 20 years	42,640	135,000	20,118	25	102,958	105,000
Specialist	Less than 1 year	$43,680	$98,000	$24,263	4	$63,020	$55,200
	1 to 3 years	30,700	110,000	17,566	34	58,116	55,000
	3.1 to 6 years	32,000	116,000	18,402	56	55,992	52,000
	6.1 to 10 years	32,000	108,823	17,501	71	63,113	60,000
	10.1 to 20 years	32,000	131,450	23,717	128	73,992	70,000
	More than 20 years	38,000	200,000	27,077	98	83,130	82,000
Supervisor	Less than 1 year	$20,000	$71,000	$20,641	5	$47,520	$52,000
	1 to 3 years	37,000	86,000	13,634	14	55,798	53,125
	3.1 to 6 years	32,000	102,000	17,788	40	63,815	64,000
	6.1 to 10 years	35,866	130,000	19,335	45	65,798	65,000
	10.1 to 20 years	27,000	171,000	24,625	77	72,396	67,000
	More than 20 years	40,000	203,000	29,022	57	75,543	70,000
	No experience	100,000	100,000	—	1	100,000	100,000
Supplier quality engineer/ professional	Less than 1 year	$55,000	$97,500	$30,052	2	$76,250	$76,250
	1 to 3 years	22,000	110,000	27,318	7	61,852	61,006
	3.1 to 6 years	30,000	95,000	16,867	20	69,059	68,500
	6.1 to 10 years	35,000	120,000	15,364	43	77,130	77,900
	10.1 to 20 years	40,000	118,000	15,944	78	79,998	79,500
	More than 20 years	38,000	146,000	20,872	82	84,388	82,000
Technician	Less than 1 year	$22,000	$45,000	$9,034	6	$38,237	$41,840
	1 to 3 years	19,728	72,000	11,893	19	44,614	44,000
	3.1 to 6 years	27,000	75,000	11,134	32	44,601	44,000
	6.1 to 10 years	22,880	80,000	10,050	45	43,046	42,000
	10.1 to 20 years	23,000	80,000	11,472	74	44,427	42,112
	More than 20 years	30,000	107,000	16,276	45	52,555	50,000
Vice president/ executive	Less than 1 year	$150,000	$150,000	—	1	$150,000	$150,000
	1 to 3 years	99,000	150,000	19,601	5	127,800	130,000
	3.1 to 6 years	86,000	211,850	40,492	8	155,606	158,000
	6.1 to 10 years	72,600	200,000	36,514	26	117,350	106,000
	10.1 to 20 years	60,000	350,000	52,588	68	133,781	120,000
	More than 20 years	67,000	518,781	69,622	118	160,467	150,000
	No experience	105,000	105,000	—	1	105,000	105,000

2009 QP SALARY SURVEY

Salary by number of years of experience in quality and job title for Canadian respondents / TABLE 2

		Minimum	Maximum	Standard deviation	Count	Mean	Median
Analyst	Less than 1 year	$62,000	$62,000	—	1	$62,000	$62,000
	1 to 3 years	28,800	72,000	23,186	3	55,267	65,000
	3.1 to 6 years	43,250	56,000	6,666	3	50,750	53,000
	6.1 to 10 years	67,000	80,000	9,192	2	73,500	73,500
	10.1 to 20 years	55,000	65,500	4,925	4	61,010	61,770
	More than 20 years	40,800	40,800	—	1	40,800	40,800
Associate	Less than 1 year	$42,000	$42,000	—	1	$42,000	$42,000
	1 to 3 years	87,400	87,400	—	1	87,400	87,400
	3.1 to 6 years	66,000	66,000	—	1	66,000	66,000
	10.1 to 20 years	40,000	65,000	11,821	4	47,875	43,250
	More than 20 years	60,000	60,000	—	1	60,000	60,000
Auditor	1 to 3 years	$35,000	$35,000	—	1	$35,000	$35,000
	3.1 to 6 years	40,000	65,000	11,087	4	51,250	50,000
	6.1 to 10 years	43,200	82,000	15,616	6	61,867	62,000
	10.1 to 20 years	60,000	62,000	1,414	2	61,000	61,000
	More than 20 years	70,000	120,000	19,189	5	91,800	92,000
Black Belt	Less than 1 year	$76,900	$76,900	—	1	$76,900	$76,900
	1 to 3 years	100,500	100,500	—	1	100,500	100,500
	3.1 to 6 years	76,500	79,000	1,768	2	77,750	77,750
	6.1 to 10 years	65,000	75,000	7,071	2	70,000	70,000
	10.1 to 20 years	82,000	82,000	—	1	82,000	82,000
Calibration technician	1 to 3 years	$70,000	$70,000	—	1	$70,000	$70,000
Champion	3.1 to 6 years	$30,000	$30,000	—	1	$30,000	$30,000
	10.1 to 20 years	66,000	66,000	—	1	66,000	66,000
Consultant	3.1 to 6 years	$106,000	$106,000	—	1	$106,000	$106,000
	6.1 to 10 years	59,000	73,000	9,899	2	66,000	66,000
	10.1 to 20 years	52,000	120,000	23,786	6	81,774	82,822
	More than 20 years	93,250	94,500	884	2	93,875	93,875
Coordinator	Less than 1 year	$38,000	$72,000	$24,042	2	$55,000	$55,000
	1 to 3 years	37,000	63,000	13,000	3	50,000	50,000
	3.1 to 6 years	31,500	72,000	15,026	6	50,728	48,433
	6.1 to 10 years	36,000	68,500	11,425	7	51,071	47,000
	10.1 to 20 years	38,000	80,000	12,961	13	54,523	50,000
	More than 20 years	54,000	77,000	16,263	2	65,500	65,500
Director	1 to 3 years	$65,000	$65,000	—	1	$65,000	$65,000
	3.1 to 6 years	59,000	102,000	24,269	3	87,000	100,000
	6.1 to 10 years	100,000	132,000	14,467	5	114,400	115,000
	10.1 to 20 years	85,000	126,000	11,692	15	102,506	98,000
	More than 20 years	83,000	150,000	20,856	10	114,100	110,000
Educator/ instructor	6.1 to 10 years	$134,000	$134,000	—	1	$134,000	$134,000
	More than 20 years	82,000	120,000	26,870	2	101,000	101,000
Green Belt	6.1 to 10 years	$85,000	$85,000	—	1	$85,000	$85,000
	10.1 to 20 years	81,000	81,000	—	1	81,000	81,000

Table 2 includes results for: x Full-time employees, _ Part-time employees, _ U.S. employees, x Canadian employees, _ International employees

Note: Categories in which there were no respondents aren't included. Canadian salaries are noted in Canadian dollars.

Salary by number of years of experience in quality and job title for Canadian respondents / TABLE 2 (CONTINUED)

		Minimum	Maximum	Standard deviation	Count	Mean	Median
Inspector	1 to 3 years	$35,360	$46,000	$7,524	2	$40,680	$40,680
	3.1 to 6 years	30,000	35,000	3,536	2	32,500	32,500
	6.1 to 10 years	27,000	33,000	3,267	3	30,747	32,240
	10.1 to 20 years	38,000	63,000	12,897	3	48,667	45,000
	More than 20 years	62,000	62,000	—	1	62,000	62,000
Manager	1 to 3 years	$65,000	$117,000	$18,412	8	$85,707	$83,530
	3.1 to 6 years	34,500	105,000	22,028	15	76,116	78,000
	6.1 to 10 years	38,000	135,000	21,829	34	76,604	71,250
	10.1 to 20 years	48,000	125,000	16,905	56	82,894	84,500
	More than 20 years	65,000	103,000	12,579	14	85,076	85,000
Master Black Belt	10.1 to 20 years	$120,000	$120,000	—	1	$120,000	$120,000
	More than 20 years	105,000	150,000	31,820	2	127,500	127,500
Process/ manufacturing/ project engineer	Less than 1 year	$52,000	$52,000	—	1	$52,000	$52,000
	1 to 3 years	39,600	160,000	65,986	3	84,200	53,000
	3.1 to 6 years	30,000	55,000	17,678	2	42,500	42,500
	6.1 to 10 years	80,000	92,000	6,110	3	86,667	88,000
	10.1 to 20 years	65,000	65,000	—	1	65,000	65,000
	More than 20 years	60,000	60,000	—	1	60,000	60,000
Quality engineer	1 to 3 years	$42,000	$42,000	—	1	$42,000	$42,000
	3.1 to 6 years	47,000	65,700	8,200	6	58,117	60,000
	6.1 to 10 years	51,500	100,000	17,318	11	75,755	76,800
	10.1 to 20 years	38,000	91,000	14,187	20	62,607	61,000
	More than 20 years	62,000	139,000	26,305	7	89,050	80,000
Reliability/safety engineer	1 to 3 years	$75,000	$75,000	—	1	$75,000	$75,000
	10.1 to 20 years	200,000	200,000	—	1	200,000	200,000
Software quality engineer	3.1 to 6 years	$72,000	$72,000	—	1	$72,000	$72,000
	6.1 to 10 years	86,000	86,000	—	1	86,000	86,000
	10.1 to 20 years	55,000	81,000	18,385	2	68,000	68,000
	More than 20 years	78,000	78,000	—	1	78,000	78,000
Specialist	1 to 3 years	$44,000	$44,000	—	1	$44,000	$44,000
	3.1 to 6 years	42,000	70,000	13,745	4	58,750	61,500
	6.1 to 10 years	50,000	78,000	11,240	7	63,000	60,000
	10.1 to 20 years	50,000	100,000	15,703	9	71,294	70,000
	More than 20 years	50,000	155,000	32,373	9	82,944	73,000
Supervisor	Less than 1 year	$80,000	$80,000	—	1	$80,000	$80,000
	1 to 3 years	42,000	68,865	18,996	2	55,433	55,433
	3.1 to 6 years	74,000	79,000	3,536	2	76,500	76,500
	6.1 to 10 years	60,000	79,000	13,435	2	69,500	69,500
	10.1 to 20 years	35,000	84,000	18,860	5	60,800	65,000
	More than 20 years	56,000	56,000	—	1	56,000	56,000
Supplier quality engineer/ professional	6.1 to 10 years	$55,096	$105,000	$27,483	3	$86,699	$100,000
	10.1 to 20 years	59,000	84,000	12,503	3	71,667	72,000
	More than 20 years	50,000	50,000	—	1	50,000	50,000
Technician	1 to 3 years	$34,753	$60,000	$10,507	4	$47,438	$47,500
	3.1 to 6 years	35,000	80,500	14,891	7	51,500	50,000
	6.1 to 10 years	23,000	60,116	13,588	5	43,823	43,000
	10.1 to 20 years	49,000	51,000	1,155	3	50,333	51,000
	More than 20 years	65,000	65,000	—	1	65,000	65,000
	No experience	32,242	32,242	—	1	32,242	32,242
Vice president/ executive	3.1 to 6 years	$38,790	$38,790	—	1	$38,790	$38,790
	10.1 to 20 years	130,000	130,000	—	1	130,000	130,000
	More than 20 years	120,000	185,000	45,962	2	152,500	152,500

2009 QP SALARY SURVEY

Certifiable Facts

IN ALL, 57.8% of those surveyed have at least one ASQ certification, and 13.3% have at least one RABQSA International certification. The most widely held ASQ certifications are certified quality auditor and certified quality engineer (see Figure 1, p. 44). Quality management system (QMS) lead auditor and internal auditor are the top RABQSA certifications (see Table 1, p. 45).

