

## Chair's Message

by Davis Balestracci

### "The Division That Keeps You Employable"



For some reason, I've been having trouble trying to think of a topic for this message. I'm still trying to make sense of what I see as many disturbing signs regarding the current state of the quality profession and ASQ. In the latest salary survey (December *Quality Progress*), the job title "statistician" was intentionally omitted for the first time in my memory. What is going on? The opportunities that made statistics such an exciting career choice for me back in 1978 are neither available nor would I necessarily be led or be able to have the luxury of making the choice of an M.S. program today.

Two recent articles have given me a lot of food for thought. The first is by Jim Clemmer (I highly recommend that you subscribe to his weekly "Improvement Points" through <http://www.clemmer.net>). Think of the first paragraph in terms of your organizations, ASQ, and the Statistics Division. Think of the second paragraph in terms of yourselves:

Responsiveness to change is as important to organizations as is to people. There are two kinds of organizations in today's world: those that are changing and those that are going out of business. The business and government graveyard is filled with the corpses of organizations that failed to respond to inevitable changes.

Similarly, there are also two kinds of people: those who are changing and those who are setting themselves up to be victims of change. As the world continues to march on

around us, if I am only maintaining the status quo -- if I'm not growing -- then I'm falling behind.

The last thing we want to do is set our members up to be victims of change! However, it is a two-way street. We are going to need to "dialogue" our way through this transition and can't afford to have members waiting for the Statistics Division to "fix it" for them.

I then came across an excellent article by H. James Harrington that, at least for me, helped put things in perspective -- "Harnessing Change: Organizational Excellence is based on

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## Editor's Corner

by Evelyn Varner



This is my first issue as editor of the Statistics Newsletter, and I am very honored to have this opportunity following Karin Chu's excellent lead as editor during the past three years.

As ever, we are looking to statistics divisions members to keep us updated with news and events of interest and I would like to strongly encourage readers to write and submit mini-papers. In my opinion this is a great forum for us to communicate what we do at work and share research interests with a wide audience. In short it's a

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## Inside This Issue

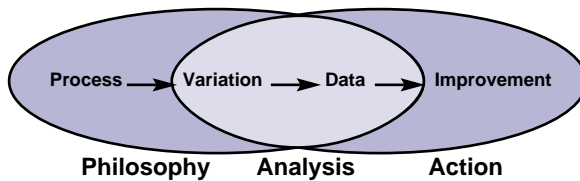
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## MISSION

- Promote Statistical Thinking for quality and productivity improvement.
- Serve ASQ, business, industry, academia, and government as a resource for effective use of Statistical Thinking for quality and productivity improvement.
  - Our primary customers are Statistics Division members.
  - Other key customers are:
    - Management
    - Users and potential users of Statistical Thinking
    - Educators of the above customers
- Provide a focal point within ASQ for application-driven development and effective use of new statistical methods.
- Support the growth and development of ASQ Statistics Division members.

## VISION

**Statistical Thinking Everywhere**  
 Statistical Thinking      Statistical Methods



## DESIRED END STATE

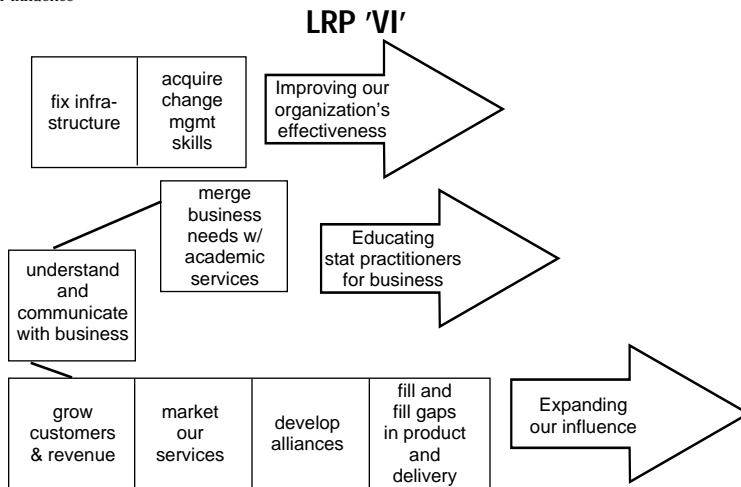
- Our members will be proud to be part of the Statistics Division.
- Our Division's operations will be a model for other organizations.
- We will be a widely influential authority on scientific approaches to quality and productivity improvement.