Few respondents reported holding ASQ's new certified pharmaceutical good manufacturing practices (GMP) professional, although this certification was still in the pilot stage when the salary survey was conducted.

Most of the ASQ certifications have titles that closely mirror job titles (for example, certified quality engineer and quality engineer), so it's easy to see which certifications are directly applicable to which jobs. However, that's not the case with the certified pharmaceutical GMP professional. Because there isn't a job title that mirrors the certified pharmaceutical GMP professional, you won't find that certification listed in Table 2 (p. 46). This table compares the salaries of respondents who do and do not have a specific ASQ certification with salaries for directly applicable job titles.

Table 3 (p. 47) provides the same type of comparison for the RABQSA International certifications. Like ASQ's certified pharmaceutical GMP professional, RABQSA's laboratory assessor certification doesn't have a directly applicable job title, so it isn't included in Table 3.

If you want to see a breakdown of salaries by ASQ certification for all the job titles (and not just the directly applicable titles), check out Tables 4 (p. 48) and 5 (p. 50). Table 4 contains the information for ASQ certifications related to auditing, engineering and Six Sigma:

- Certified biomedical auditor.
- Certified HACCP (hazard analysis and critical control point) auditor.
- Certified quality auditor.
- Certified quality engineer.
- Certified reliability engineer.
- Certified software quality engineer.
- Certified Six Sigma Black Belt.
- Certified Six Sigma Green Belt.

Table 5 contains the information for technician-related and miscellaneous certifications and for no certifications:

- Certified calibration technician.
- Certified quality technician.
- Certified manager of quality/organizational excellence.
- Certified pharmaceutical GMP professional.
- Certified quality improvement associate.
- Certified quality inspector.
- Certified quality process analyst.
- Respondents who don't hold any ASQ certifications.

You can find the tables that break down the respondents' salaries by RABQSA certifications and all job titles in Section 18 of the salary survey report at www.qualityprogress.com.

Money Talks

Has attaining certifications helped you advance your career? How?

"Yes—I have been able to differentiate myself from others, improve my skill set and therefore advance in my career."

Travis Van Dorn
Manager of project quality management
Black & Veatch

Percentage of respondents holding ASQ certifications / FIGURE 1

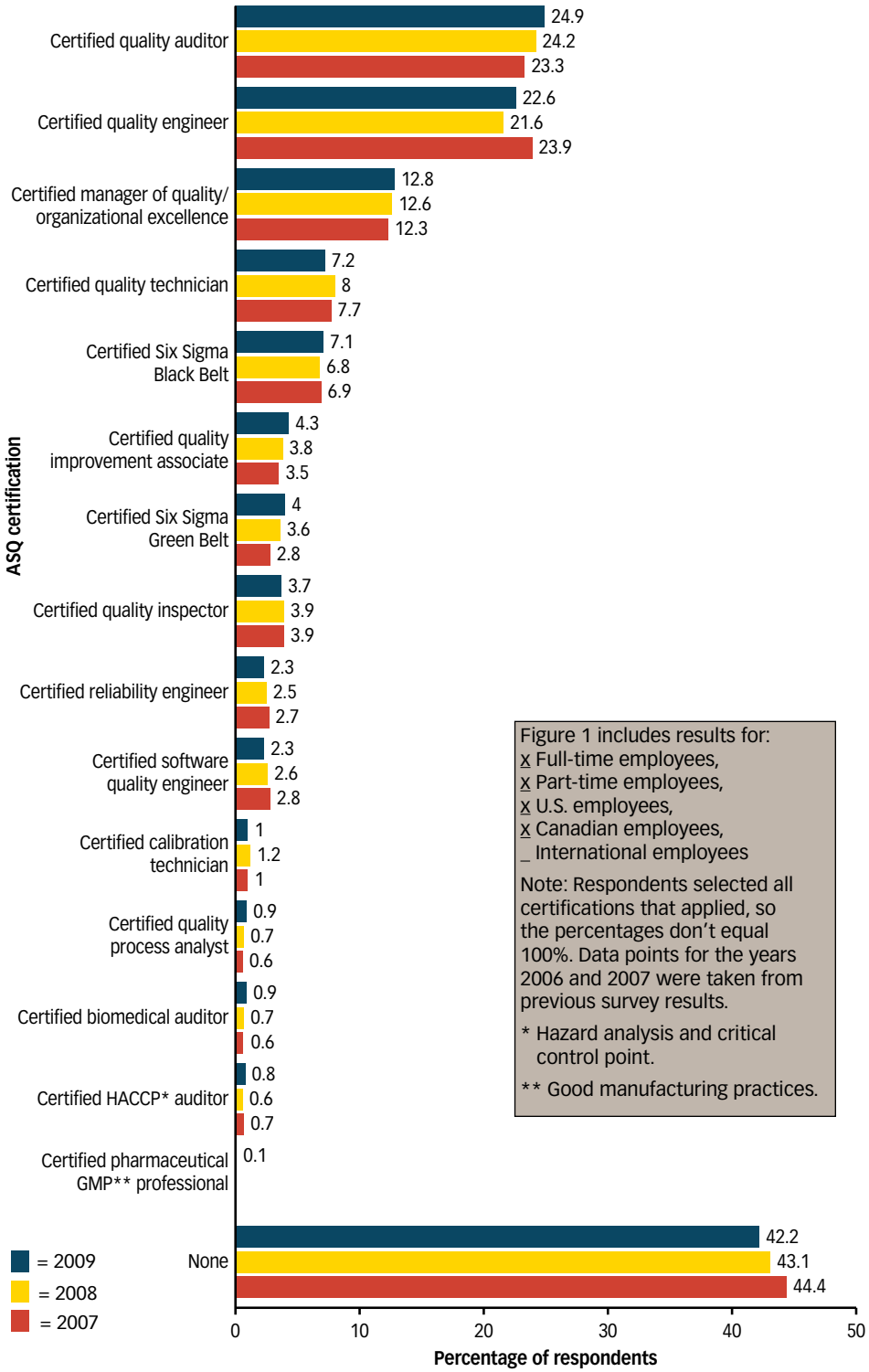


Figure 1 includes results for:
X Full-time employees,
X Part-time employees,
X U.S. employees,
X Canadian employees,
_ International employees

Note: Respondents selected all certifications that applied, so the percentages don't equal 100%. Data points for the years 2006 and 2007 were taken from previous survey results.

* Hazard analysis and critical control point.

** Good manufacturing practices.

Total Package

All sections printed in this issue of *Quality Progress* are also available in the online report in PDF format at www.qualityprogress.com/salarysurvey.

Money Talks

What do you hope to accomplish next in your career?

"Obtain additional ASQ certifications."

Lanette Zaborowski, Senior project quality engineer-compliance CUNO

Percentage of respondents holding RABQSA certifications / TABLE 1

Certification	Percentage
QMS* lead auditor	5.68%
Internal auditor	4.29
QMS auditor	2.37
AS9100 auditor	1.43
QMS provisional auditor	0.79
RABQSA IPC** quality management systems lead auditor	0.64
Environmental lead auditor	0.63
Environmental auditor	0.62
AS9100 aerospace experience auditor	0.61
QMS associate auditor	0.29
RABQSA IPC quality management systems auditor	0.19
QMS principal auditor	0.19
AS9110 auditor	0.16
AS9110 aerospace experience auditor	0.13
OHS*** lead auditor	0.10
Management consultant	0.10
OHS auditor	0.09
Food safety auditor	0.08
Laboratory assessor	0.06
Management system certification body auditor	0.06
QMS business improvement auditor	0.06
Environmental associate auditor	0.05
Information security management systems auditor	0.03
Responsible care management systems auditor	0.03
Food safety provisional auditor	0.03
Food safety principal auditor	0.03
Food safety lead auditor	0.03
OHS provisional auditor	0.01
Food safety associate auditor	0.01
Environmental provisional auditor	0.01
Environmental principal auditor	0.01
Security management systems auditor	0.00
OHS principal auditor	0.00
OHS business improvement auditor	0.00
OHS associate auditor	0.00
Food safety business improvement auditor	0.00
Environmental business improvement auditor	0.00
None	86.73

Table 1 includes results for: x Full-time employees, x Part-time employees, x U.S. employees, x Canadian employees, _ International employees

Note: Respondents selected all the certifications that applied, so the percentages don't equal 100%.

* Quality management system.

** Integrated process control.

*** Occupational health and safety.

Money Talks

What, specifically, drives you when it comes to your career aspirations?

"Any position I take must have a challenge where I need to attain new skills to reach a level of achievement or where I can use my existing skills to implement major, new programs."

Carl Suraci
Senior quality assurance auditor
Church & Dwight Co. Inc.

Differences in salary for ASQ certification / TABLE 2

	United States		Canada	
	Average salary	Difference	Average salary	Difference
Analysts who:				
Aren't certified quality process analysts	$64,473		$59,126	
Are certified quality process analysts	50,243	-$14,230	43,250	-15,876
Associates who:				
Aren't certified quality improvement associates	60,289		58,129	
Are certified quality improvement associates	46,785	-13,504	40,000	-18,129
Auditors who:				
Aren't certified biomedical auditors	69,199		66,233	
Are certified biomedical auditors	97,783	+28,584	—	—
Aren't certified HACCP* auditors	70,060		67,365	
Are certified HACCP auditors	43,500	-26,560	47,000	-20,365
Aren't certified quality auditors	65,913		68,200	
Are certified quality auditors	71,946	+6,033	63,775	-4,425
Black Belts who:				
Aren't certified Six Sigma Black Belts	88,570		73,633	
Are certified Six Sigma Black Belts	85,906	-2,664	83,500	+9,867
Calibration technicians who:				
Aren't certified calibration technicians	52,586		—	
Are certified calibration technicians	56,150	+3,564	70,000	—
Green Belts who:				
Aren't certified Six Sigma Green Belts	62,281		83,000	
Are certified Six Sigma Green Belts	68,700	+6,419	—	—
Inspectors who:				
Aren't certified quality inspectors	45,760		41,622	
Are certified quality inspectors	50,292	+4,532	36,000	-5,622
Managers who:				
Aren't certified managers of quality/organizational excellence	84,482		79,730	
Are certified managers of quality/organizational excellence	94,033	+9,551	87,472	+7,742
Quality engineers who:				
Aren't certified quality engineers	72,000		70,846	
Are certified quality engineers	77,234	+5,234	66,418	-4,428
Reliability/safety engineers who:				
Aren't certified reliability engineers	98,512		137,500	
Are certified reliability engineers	97,722	-790	—	—
Software quality engineers who:				
Aren't certified software quality engineers	87,691		—	—
Are certified software quality engineers	94,727	+7,036	74,400	
Technicians who:				
Aren't certified quality technicians	46,443		47,845	
Are certified quality technicians	44,406	-2,037	51,061	+3,216

Table 2 includes results for: x Full-time employees, _ Part-time employees, x U.S. employees, x Canadian employees, _ International employees

Note: Categories in which there were no respondents aren't included. Canadian salaries are noted in Canadian dollars.

* Hazard analysis and critical control point.

Take It All

All sections printed in this issue of *Quality Progress* are also available in the online report in PDF format at www.qualityprogress.com/salarysurvey.

Differences in salary for RABQSA certification / TABLE 3

	United States		Canada	
	Average salary	Difference	Average salary	Difference
Auditors who:				
Aren't AS9100 aerospace experience auditors	$69,387		$66,835	
Are AS9100 aerospace experience auditors	84,591	+$15,204	56,000	-$10,835
Aren't AS9100 auditors	69,335		66,894	
Are AS9100 auditors	87,745	+18,410	55,000	-11,894
Aren't AS9110 aerospace experience auditors	69,772		66,233	
Are AS9110 aerospace experience auditors	83,500	+13,728	—	—
Aren't AS9110 auditors	69,845		66,233	
Are AS9110 auditors	78,500	+8,655	—	—
Aren't environmental associate auditors	70,006		66,233	
Are environmental associate auditors	34,800	-35,206	—	—
Aren't environmental auditors	69,559		66,233	
Are environmental auditors	97,250	27,691	—	—
Aren't environmental lead auditors	69,760		66,233	
Are environmental lead auditors	84,833	+15,973	—	—
Aren't internal auditors	69,693		68,071	
Are internal auditors	73,425	+3,732	35,000	-33,071
Aren't OHS* auditors	69,821		66,233	
Are OHS auditors	95,000	+25,179	—	—
Aren't OHS lead auditors	69,920		66,233	
Are OHS lead auditors	66,250	-3,670	—	—
Aren't QMS** associate auditors	69,898		66,482	
Are QMS associate auditors	—	—	62,000	-4,482
Aren't QMS auditors	69,490		66,233	
Are QMS auditors	80,620	+11,130	—	—
Aren't QMS lead auditors	68,743		66,413	
Are QMS lead auditors	78,686	+9,943	65,333	-1,080
Aren't QMS principal auditors	69,573		66,233	
Are QMS principal auditors	105,000	+35,427	—	—
Aren't QMS provisional auditors	69,579		66,233	
Are QMS provisional auditors	84,500	+14,921	—	—
Aren't RABQSA IPC*** quality management systems lead auditors	69,888		66,233	
Are RABQSA IPC quality managementsystems lead auditors	73,000	+3,112	—	—
Aren't responsible care management systems auditors	69,844		66,233	
Are responsible care managementsystems auditors	87,500	+17,656	—	—

In the U.S. and Canada, managers who are **ASQ certified managers of quality/organizational excellence** reported they earned a higher average salary **than their counterparts without this certification.** In the United States, the difference is $9,551. In Canada, the difference is $7,742.

Table 3 includes results for: x Full-time employees, _ Part-time employees, x U.S. employees, x Canadian employees, _ International employees

Note: Categories in which there were no respondents aren't included. Canadian salaries are noted in Canadian dollars.

* Occupational health and safety. ** Quality management system. *** Integrated process control.

Money Talks

What, specifically, drives you when it comes to your career aspirations?

"Design for manufacturing/assembly, design of experiments, Green Belt, lean, statistical process control, failure mode effects analysis, problem solving, quality function deployment—(these quality concepts) help provide exposure to various tools that I can use in work and personnel situations, provides a great outlook on business and plant processes."

Tim Hailey
Senior software quality engineer, CSQE

Salary by ASQ certification and job title—part 1 / TABLE 4

	Certified biomedical auditor	Certified HACCP* auditor	Certified quality auditor	Certified quality engineer	Certified reliability engineer	Certified software quality engineer	Certified Six Sigma Black Belt	Certified Six Sigma Green Belt
United States								
All respondents	$99,924[68]	$89,747[50]	$83,763[1,898]	$88,601[1,697]	$102,015[180]	$102,738[174]	$95,423[534]	$82,624[305]
Analyst	40,000[1]	48,000[1]	59,250[35]	80,287[22]	80,000[1]	86,471[7]	72,080[10]	61,234[12]
Associate	—	27,000[1]	62,725[10]	73,377[2]	—	—	98,500[1]	50,750[1]
Auditor	97,783[8]	43,500[2]	71,946[216]	81,860[30]	85,000[1]	106,293[3]	78,088[4]	80,875[8]
Black Belt	—	—	91,737[30]	85,285[39]	89,224[5]	114,875[4]	85,906[101]	83,707[10]
Calibration technician	—	—	—	61,614[2]	—	—	—	—
Champion	83,000[1]	—	93,000[3]	74,000[1]	—	—	112,500[2]	—
Consultant	95,000[3]	—	93,972[38]	102,414[26]	90,000[1]	137,000[5]	94,374[19]	89,442[12]
Coordinator	—	93,173[2]	60,028[47]	76,406[11]	78,000[1]	—	52,000[1]	67,951[5]
Director	121,591[11]	124,615[13]	112,027[171]	117,177[127]	126,447[15]	130,627[12]	120,041[56]	106,806[25]
Educator/instructor	—	—	53,800[5]	71,872[9]	70,000[4]	62,000[1]	65,333[3]	87,333[3]
Green Belt	—	—	60,000[4]	55,500[2]	—	—	—	68,700[18]
Inspector	—	70,500[2]	53,624[20]	68,031[7]	—	52,000[1]	52,000[1]	47,000[1]
Manager	100,529[21]	87,029[17]	89,125[556]	92,127[486]	109,228[38]	108,908[42]	96,787[116]	88,557[71]
Master Black Belt	150,000[1]	150,000[1]	112,042[12]	114,093[34]	126,641[10]	137,500[2]	111,546[62]	113,800[5]
Process/manufacturing/ project engineer	—	—	80,344[29]	84,414[61]	88,727[7]	96,000[3]	85,901[26]	78,822[18]
Quality engineer	81,909[11]	72,000[2]	77,675[342]	77,234[558]	87,681[28]	86,710[20]	81,110[84]	72,845[64]
Reliability/safety engineer	—	—	98,478[12]	102,828[23]	97,722[51]	102,071[3]	97,989[7]	76,833[6]
Software quality engineer	—	—	93,721[17]	117,160[4]	112,000[1]	94,727[56]	86,500[2]	96,000[2]
Specialist	79,200[5]	74,000[4]	71,971[138]	83,505[47]	110,750[6]	104,313[8]	89,374[8]	73,857[7]
Supervisor	52,000[1]	56,250[2]	69,637[62]	73,068[38]	—	84,250[2]	79,000[5]	66,364[11]
Supplier quality engineer/professional	89,000[2]	80,000[1]	82,157[85]	82,286[114]	94,791[8]	96,000[2]	77,679[13]	75,417[12]
Technician	—	51,000[1]	49,259[26]	50,568[18]	—	107,000[1]	—	42,952[5]
Vice president/executive	159,667[3]	65,000[1]	137,439[40]	170,026[36]	131,667[3]	171,000[2]	149,154[13]	149,418[9]

Table 4 includes results for: x Full-time employees, _ Part-time employees, x U.S. employees, x Canadian employees, _ International employees

Note: Small numerals indicate the number of responses. Canadian salaries are noted in Canadian dollars.

* Hazard analysis and critical control point.

Salary by ASQ certification and job title—part 1 / TABLE 4 (CONTINUED)

	Certified biomedical auditor	Certified HACCP* auditor	Certified quality auditor	Certified quality engineer	Certified reliability engineer	Certified software quality engineer	Certified Six Sigma Black Belt	Certified Six Sigma Green Belt
Canada								
All respondents	—	$65,889[9]	$75,655[65]	$75,328[86]	$99,850[2]	$72,500[10]	$86,993[27]	$83,167[9]
Analyst	—	—	46,933[3]	40,800[1]	—	55,500[2]	40,800[1]	—
Associate	—	—	40,000[1]	46,500[1]	—	—	—	—
Auditor	—	47,000[1]	63,775[8]	56,000[1]	—	—	55,000[1]	—
Black Belt	—	—	65,000[1]	82,000[1]	—	—	83,500[4]	91,250[2]
Calibration technician	—	—	—	—	—	—	—	—
Champion	—	—	—	—	—	—	—	—
Consultant	—	—	93,875[2]	93,875[2]	—	—	—	—
Coordinator	—	61,000[1]	54,250[4]	66,500[3]	—	—	—	61,000[1]
Director	—	—	98,333[6]	125,286[7]	—	—	105,667[3]	—
Educator/instructor	—	—	—	108,000[2]	134,000[1]	—	134,000[1]	—
Green Belt	—	—	—	—	—	—	—	—
Inspector	—	—	—	30,000[1]	—	—	—	—
Manager	—	76,667[3]	84,174[23]	78,680[26]	—	80,667[3]	87,250[8]	88,333[3]
Master Black Belt	—	—	—	—	—	—	105,000[1]	—
Process/manufacturing/ project engineer	—	—	39,600[1]	52,500[4]	—	—	90,000[2]	—
Quality engineer	—	—	66,461[9]	66,418[20]	65,700[1]	—	90,000[2]	80,000[3]
Reliability/safety engineer	—	—	—	75,000[1]	—	—	—	—
Software quality engineer	—	—	78,000[1]	78,000[1]	—	74,400[5]	—	—
Specialist	—	65,000[1]	108,333[3]	68,188[8]	—	—	73,667[3]	—
Supervisor	—	65,000[2]	67,500[2]	74,000[1]	—	—	84,000[1]	—
Supplier quality engineer/professional	—	—	55,096[1]	69,548[2]	—	—	—	—
Technician	—	60,000[1]	—	42,333[3]	—	—	—	—
Vice president/executive	—	—	—	120,000[1]	—	—	—	—

Money Talks

Besides or in addition to certification, what quality-related training have you completed? How has this advanced your career?

"I have taken classes focused on quality's basic principles and learned the main processes that we all use regularly to control our outcomes in manufacturing."