## PRINCIPLES

- Our customers' needs will be continuously anticipated and met (i.e. Customer focused rather than customer driven).
- Our market focus for products and services is weighted as follows:
  - Greatest weight on intermediate level.
  - Nearly as much weight on basic level.
  - Much less weight on advanced level.
- Focus on a few key things.
- Balance short-term and long-term efforts.
- Value diversity (including geographical and occupational) of our membership.
- Be proactive.
- Recognize that we exist for our customers.
- View statistics from the broad perspective of quality management.
- Apply Statistical Thinking ourselves; that is, practice what we preach.
- Uphold professional ethics.
- Continuously improve.

## STRATEGY

- Improve our organizational effectiveness
- Educate statistical practitioners for business
- Expand our influence



## MEETING GROUND RULES

- Respect and listen to all participants.
- No speeches.
- No "side-bar" discussions.
- Decisions by consensus, if possible.
- We will be open and honest, even if it hurts.
- Support your ideas, don't defend them.
- We will delegate word-smithing to small groups.
- All help facilitate, although we will have a formal leader, facilitator, scribe, and timekeeper (including at breakouts).
- We will rotate scribes.
- We will keep a separate flipchart for To-Do's.
- Mission, Vision, Principles, Strategy, Ground Rules should be visible.

## Disclaimer

The technical content of material published in the ASQ Statistics Division Newsletter may not have been refereed to the same extent as the rigorous refereeing that is undergone for publication in **Technometrics** or **I.Q.T.** The objective of this newsletter is to be a forum for new ideas and to be open to differing points of view. The editor will strive to review all articles and to ask other statistics professionals to provide reviews of all content of this newsletter. We encourage readers with differing points of view to write to the editor and request an opportunity to present their views via a letter to the editor. The views expressed in material published in this newsletter represents the views of the author of the material, and may or may not represent the official views of the Statistics Division of ASQ.

# Criteria for Basic Tools and Mini-Paper Columns

### Basic Tools

Purpose: To inform/teach the "quality practitioner" about useful techniques that can be easily understood, applied and explained to others.

Criteria:

- Application oriented/not theory
- Non-technical in nature
- Techniques that can be understood and applied by non-statisticians.
- Approximately three to five pages or less in length (8 1/2" x 11" typewritten, single spaced.)
- Should be presented in "how to use it" fashion.
- Should include applicable examples.

Possible Topics:

New SPC techniques  
 Graphical techniques  
 Statistical thinking principles  
 "Rehash" established methods

### Mini-Paper

Purpose: To provide insight into application-oriented techniques of significant value to quality professionals.

Criteria:

- Application oriented.
- More technical than Basic Tools, but contains no mathematical derivations.
- Focus is on insight into why a technique is of value.
- Approximately six to eight pages or less in length (8 1/2" x 11" typewritten, single spaced.)  
 Longer articles may be submitted and published in two parts.
- Not overly controversial.
- Should include applicable examples.

### General Information

Authors should have a conceptual understanding of the topic and should be willing to answer questions relating to the article through the newsletter. Authors do not have to be members of the Statistics Division.

Submissions may be made at any time to the Statistics Division Newsletter Editor. All articles will be reviewed. The editor reserves discretionary right in determination of which articles are published.

Acceptance of articles does not imply any agreement that a given article will be published.

# CHAIR'S MESSAGE

Continued from page 1

total quality" — in the December 2003 of *Quality Digest* (I encourage you to investigate this monthly journal that always seems to have a "nugget" or two to think about, particularly the columns of Mr. Harrington and Blanton Godfrey. It also contains a statistics column — of which I am not a fan because of the stereotypes it propagates [You can decide for yourself]. Anyway, check it out and sign up for a free subscription at <http://www.qualitydigest.com>).