Jennifer Rouse
Metrology technician
Moen

Salary by ASQ certification and job title—part 2 / TABLE 5

	Certified calibration technician	Certified quality technician	Certified manager of quality/ organizational excellence	Certified pharmaceutical GMP* professional	Certified quality improvement associate	Certified quality inspector	Certified quality process analyst	None
United States								
All respondents	$66,630[76]	$62,883[535]	$97,103[965]	$98,573[5]	$69,235[311]	$62,794[279]	$65,075[67]	$82,966[3,121]
Analyst	—	53,250[10]	91,027[8]	—	63,373[16]	55,000[5]	50,243[7]	60,952[98]
Associate	60,000[1]	67,000[2]	101,800[3]	—	46,785[16]	54,000[2]	63,375[2]	54,695[30]
Auditor	—	54,683[14]	83,123[21]	86,500[1]	52,234[16]	61,393[9]	64,750[2]	66,950[83]
Black Belt	101,000[1]	85,833[6]	93,074[23]	—	88,596[4]	93,500[4]	84,300[2]	87,852[78]
Calibration technician	56,150[18]	55,400[5]	—	—	75,000[1]	55,500[2]	—	51,593[19]
Champion	—	105,000[1]	105,500[2]	—	—	—	—	87,995[12]
Consultant	—	54,000[3]	93,342[34]	—	66,844[10]	97,000[1]	51,000[1]	90,445[90]
Coordinator	46,500[4]	52,489[21]	85,982[9]	—	55,090[21]	52,229[5]	56,960[5]	57,276[97]
Director	—	101,064[22]	115,842[153]	98,366[1]	98,133[28]	84,111[9]	70,125[4]	111,712[374]
Educator/instructor	—	48,250[4]	72,571[7]	—	60,000[3]	38,000[1]	48,000[1]	93,814[45]
Green Belt	—	56,250[2]	64,000[1]	—	44,500[2]	—	—	60,500[13]
Inspector	75,000[1]	48,322[10]	52,000[1]	—	46,999[4]	50,292[30]	43,000[2]	41,672[51]
Manager	78,965[12]	71,485[122]	94,033[416]	109,000[2]	81,624[70]	71,010[65]	84,653[12]	82,865[955]
Master Black Belt	150,000[1]	108,000[2]	114,937[23]	—	114,750[4]	85,500[2]	125,000[1]	105,589[49]
Process/manufacturing/ project engineer	58,750[2]	69,200[5]	86,985[17]	—	84,613[8]	73,700[5]	65,000[1]	76,060[90]
Quality engineer	67,994[17]	62,204[136]	85,703[117]	90,000[1]	69,523[25]	65,024[57]	55,000[8]	71,500[438]
Reliability/safety engineer	—	70,333[3]	97,000[4]	—	47,097[1]	—	47,097[1]	99,990[27]
Software quality engineer	—	97,000[2]	87,968[4]	—	80,500[4]	—	—	88,053[37]
Specialist	62,537[5]	57,597[29]	89,875[33]	—	56,135[32]	53,627[18]	80,333[3]	69,733[167]
Supervisor	71,727[7]	65,700[18]	76,447[22]	—	59,431[16]	63,574[16]	53,786[7]	67,815[102]
Supplier quality engineer/professional	110,000[1]	68,318[24]	83,100[30]	—	56,167[6]	75,140[8]	84,250[4]	78,219[57]
Technician	55,908[6]	44,406[90]	43,000[1]	—	50,790[19]	46,630[38]	46,440[4]	44,963[75]
Vice president/executive	—	100,000[4]	141,322[36]	—	93,700[5]	110,000[2]	—	145,112[134]

Table 5 includes results for:
X Full-time employees,
_ Part-time employees,
X U.S. employees,
X Canadian employees,
_ International employees

Note: Small numerals indicate the number of responses. Canadian salaries are noted in Canadian dollars.

* Good manufacturing practices.

Money Talks

What, specifically, drives you when it comes to your career aspirations?

"Learn as much as you can whenever you can to help advance and maintain your professional standing."

Bill Busher
Quality systems engineer
INFICON

Review other Salary Survey sections related to **education and certification,** including:

Section 5: Salary by Six Sigma Training (p. 52)

Section 16: Salary by Highest Level of Education (online)

Section 17: Salary by Highest Level of Education and Number of Years in the Quality Field (online)

Section 18: Salary by RABQSA International Certification (online)

Access the complete report at www.qualityprogress.com/salarysurvey.

Salary by ASQ certification and job title—part 2 / TABLE 5 (CONTINUED)

Canada								
All respondents	$64,333[3]	$63,394[34]	$87,411[44]	—	$64,116[25]	$53,055[10]	$58,363[4]	$75,744[192]
Analyst	—	28,800[1]	—	—	56,596[3]	—	43,250[1]	69,900[5]
Associate	—	—	40,000[1]	—	40,000[1]	—	—	60,067[6]
Auditor	—	72,667[3]	56,0001	—	51,500[2]	—	43,200[1]	81,400[5]
Black Belt	—	82,000[1]	—	—	—	—	—	77,950[2]
Calibration technician	70,000[1]	—	—	—	—	—	—	—
Champion	—	—	—	—	—	—	—	48,000[2]
Consultant	—	93,250[1]	78,965[3]	—	—	—	—	83,571[7]
Coordinator	71,000[1]	46,250[2]	70,000[2]	—	54,400[5]	61,000[1]	61,000[1]	49,804[17]
Director	—	116,500[2]	108,270[10]	—	104,000[1]	—	—	99,659[15]
Educator/instructor	—	—	134,000[1]	—	—	—	—	120,000[1]
Green Belt	—	—	81,000[1]	—	—	—	—	85,000[1]
Inspector	—	50,000[2]	—	—	—	36,000[2]	—	40,767[6]
Manager	—	70,269[6]	87,472[18]	—	81,518[9]	64,277[2]	86,000[1]	81,524[67]
Master Black Belt	—	—	—	—	—	—	—	135,000[2]
Process/manufacturing/ project engineer	—	65,000[1]	—	—	—	—	—	86,250[4]
Quality engineer	52,000[1]	59,000[6]	67,333[3]	—	43,452[1]	56,333[3]	—	74,085[14]
Reliability/safety engineer	—	—	—	—	—	—	—	200,000[1]
Software quality engineer	—	—	78,000[1]	—	—	—	—	—
Specialist	—	51,000[2]	73,667[3]	—	44,000[1]	50,000[2]	—	68,968[11]
Supervisor	—	58,000[2]	—	—	—	—	—	64,552[7]
Supplier quality engineer/professional	—	45,000[1]	—	—	—	—	—	77,200[5]
Technician	—	51,061[4]	—	—	46,500[2]	—	—	48,488[11]
Vice president/executive	—	—	—	—	—	—	—	117,930[3]

A Little Can Go a Long Way

THIS YEAR, FOUR job titles are directly applicable to Six Sigma training: Green Belt (GB), Black Belt (BB), Master Black Belt (MBB) and Champion. As Table 1 shows, the vast majority of these respondents (97.3%) have completed at least one Six Sigma training program.

If you're a GB, BB, MBB or Champion, it typically pays to have completed an equivalent (or higher) level of Six Sigma training. For example, the BBs who indicated their highest level of Six Sigma training was BB training earn an average of $7,728 more than their counterparts without any Six Sigma training (see Table 2).

Because there are so few GBs, BBs, MBBs and Champions who have no Six Sigma training, it's uncertain as to whether the dollar figures in Table 1's "None" column accurately represent that population. When you look at the data from all the respondents in Table 3, however, you'll see there are numerous respondents who don't have any Six Sigma training—and they typically earn less than their counterparts with Six Sigma training.

For example, the 3,952 U.S. respondents without any Six Sigma training earn an average of $4,763 less than the 1,492 respondents who indicated their highest level of Six Sigma training is GB and $13,803 less than the 1,197 respondents who indicated their highest level of Six Sigma training is BB.

Number of respondents with job titles directly related to Six Sigma training / TABLE 1

	Highest level of Six Sigma training completed					
	Green Belt	Black Belt	Master Black Belt	Champion	Executive	None
Green Belt	34	1	—	—	—	1
Black Belt	5	194	18	2	1	3
Master Black Belt	—	16	112	2	1	1
Champion	5	6	2	1	—	6

Table 1 includes results for: x Full-time employees, x Part-time employees, x U.S. employees, x Canadian employees, _ International employees

Note: Respondents were asked to indicate their highest level of training completed. Thus, if a respondent completed Master Black Belt training, only that training is shown, not the person's Black Belt or Green Belt training.

Salary by Six Sigma training for directly applicable job titles / TABLE 2

	Highest level of Six Sigma training completed					
	Green Belt	Black Belt	Master Black Belt	Champion	Executive	None
United States						
Green Belt	$66,229[31]	$85,000[1]	—	—	—	$45,000[1]
Black Belt	77,984[5]	87,061[187]	$94,306[18]	$93,500[2]	$70,000[1]	79,333[3]
Master Black Belt	—	101,730[16]	111,411[109]	130,000[2]	66,000[1]	83,000[1]
Champion	87,500[4]	102,530[6]	99,900[2]	68,000[1]	—	80,192[5]
Canada						
Green Belt	$83,000[2]	—	—			—
Black Belt	—	$79,271[7]	—			—
Master Black Belt	—	—	$125,000[3]			—
Champion	66,000[1]	—	—			$30,000[1]

Table 2 includes results for: x Full-time employees, _ Part-time employees, x U.S. employees, x Canadian employees, _ International employees

Note: Respondents were asked to indicate their highest level of training completed. Thus, if a respondent completed Master Black Belt training, only that training is shown, not the person's Black Belt or Green Belt training. Small numerals indicate the number of responses. Canadian salaries are noted in Canadian dollars.

Salary by Six Sigma training for all job titles / TABLE 3

	Highest level of Six Sigma training completed					
	Green Belt	Black Belt	Master Black Belt	Champion	Executive	None
United States						
All respondents	$82,868[1,492]	$91,908[1,197]	$113,888[276]	$109,538[81]	$118,340[68]	$78,105[3,952]
Analyst	66,842[34]	68,629[26]	88,833[3]	80,000[1]	—	62,349[116]
Associate	56,719[8]	90,800[3]	—	—	—	53,031[46]
Auditor	82,392[41]	79,171[12]	65,750[2]	77,500[2]	109,167[3]	67,316[249]
Black Belt	77,984[5]	87,061[187]	94,306[18]	93,500[2]	70,000[1]	79,333[3]
Calibration technician	44,500[2]	57,000[1]	—	—	—	54,976[34]
Champion	87,500[4]	102,530[6]	99,900[2]	68,000[1]	—	80,192[5]
Consultant	86,111[28]	96,254[34]	109,308[13]	83,000[1]	161,000[1]	89,087[99]
Coordinator	58,890[27]	74,400[5]	125,000[1]	—	140,000[1]	57,088[140]
Director	110,637[119]	116,643[132]	128,113[39]	123,102[21]	123,797[13]	109,920[391]
Educator/instructor	67,833[6]	88,447[13]	123,500[4]	71,000[1]	122,500[2]	84,699[41]
Green Belt	66,229[31]	85,000[1]	—	—	—	45,000[1]
Inspector	50,999[6]	—	—	—	—	46,159[96]
Manager	88,822[436]	94,829[348]	108,254[37]	110,937[32]	91,267[19]	81,473[1,143]
Master Black Belt	—	101,730[16]	111,411[109]	130,000[2]	66,000[1]	83,000[1]
Process/manufacturing/ project engineer	79,444[56]	79,636[63]	93,675[4]	120,351[1]	—	79,450[89]
Quality engineer	73,906[373]	79,365[212]	100,696[15]	74,667[3]	89,167[6]	71,891[583]
Reliability/safety engineer	88,852[22]	93,839[16]	146,367[3]	—	90,000[1]	99,491[44]
Software quality engineer	93,793[22]	91,250[4]	120,000[1]	—	—	90,117[69]
Specialist	73,591[71]	82,808[26]	98,493[4]	79,625[4]	73,500[1]	68,057[266]
Supervisor	70,305[58]	68,208[12]	115,000[2]	79,200[3]	—	67,577[154]
Supplier quality engineer/ professional	81,820[81]	80,309[43]	79,000[4]	65,000[2]	81,000[4]	77,099[93]
Technician	48,968[31]	57,463[4]	56,000[1]	—	45,000[1]	44,966[173]
Vice president/executive	147,254[31]	145,049[33]	179,429[14]	160,600[5]	187,619[14]	135,716[116]
Canada						
All respondents	$74,330[54]	$87,624[55]	$101,889[9]	$92,000[2]	$98,000[1]	$70,027[266]
Analyst	—	60,400[2]	—	—	—	60,143[9]
Associate	60,000[1]	—	—	—	—	55,271[7]
Auditor	63,333[3]	—	—	—	98,000[1]	57,836[11]
Black Belt	—	79,271[7]	—	—	—	—
Calibration technician	—	—	—	—	—	70,000[1]
Champion	66,000[1]	—	—	—	—	30,000[1]
Consultant	92,125[2]	100,822[2]	79,000[2]	84,000[1]	—	72,125[4]
Coordinator	67,333[3]	—	—	—	—	51,106[25]
Director	92,000[2]	112,638[10]	102,000[2]	—	—	103,274[19]
Educator/instructor	—	—	—	—	—	112,000[3]
Green Belt	83,000[2]	—	—	—	—	—
Inspector	—	—	—	—	—	40,860[10]
Manager	86,670[17]	83,325[20]	75,000[1]	100,000[1]	—	79,242[83]
Master Black Belt	—	—	125,000[3]	—	—	—
Process/manufacturing/ project engineer	—	90,000[2]	—	—	—	54,514[7]
Quality engineer	73,244[9]	84,250[4]	—	—	—	66,235[31]
Reliability/safety engineer	—	—	—	—	—	137,500[2]
Software quality engineer	—	—	—	—	—	71,500[4]
Specialist	63,000[6]	74,750[4]	—	—	—	68,853[16]
Supervisor	67,500[2]	79,000[2]	—	—	—	61,096[9]
Supplier quality engineer/ professional	60,333[3]	55,096[1]	105,000[1]	—	—	76,333[3]
Technician	45,000[3]	—	—	—	—	49,034[18]
Vice president/executive	—	120,000[1]	—	—	—	117,930[3]

Table 3 includes results for:
x Full-time employees,
_ Part-time employees,
x U.S. employees,
x Canadian employees,
_ International employees

Note: Respondents were asked to indicate their highest level of training completed. Thus, if a respondent completed Master Black Belt training, only that training is shown, not the person's Black Belt or Green Belt training. Small numerals indicate the number of responses. Canadian salaries are noted in Canadian dollars.

Cover

by Matt Rowe
and Brent White

In 50 Words Or Less

- Usually considered separately, process focused management and organizational development can be combined during process improvement efforts.
- By focusing on customer-centric results and the attitudes of employees toward change, organizations can ensure their improvement efforts will be successful.

Your Bases

Double up your approach to guarantee successful process improvement

RECENTLY, WE WERE asked to give a presentation to a graduate-level organizational development (OD) class comparing the goals and benefits of process focused management (PFM) with those of OD. Although we are familiar with OD and fully understand the value of applying a PFM approach, we had never before been asked to provide a detailed comparison of the two disciplines.

The positive reactions of the graduate students, many of them OD professionals, led us to conclude that the complementary nature of PFM and OD is probably not well understood by many practitioners of either discipline.

PFM, which is also referred to as business process management or simply process management, is not process improvement per se. It is an integral—and often absent—part of a successful continuous process improvement effort.

Functionally oriented companies, no matter how customer focused they try to be, almost always end up driving toward internal functional metrics and goals (see Figure 1). PFM is an enterprisewide initiative intended to increase the organization's cross-functional process focus. This means business leaders, managers and associates at all levels understand and work to support the end-to-end processes that are followed to satisfy specific customer needs.

Customer-driven process

Typically, leaders and managers attempt to influence those issues on which they have the most impact and which are most important to their immediate supervisors. Even matrix-managed organizations tend to be structured hierarchically, further encouraging management to be driven by functional goals. After all, the only difference is that matrixed managers are responsible for more than one function and answer to more than one supervisor.

In PFM, the emphasis is on what the customer needs and what the business must do to deliver that product or service, rather than on how well the individual functions operate.

For example, a car rental company would focus on the cross-functional process of providing the appropriate cars rather than on the function-oriented process of fleet management (see Figure 2). The difference is more than simply a change in the name of the process. By calling a process what it is from the customer's perspective, the first step is taken in eliminating psychological and artificial boundaries and their functionally focused objectives.

These changes must include modifications in employee and management behavior to be successful. Customers do not care how efficient outbound calls per sale might be; they simply want the specific cars they request. Customers want to provide the necessary information, receive reasonable rates and be informed their specific type of vehicle is standing by.

Companies that manage their operations while focusing on customer-oriented processes do a much better job of putting customer needs first because process performance is measured in ways that support customer expectations. When employees are managed through the use of concrete data they can understand and influence, their behavior focuses on moving those process metrics in a positive direction.

Management guru Peter Drucker said it best: "The single most important thing to remember about any enterprise is that there are no results inside its walls. The result of a business is a satisfied customer."[1]

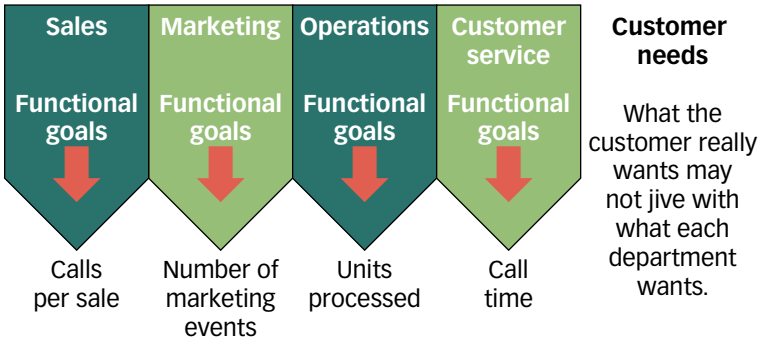
Overlooked, underused

Unfortunately, PFM is not usually promoted as a standalone business concept or even given enough attention when it is mentioned. It is typically only a small portion of Six Sigma training, so its value as a solid foundation for any process improvement method is usually understated and often misunderstood.

Many organizations have learned that improving a process and then simply handing it over to a functional owner can lead to a return to functionally focused management behaviors and, eventually, the same sort of inefficiencies that led to the process improvement effort in the first place. This is why PFM must be applied across the enterprise, as well as within the specific processes designated for improvement. A system of continuous improvement must be implemented.

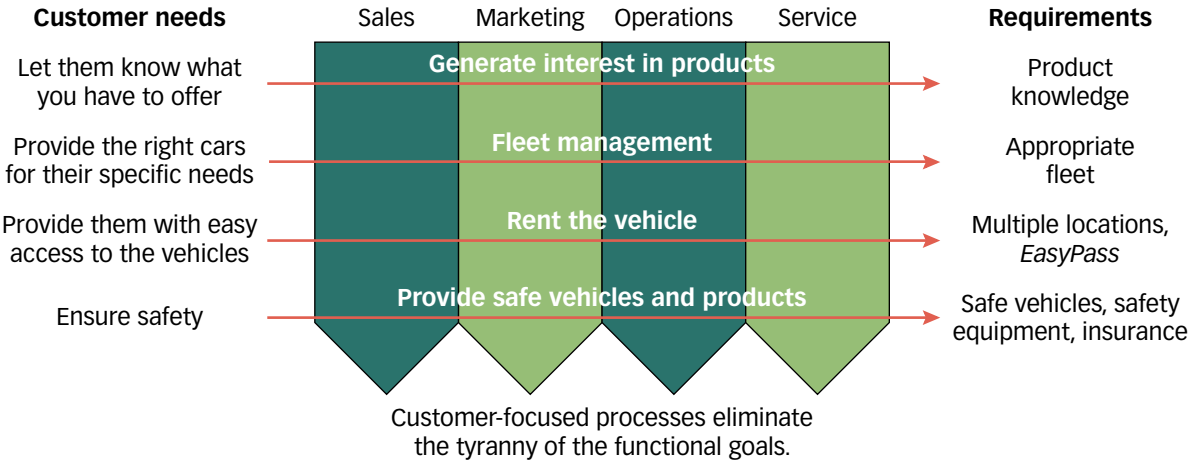
Although organizational structure and hierarchy are purposeful—and seemingly concrete in nature—they are basically the result of learned business behaviors developed over time and in reaction to the current environment. Both are organizationally and behaviorally embedded in the typical business culture.

Functional management / FIGURE 1



Individual functional goals result in a process with gaps, overlaps, rework and other issues.

Process focused management (car rental example) / FIGURE 2



Customer-focused processes eliminate the tyranny of the functional goals.

Simply changing the formal organization of the business and creating a more process focused form of management are not necessarily enough to be successful. New manager and employee behaviors must be identified, monitored and managed. It is in this way that the success of PFM can be significantly enhanced through a link to the concepts and execution of OD.

Larry E. Greiner, professor of management and organization in the Marshall School of Business at the University of Southern California, correlates changes in management behavior to growth in company size over time (see Figure 3).[2]

PFM can come into play at any time, but it is likely to be needed by senior managers at the onset of the autonomy phase in which control via metrics and delegation are crucial. In general, however, PFM facilitates growth throughout the various phases and can be implemented earlier or later in the business growth cycle.

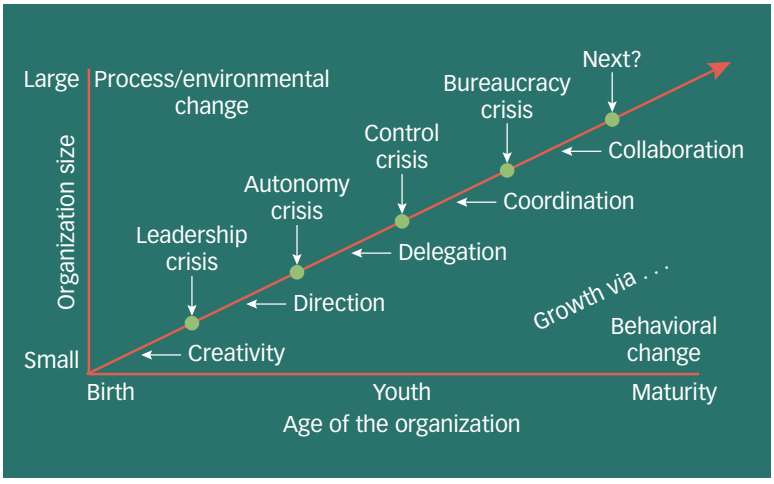
OD tools can be used during any phase to assess whether the employees and managers are prepared to cope with and behave successfully in the current environment. Combined, the two disciplines create a powerful business management approach. PFM provides a more physical, process-oriented method for the business, while OD assesses and manages the behavior of employees within that physical environment.

A role to play

So, what is OD's and, by extension, HR's roles in creating and maintaining a process focused organization? It is imperative that everyone is focused on the organization's vision. OD plays a critical role, first by ensuring this vision has been created, supported and followed at the highest levels of the organization. Second, this vision must be tied to and cascaded throughout all levels of the organization's processes.

OD must also take a lead role in establishing the process focused climate of the organization. The theory postulated by Jack Gibb is that group development is a matter of trust between workers. As trust increases, self-protective and other unproductive behaviors decrease. According to Gibb, there are four stages of group development: acceptance, data flow, goal formation/productivity and organization/control.[3]

Greiner's model of organizational growth / FIGURE 3



Our premise is that PFM is an integral part of establishing this high level of trust. Let's take a look at each of these four stages and detail how OD can create and sustain a process focused organization:

Stage 1: acceptance

Trust is a key element in this stage. All stakeholders understand that the information communicated about process performance should focus on improving customer experience. Good news and bad is shared consistently, with the goal of rewarding success and improving any sources of less-than-acceptable performance.

Employees need to be involved in defining the processes in which they work. Involvement and effective two-way communication enable the gradual building of trust within and across process teams. What better than OD to help focus on these key elements?

Stage 2: data flow

The flow of information is a cornerstone of the process focused organization and is directly related to the amount of trust in the organization. When the holding of information is viewed as power, very little information is shared. Information sharing is a strong characteristic of any healthy, process focused organization.

A mind-set is established in most individuals that given solid information, good decisions will be made. Using OD, leaders can learn how and what to share, and encourage openness to the fullest extent. Trusting employees to make good decisions is vital to success, as is a reliable process data flow via solid relationships with key leaders and process owners.

Stage 3: goal formation/productivity

To be successful, process teams must have clear goals aligned with the organization and, most importantly, with the voice of the customer. OD can play a vital role ensuring goal alignment and clarity exist by tying goal generation to the actual requirements of the process from the customer perspective. Empowered by knowing what the process requires for success—and that the requirements are linked to strategic goals—day-to-day management and decision making are more effective and become powerful enablers of productivity.

Stage 4: organization/control

Once the new way of doing business is embedded in the organization, systems must be established to help maintain the gains. Establishing process focused leadership as the way to do business is the key.

Leaders must ensure standardized ways of doing work are recorded, new process flows are established and standard procedures are integrated. Robust process metrics that include predictive input and in-process metrics, as well as meaningful output metrics, should be monitored via up-to-date, cross-functional process dashboards. Without this step, most organizations can easily revert to "the way we've always done it."

Health assessment

In today's complex business environment, anyone trying to make a business healthier must look at a very broad, cross-functional picture.

This is much like a holistic physician, who not only considers specific processes of the human body, but also examines and contemplates the overall behavior of the patient and the environment, both of which may affect those processes. Successful business managers are organizational physicians who must understand that a healthy business meets customer needs while maintaining efficient processes and effective employees.

According to Roland Cavanagh, managing partner of Implementation Partners LLC and co-author of *The Six Sigma Way*, "A holistic business process management initiative provides a robust set of tools and techniques, and provides the organizational physician with a baseline for the health of the business." He adds, "Organizational development tools and techniques, as well as other solution-oriented methodologies like lean or Six Sigma, provide more advanced diagnostic tools and, ultimately, the surgical procedures required to improve the business's health."

The primary objective of OD is to improve organizational health, which typically begins with correct alignment to overall business objectives. This means the organizational objectives must be properly aligned with the customer needs. PFM can facilitate this technical alignment, while OD's focus on organizational behavior, psychology and sociology (among other things) effectively complements the process-oriented view with a behavioral and cultural view.

The major focus of OD is on the total system, regardless of size, and includes all of its interdependent units and processes—exactly like PFM, except OD is driven by more humanistic principles. And, like PFM, OD relies on performance data to understand and diagnose the current state to determine where the organization should be. An OD practitioner then develops a plan and determines how to conduct an intervention that will facilitate the achievement of the desired change.

For maximum success in implementing and sustaining efficient business processes and organizational health, the disciplines of OD and PFM should be closely integrated and synchronized. OD professionals, functioning like doctors, assess how well the processes perform but with the very specific objective of understanding how factors such as employee behavior, outlook and job satisfaction impact business success. Process-oriented managers rely on customer-oriented PFM as a mechanism to understand the internal systems of the business and to assess how well these systems perform with respect to technical customer requirements.

When physicians collaborate, they must have a thorough understanding of each other's specific area of expertise to be most effective, and they should actively seek out opportunities to combine their skills toward a common end. Similar to how you should never look at data without also looking at the process, the health of a process should not be assessed physically without also assessing the behavior and environment of its processors.

Applying a process focus while also considering behavioral aspects in the work environment provides a more complete picture of the current state of business health and leads to much better ideas for how to properly intervene and move the business forward. QP

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Leave a Legacy

How will you be remembered?

IN MANY management development programs, an instructor assigns this task: Write a brief eulogy summarizing what you think a business associate would say about you. Questions to consider include:

- What impact have you strived to make in the world?
- How has the impact been noted?
- Who has benefited from your efforts?
- What remains to be done?
- What impression have you left?

In 1989, Joseph Juran delivered this eulogy following Kaoru Ishikawa's death:

"There is so much to be learned by studying how Dr. Ishikawa managed to accomplish so much during a single lifetime. In my observation, he did so by applying his natural gifts in an exemplary way. He was dedicated to serving society rather than serving himself. His manner was modest, and this elicited the cooperation of others. He followed his own teachings by securing facts and subjecting them to rigorous analysis. He was completely sincere, and as a result was trusted completely."[1]

While most of us may never reach the level of Ishikawa and Juran's accomplishment, all of us consider the mark we're leaving.

Years ago, after a lengthy discussion of what I did at work, my father asked me, "How important is all that? What difference does what you do make?" As I stumbled through a reply, I realized my answer was wholly inadequate and meaningless to an outside listener.

How would you have answered those questions? Take 10 to 15 minutes and sketch out your eulogy. Does it adequately summarize your business life? What changes should you make on your life's journey?

Elevator speech

Another exercise I often use as a networking tool for people who are changing careers and searching for employment is the elevator speech. The supposition is that you get into an elevator at the top floor in a tall building and a stranger asks what you do. You have the time it takes for the elevator to reach the ground floor—assuming no stops at interim floors—to answer. Draft your elevator speech in five minutes.

The proof of the speech's clarity will come when you test it with a colleague. Watch his or her body language. Is the person exhibiting confusion, lack of interest or disagreement? The objective is to convey meaningful information that will generate mutual interest and aid you both in determining whether a follow-up conversation at a later time would be useful. You can effectively use this same speech when you network with business people in a social setting.

These exercises aren't meant to stimulate morbid thoughts about dying. Rather, they are meant to get you thinking about how you can better apply your knowledge, experience, skills and attitude. We must realize we are all an entity within a global system in which what we do, how we do it and to whom we do it affects other inhabitants of this world.

Time to give back

Readers, it's payback time. Emerge and find a way to give back. Be thankful for the job you may still have, your family, the freedoms you enjoy, your health, your friends and those who buy the products or services you help produce.

Within this vast system, thousands of communities of interest exist, some formal and some informal. One community of interest, to which most of the readership of this publication belongs, is ASQ. And, depending on your type of membership, most members belong to a local section.

My section has about 100 members. In spite of years of effort, the entire work of managing and supporting the section falls on 10 to 12 members. Even though about 10% of the section's membership attends meetings, those members primarily take from, rather than give to, the association. For those members who remain in the shadows, is this how you wish to be remembered?

In today's "what's in it for me" environment, we tend to forget the "and you." I attribute much of the success I've enjoyed to these two axioms:

1. Strive to make your work important and helpful for others.
2. Always deliver more than what you are paid for.

How will you be remembered? Think about it. Vow to make some positive changes on your journey through life. Don't just sit there. Do something useful for others—regardless of whether you're getting paid for it. QP

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Raise Your Batting Average

Remember the importance of sequence in experimentation

DESIGN OF EXPERIMENTS (DoE) has been an effective tool for experimenters, statisticians and quality professionals for decades. DoE has evolved since the seminal work of Sir Ronald A. Fisher in the 1920s, and since George E.P. Box and his colleagues enhanced and popularized the approach in the process industries in the 1950s and 1960s. The utility of the method has even spread to the service industries, backed by a growing amount of literature.[1,2]

> Experimentation is sequential, and **the DoE tools must be embedded in the strategy,** linked and sequenced to guide the experimenter.

A key aspect of experimentation is that it is sequential. Box emphasized that experimentation and learning is an iterative process, as shown in Figure 1. Problems are rarely solved and significant advances in knowledge are rarely made after a single experiment. Learning is a process, not an event. With some exceptions, a series of experiments is usually the norm.

When you look at the plethora of DoE books on the market, however, you see little discussion on the sequential (iterative) nature of the endeavor. This is due, in large part, to the statistics profession's focus on individual statistical tools without thinking about how the tools are sequenced and linked to solve problems.

Some approaches

When sequential experimentation is discussed, it is addressed in a number of ways, all of which are effective under the right circumstances. A classic treatment of the subject is optimization of the product or process design via "hill climbing," using the method of steepest ascent. A response surface method[3] or a simplex optimization[4] is used to guide the sequence of experiments.

Another approach is to run a fractional-factorial design, perhaps followed by additional experiments to sort out any interactions identified by the fractional-factorial design.

You can also use a design that permits the estimation of linear effects or linear and interaction effects, and includes counterpoints to detect response-surface curvature if it exists. If curvature is detected, additional experiments are run using designs that involve three, four and five levels to estimate quadratic effects enabling the identification of optimal conditions.

We also often find situations in which, as the experimenter moves from one experiment to the next, the factor ranges may change (expand, narrow or shift), the center of the experimental region may be changed or variables may be added to or deleted from the study.

Each of these approaches is useful, but they can be made even more effective when included in an overall strategy of experimentation.

A strategy that works

Over the years, it has been recognized that experimentation is more effective when

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it is approached with a strategy in mind. For any strategy to be effective, it must recognize that the design (or sequence of designs) should match the experimental environment. Experimentation is sequential, and the DoE tools must be embedded in the strategy, linked and sequenced to guide the experimenter.

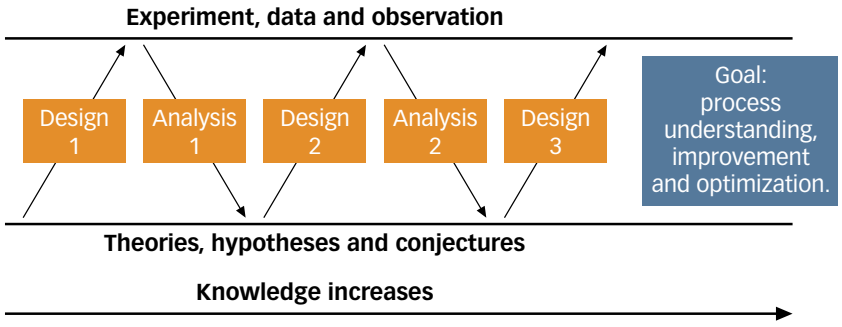
The sidebar, "Ignoring Sequence—An Example," describes an experiment in which the sequential nature of experimentation was not considered, resulting in an ineffective and inefficient experimental program. Poor planning is frequently the culprit. For instance, you may run out of time and money before you get to a useful answer. An important variable may be missed because a well-thought-out experimental plan was not developed—often the result of a desire to show results too quickly.

This experience leads to the following principles that can enhance experimental strategies:

- **Plan ahead.** Decide on the series of experiments that may be needed to satisfy the objective of the experimental program.
- **Consider all factors.** In the beginning, include (or at least consider) all factors (Xs) that may possibly be important. Recall the Pareto effect, which says the majority of the variation will be caused by a small subset of the factors. As you move through the experimentation, the important factors will be discovered and tested further in later experiments.
- **Don't spend all your resources on a single experiment.** As mentioned earlier, an issue is rarely resolved in a single experiment.

A strategy that uses these principles was developed at DuPont in the 1960s and offered in public workshops in the 1970s. This strategy identifies three experimental environments: screening, characterization and optimization (SCO). The objective of

Sequential nature of experimentation and learning / FIGURE 1



Adapted from George E.P. Box, James S. Hunter and William G. Hunter, *Statistics for Experimenters: Design, Innovation and Discovery,* second edition, John Wiley and Sons, 2005.

IGNORING SEQUENCE—AN EXAMPLE

A lab director uses the "critical test" strategy, which assumes subject matter expertise and a few tests will identify a better product or a product with less impurity. The lab director came to work each day and instructed technicians on what test to run. When a few tests didn't produce a better product, he identified what he said was another "few tests that will work." The result was a series of "re-dos," not a planned series of experiments.

After 54 tests, a better product design was not found and the importance of the factors was not identified. The lab director failed to recognize that a critical test approach is a low-yield strategy. A different strategy was needed.

A better approach

The information gained in the previous tests was useful in defining the new strategy. It was decided to run an optimization experiment because there were only three factors involved, and the ranges were well defined. A 15-run, face-centered-cube design was used, which involved some replicate test controls, resulting in 23 total tests. It was learned that increasing the active ingredient of the formulation had no effect on impurity, so the minimum level tested was chosen for the product, which reduced product cost. Using response-surface optimization, a combination of the other two factors—which minimized the impurity—was found.

The predicted measured impurity of this formulation was about 50% lower than that of the current product. An added bonus was that the developed model accurately predicted the impurity of the old product. This suggested that the model could be used in the future to identify formulations for other applications, which could accommodate higher impurity levels. *—R.D.S*

each of the three phases and the designs used are summarized in Table 1 (p. 66).

Screening: This phase explores the effects of a large number of variables, with the objective of identifying a smaller number of variables to study further in characterization or optimization experiments. Additional screening experiments involving additional factors may be needed when the results of the initial screening experiments are not promising. On several occasions, I've seen the screening experiment solve the problem.

When there is very little known about the system being studied, sometimes range-finding experiments are used, in which the candidate factors are varied one factor at a time to get an idea of what factor levels it would be appropriate to consider. Varying one factor at a time can be useful.

Comparison of experimental environments / TABLE 1

Type of experimental environment			
Characteristics	**Screening**	**Characterization**	**Optimization**
Number of factors	6–30	3–8	2–6
Desired information	Important factors	Understand how systems work	Prediction equation and optimization
Model form	Linear or main effects	Linear and interaction effects	Linear, interaction and curvilinear effects

Adapted from C.G. Pfeiffer, "Planning Efficient and Effective Experiments," *Materials Engineering,* May 1988, pp. 35-39.

Characterization: In this phase, you experiment to better understand the system by estimating interactions and linear (main) effects.

Optimization: In this phase, using response surface contour plots and perhaps mathematical optimization, you develop a predictive model for the system that can be used to find useful operating conditions.

Keep in mind Dave Bacon's observation—particularly when working with an existing process—that there may be only time, money and process availability to

run a single experiment.[5] This situation is covered by the strategy of planning ahead, considering all factors and performing multiple experiments when an SCO experiment is used to solve the problem. I have seen such a strategy work on a number of occasions.

The SCO strategy in fact embodies several strategies, which are subsets of the overall SCO strategy:

- Screening-characterization-optimization.
- Screening-optimization.
- Characterization-optimization.
- Screening-characterization.
- Screening.
- Characterization.
- Optimization.

The end result of each of these sequences is a completed project. There is no guarantee of success in any instance, only that SCO strategy will raise your batting average in hitting on the right answers.

The strategy used depends on the experimental environment, which includes the objectives of the experimental program. Criteria that can be used to characterize the experimental environment are outlined in Table 2. These characteristics involve program objectives, the nature

Characterizing the experimental environment / TABLE 2

- Objectives of the experimental program.
- Number of factors (Xs).
- Type of factors (Xs):
  - Quantitative (for example: temperature, pressure and feed rate).
  - Qualitative (for example: reactor type, catalyst and team).
- Type of output variables (Y)—continuous or discrete.
- Can the factors be studied over their full ranges?
- Resource constraints—time, funds (money) and people.
- Quality of prediction required:
  - Identify key drivers, find sweet spot or make predictions.
- Is the available scientific theory useful:
  - Has a theory been developed for all responses?

of the factors (Xs) and responses (Ys), resources available, quality of the information to be developed and the theory available to guide the experiment design and analysis. A careful diagnosis of the experimental environment along these lines can have a major effect on the success of the experimental program.

Over the years, we have learned that experimentation can be used to improve all types of processes in manufacturing and service. As with any endeavor, it is important to have a strategy to guide your work. Recognizing that experimentation is sequential—sometimes involving several phases—the SCO strategy has proven to be a high-yield strategy to guide experimentation. The SCO strategy has stood the test of time, and it's definitely worth your consideration. QP

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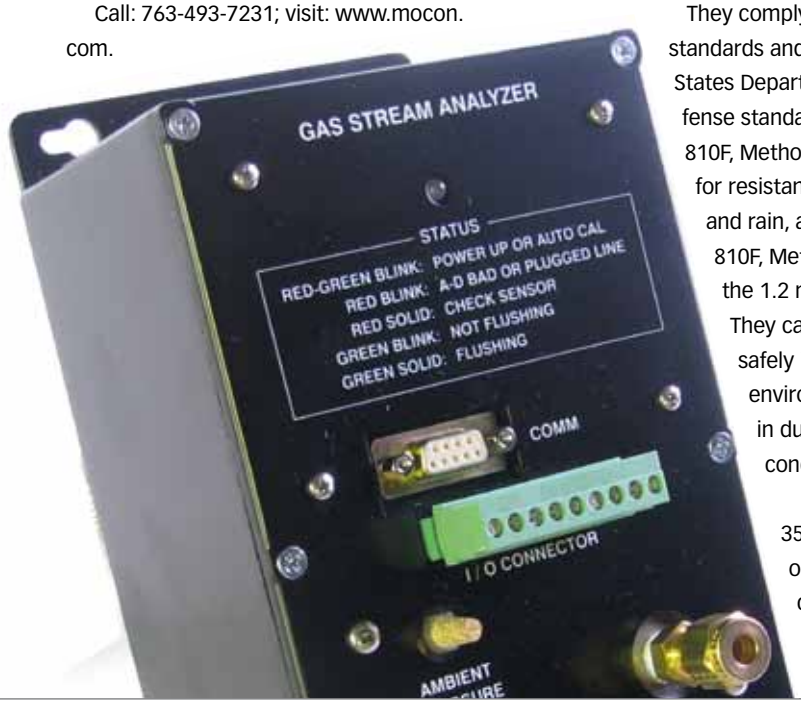

Videoscope ▸

Olympus has announced the Iplex LX and Iplex LT industrial videoscopes. These videoscopes are small and lightweight, making them suitable for a range of remote visual inspections of parts or structures in which access is limited.

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Mod Tech Industries has released the Air Assist Movement (AAM) system. The concept of the system is to allow for the measuring of a manufactured part or parts located on one AAM plate, while another product is simultaneously being set up or staged on a second plate.

Once the first part-measurement program is complete, it is moved through the AAM plate from the measuring location to its origin or home position on a cushion of air. The second plate is then relocated to the measuring location by the same process. At this time, the first plate is now available for another part set-up.

This exchange process continues in an alternate sequence for as many like parts or different parts as there are to be measured. With the recommended air supply, an AAM plate can lift and move more than 500 lbs., making it adaptable for use on most coordinate measuring machines. The system is also removable, allowing for flexibility.

Call: 715-524-4510; visit: www.modtechindustries.com.

Packing robot

QComp Technologies has released the Duet Packer Cell for packaging individual products. It features two robots that pack

products into shipping cases or containers at a rate of 150 picks per minute.

The preengineered system is designed to provide manufacturers with a turnkey solution to increase the customer's bottom line and reduce production costs.

The Duet Packer Cell is a packing method that provides the flexibility manufacturers need to accommodate last-minute product changes or complete redeployment for new products.

The QComp Duet Packer Cell is preengineered, allowing for easy install and startup. It meets the Regulatory Impact Analysis and American National Standards Institute standards.

The unit can pick up to 45 lbs. per pick and features one 4-axis robot, one 6-axis robot and integrated feed conveyors.

Call: 920-757-0775; e-mail: info@qcomptech.com.

Software

Adept Technology's ACE PackXpert is a software solution built on Adept's fully integrated automation control environment, Adept ACE software.

It is designed for packaging applications and allows manufacturers to respond to part changes without reprogramming.

ACE PackXpert features an intuitive graphical interface and 3-D workspace display for visualizing the system operation.

This software enables users to coordinate the efforts of an entire line of robots by working across multiple controllers.

The program is designed for novice users, with no programming required to bring an application online, while permitting users with V+ programming expertise to leverage their existing library of V+ functionality.

Call: 925-245-3400; visit: www.adept.com.

Fuel-polishing module ▲

The daily build-up of condensation in a diesel fuel system can lead to fuel contamination through bacteria growth. Parker Energy Systems' FPM-050 fuel-polishing module reduces the daily accumulation of water in fuel systems, preventing corrosion and minimizing equipment downtime.

The FPM-050 is a fuel recirculation system that uses solid-state pump technology, an existing fuel filter and 150 mA at 12V direct current or less than 2W of power.

It's ideal for equipment that sits for long periods between uses or is stored outside or away from the grid power during downtime. It has been designed to work with a variety of fuels, such as diesel, biodiesel blends and kerosene.

Call: 877-217-4501; visit: www.parkerfuelpolishing.com.

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(Act of August 12, 1970; Section 3685, Title 39, United States Code)

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1. Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541	60,751	53,840
2. Paid In-County Subscriptions	0	0
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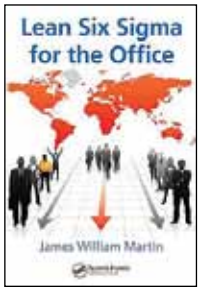
William A. Tony
Publisher

QP REVIEWS

Lean Six Sigma for the Office

James William Martin, Taylor & Francis Group, 2008, 348 pp., $49.95 (book).

Over the years, companies have successfully combined lean manufacturing and Six Sigma process improvement techniques to achieve significant improvements in how they manufacture products. However, applying techniques developed for the manufacturing floor in an office setting has been difficult at best. Martin's book aims to help Master Black Belts, Black Belts and managers improve how their office processes work.



The book is divided into three sections. The first section spans the first three chapters and discusses aligning improvement opportunities with corporate strategy, identifying projects and covering the basics of lean Six Sigma (LSS). Section 2 discusses how to plan and conduct *kaizen* events. This section is broken into three chapters, which describe *kaizen* event planning, data collection/analysis and examples of process improvements in an office setting. The final three chapters cover aspects of solution implementation, including building business cases, implementing solution control plans and behavioral dynamics.

The book does a good job of showing how LSS tools can be applied in an office environment. The examples in chapter 6 were particularly helpful, although it would have been helpful to use the examples in chapter 6 as separate cases to show how LSS is applied from start to finish. In addition, the book tends to describe calculations, such as *takt* time, in paragraph form instead of showing examples of calculations using mathematical equations. This inhibits rather than enhances understanding, especially for people who are visual learners.

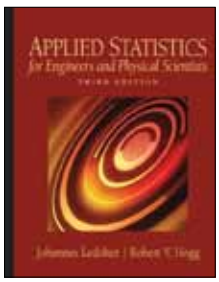
Overall, this is a good book, but the presentation style makes it ill-suited as a reference text, making it less useful than it could be.

Brian Cocolicchio
New City, NY

Applied Statistics

Johannes Ledolter and Robert V. Hogg, Prentice Hall, 2009, 608 pp., $134.67 (third edition, book).

This book provides an introduction to the basic statistical and probability theories and applications in the field of engineering and science. The statistics and probability content is comparable to other statistics books geared to similar audiences.



The first chapter serves as introductory material to get students' feet wet. Several basic but useful statistical concepts and graphical tools are introduced here. The next couple chapters pertain to more rigorous probability concepts, models and statistical distributions.

The driving forces behind all statistical inferences are introduced in chapter 4, and chapter 5 is the logical extension and application of the confidence intervals and testing hypothesis addressed in the previous chapter. The introduction of the design and analysis of experiments with one factor or more are introduced in chapters 6 and 7. The catch-all tool of regression is introduced in chapter 8.

Compared with other introductory applied statistics textbooks aimed at the application in the field of engineering and science, this book provides easy and less demanding content from the student's point of view.

Shin Ta Liu
Lynx Systems
San Diego

Journey to Excellence

Kathleen J. Goonan, Joseph A. Muzikowski and Patricia K. Stoltz, ASQ Quality Press, 2009, 248 pp., $30 member, $50 list (book).

Goonan, Muzikowski and Stoltz—all of whom have experience as Baldrige examiners—pool their considerable healthcare quality experience to present an analysis of nine healthcare Baldrige Award recipients from the healthcare arena.

With the major challenges facing healthcare organizations today, it is little wonder that in recent years, half of the Baldrige Award applicants have been healthcare providers. Thousands more U.S. healthcare institutions are now implementing the Baldrige criteria. However, as these authors wisely acknowledge, when approaching Baldrige criteria, there are no easy answers and no magic bullets. Instead, they summarize key aspects from real healthcare institutions that succeeded through use of the Baldrige criteria and a systematic approach to managing, improving and changing their organizations for the better.

In concise, well-thought-out chapters, the authors explain the context in which today's healthcare providers operate; present an overview of Baldrige and how it is used in the change process; summarize a description of the journey toward Baldrige excellence; explain their leadership, assessment, sensemaking, execution and results elements they say will help achieve Baldrige discipline; and end with high-level conclusions drawn from the success of these institutions. The book includes extensive remarks from key leadership among the nine recipients, bringing to life these principles and illustrating how these organizations achieved their success. The authors also include examples of the practices used by these recipients.

With the current high level of interest in and concern regarding healthcare in the United States, this work nicely makes the case to all healthcare companies about how the Baldrige quality framework can make a difference in their organizations. This book is recommended for all healthcare executives and quality professionals.

Dale Farris
Groves, TX

Strategic Project Management

Terry Schmidt, John Wiley and Sons, 2009, 272 pp., $29.95 (book).

Compared to the 39 project management books I have read, this book is best at addressing the dilemma of why well-intentioned projects fail and how to prevent future failures. The secret lies in overcoming the typical tendency project teams have to rapidly move out of the planning phase to get to work on the tasks.

The author demonstrates through multiple examples how four simple questions can set the stage for a successful project. He then takes the reader through the if-then practice of setting objectives using causal logic as opposed to sequential logic and the creation of an objectives tree.

With a systems-thinking perspective, the author introduces a conceptual framework called the Logical Framework or LogFrame Matrix. This left-to-right matrix captures definitive statements pertaining to objectives for the goal, purpose, outcomes and inputs in a column labeled "objectives." Adjacent columns are used to verify and measure success.

Four chapters drill down to explore how the four questions work together as an integrated thinking system. A section on managing the strategic action cycle, managing the people dynamics, and applying the concepts and practices in your world rounds out the book. Included are forms, a glossary and a plethora of real-life examples.

The concepts and practices discussed in this book apply a new and more effective way of assuring your project is a strategic fit to the organization. That means the goal, purposes, outcomes and measures are aligned, communicated and understood by affected stakeholders. Use of these upfront planning practices sets the stage for the application of traditional tools of project management.

For quality professionals who are establishing and managing projects, especially those responsible for initiating Six Sigma projects, this book is a must read.

Russ Westcott
R.T. Westcott & Associates
Old Saybrook, CT

RECENT RELEASES

Dare to be Different

James L. Lamprecht and Renato Ricci, ASQ Quality Press, 2010, 152 pp., $20 member, $34 list (book).

Stories From My Sensei

Steve Hoeft, CRC Press, 2009, 180 pp., $29.95 (book).

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JANUARY

1-31 **The Future of Off-Highway Vehicles: Balancing Performance, Safety, Compliance and Fuel Efficiency (phone or webcast).** Visit the Society of Automotive Engineers at www.sae.org.

5 ASQ Education Course. **Lean Six Sigma Black Belt for Healthcare: Blended Format—Virtual Course**.

7 ASQ Conference. **Northeast Pharmaceutical GMP.** Somerset, NJ.

12-13 **SCOR Framework.** San Diego. Call the Supply Chain Council at 202-962-0440 or e-mail info@supply-chain.org.

15 **Safe Quality Food—Transitioning from Level 2 to Level 3.** Webinar. Visit Eagle Food Registrations at www.eaglefoodregistrations.com.

18-20 **Improving Your Project Management Skills: The Basics for Success.** New York. Visit the American Management Association at www.amaseminars.org or call 800-262-9699.

19 **ISO 9001:2008 Discussion Group.** Charlotte, NC. Call John Lynch at PQI Consulting at 704-845-0466 or visit www.pqiconsulting.com.

19-20 **Global Food Safety and Quality Benchmarked Standards: ISO 22000 and PAS 220.** Guelph, Ontario. Call the Guelph Technology Food Center at 519-821-1246 or visit www.gftc.ca.

20-21 ASQ Education Course. **Service Excellence Through Quality Practices—Webinar**.

21-22 **Demonstrating Reliability with Accelerated Testing.** San Jose, CA. Call Hobbs Engineering at 303-465-5899 or visit www.hobbsengr.com.

21-22 **Traceability Interoperability Summit 2010.** Denver. Visit the Traceability Institute's website at www.traceability-institute.com.

25-28 ASQ Conference. **56th Annual Reliability and Maintainability Symposium.** San Jose, CA.

25-29 **January 2010 Roadshows.** Various locations in California including Santa Rosa, Sacramento, Fresno and Bakersfield. ASQ Customer-Supplier Division presents seminars on supplier auditing and certification. Call Dennis Arter at 509-783-0377 or visit the division's website at www.asq.org/cs/quality-information/courses-cs.html.

26 **How to Achieve and Sustain Manufacturing Excellence.** Athens, GA. Visit the Association for Manufacturing Excellence at www.ame.org.

FEBRUARY

3 ASQ Education Course. **ISO 22000: 2005 Food Safety Overview—Vitual Course**.

8-12 ASQ Education. **Black Belt/Quality Engineering Statistics.** Richardson, TX.

11-12 **Certificate Issuers' Accreditation Workshop.** Washington, D.C. Visit the American National Standards Institute's website at www.ansi.org.

17 **Developing Rating Scales for Performance Tests.** Webinar. Visit the International Society for Performance Improvement at www.ispi.org.

17-18 **Product Safety and Product Liability Prevention Seminar.** Milwaukee. Visit Randall Goodden International at www.randallgoodden.com or e-mail info@randallgoodden.com.

22-26 **Building and Implementing Growth Strategies.** Chicago. Call Susan Popa at the University of Chicago Booth School of Business at 312-464-8732 or e-mail susan.popa@chicagobooth.edu.

25-28 **ASQ, Society for Health Systems and the Institute of Industrial Engineers Joint Conference: Aim to Build Better Healthcare Delivery Systems.** Atlanta. Visit SHS's website at www.shsweb.org.

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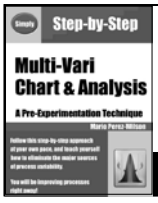

Stir Up Trouble

Creating a path to permanent problem resolution

PROBLEM SOLVING often requires us to retrace our steps to figure out where we went wrong. As quality professionals, there are a handful of tools at our disposal to do just that, whether it's reverse brainstorming or a TRIZ technique that instructs the user to "do it in reverse." I've had experience with one such tool, which my former company fondly referred to as "creating the trouble."

At this company, which manufactures grinding wheels, most rejections occur because of different types of physical cracks that appear on the wheel's surface. The usual way of solving the problem was to guess the reason, take corrective actions based on those guesses and make the wheel again, hoping the corrected recipe will result in the absence of any cracks.

Find, solve, repeat

Despite the best efforts of the staff, such solutions were only temporary, and often the same problem would reappear after some time. So, the same team would find another reason for the crack and prove its worth by running the process again—and again find the solution, at least for the time being.

Finally, we decided if a wheel was cracked, we needed to first try to manufacture the cracked wheel—that is, the team needed to find the ways and means to produce the exact same type of cracked wheel once again.

Only the correct cause would create the same type of crack once again. That way, we would be able to identify the exact reason the wheel cracked in the first place.

Now, all of our team members who want to solve a problem must first prove they can create the problem. This has proved to be a meaningful and easy way to get to the root cause and eliminate the issue for good.

Frit's a problem

One of our processes involves a frit, which is a glassy material formed by melting various oxides in a rotary furnace, and then pouring the glassy liquid into a tub of water.

This process results in the solidification of the molten material, which forms a substance that can be crushed into powder and added to vitrified bonds to regulate temperature. Frits are normally glassy white or transparent, but we had a problem in which they emerged from the kiln red.

When we attempted to solve the problem with the usual methods, we started looking for traces of iron from rusted portions and examining the purity of the incoming material. When we couldn't find the answer, we went to our shop-floor team members and asked them how they would turn frit red. They told us it could be done with the addition of furnace oil.

It was such a simple solution, but it did not occur to us. When we tried adding furnace oil to frit in a controlled sample and fired it in a furnace, it turned red. Now, the solution was obvious: We needed to locate the furnace oil leak in the oil line and plug it. The problem was permanently resolved but might not have been had we stuck to the usual causes.

Using this strategy, we have successfully resolved many issues on a permanent basis. So, the next time you run into a problem that's difficult to solve, try this approach. It just might be worth the trouble. QP

A BETTER SOLUTION

There are a variety of ways to solve problems, and everyone has an approach they prefer. Share your stories of confusing quandaries and the strategies you used to resolve them by e-mailing editor@asq.org.

V.E. ANNAMALAI is professor of mechanical engineering at S.S.N. College of Engineering in Chennai, India. Prior to that, he was vice president technical of Carborundum Universal Ltd. in Chennai, heading R&D and process management. Annamalai earned a doctorate in materials science from the Indian Institute of Technology in Madras. He is a member of ASQ.

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