Harrington compares what he calls the evolution of three distinct stages of management systems during the last 20 years. Regardless of the stage, he acknowledges the underlying importance of statistics and statistical thinking:

## 1. Total quality control

The importance of product quality was acknowledged...and delegated to a quality department. Many of the common activities evolved into the ISO 9001:2000 series specifications for quality systems.

However, despite the structure, typical areas of noncompliance included *properly applying statistical process control*, performing effective design reviews, qualifying processes before they're released to production, and certifying employees.

## 2. Total quality management

Management then embraced quality and the pursuit of continuous improvement as its responsibility. All employees and managers were given quality educations *to understand statistical thinking* and solve complex problems through a team process: The quality of support and business processes became every bit as important as the quality of production processes. A lot of "traditional" quality personnel had trouble making this link...which was noticed by management. Six Sigma appeared...

## 3. Self-control (Current transition?)

Perhaps as a post Six Sigma phenomenon, mutual trust and confidence is developing between management and employees. Formal, established team structures mean that employees are provided with specific business objectives, develop their own processes and standards, and inspect their own work, which eliminates the

need for "supervision." The quality assurance department has been integrated into manufacturing engineering, product engineering, manufacturing and sales.

*Excellence and value, rather than quality, are the focal points of the company's activities.* "Near perfect quality" is assumed...yet "statistics" still remains the dreaded piece of the puzzle: Talk about opportunity!

## Another quality paradigm bites the dust?

During the total quality management stage, the "85/15" rule was sacrosanct: More than 85 percent of all problems could be solved only by management. The implication as we evolve towards the self-control paradigm is that the increased accountability and knowledge given to employees — and previously reserved for bosses — will allow them, according to Harrington, to solve 75 percent of the problems that occur in today's business climate. Yet another glaring opportunity for effective application of statistical thinking/methods!

## What does this all mean?

Harrington made the point that throughout all of this, a key element has been to *"manage statistically rather than fly by the seat of our pants."* Such was our vision when we decided several years ago that "Statistical thinking everywhere" was where the Division needed to go to serve our members. Some of our longtime members did not agree — and have "voted with their feet" — but we remain committed that our survival, and, more importantly, the current membership's survival, depends on implementing this strategy. We've come a LONG way from sampling plans, factorial experiments, and SPC on the shop floor!

However, many high power Six Sigma consulting firms have in essence said, "Keep formally trained statistical people the heck away from the Green and Black Belt training!" The respect for formally trained statisticians is diminishing [I (a formally trained statistician) literally

cringe at some of the legalized torture that passes for "Six Sigma" training!].

The officer team has come up with the vision that the Statistics Division is "The Division that keeps you employable." I hope that *Quality Progress* articles such as the one I wrote on change ("Handling the Human Side of Change," November 2003) and Ron Snee's recent excellent articles ("Frontiers of Quality: The Six Sigma Sweep" (September 2003) and "Statistics Roundtable: Eight Essential Tools" (December 2003)) show that many quality jobs have evolved to where team facilitation/problem solving skills and change management skills will be necessary for job survival as the cruel fallout settles from this transition. Folks, unless a lot of us change, there are going to be serious casualties!

Serious students of statistics, if not careful to watch dogmatic rigidity, will lose to the cultural juggernaut of the "user friendly computer software and color printer" approach to statistics with the belief that anyone can do statistical training — and application — with "adequate" education!

## What we are trying to do. And what YOU can do

Please stay tuned as the Division, through the dogged efforts of Bob Mitchell (Immediate Past Chair) and Tom Bargerstock (Vice Chair – Products & Services), plans to offer

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# EDITOR'S MESSAGE

Continued from page 1

great way to share with the ASQ stat division readership.

I am really looking forward to my tenure as editor, and encourage your comments and suggestions. As you can see there has been some great activity in the statistics division this past quarter. With your involvement and contribution I know we can all look forward to a great year.

I hope to keep this a vibrant and relevant newsletter.

Looking forward to a great new year.

Eve

# Chair's Message

Continued from page 3

Tele-Classes and Webinars of relevance to our members. We also plan to release monthly "e-Zines" as short one-page articles of interest from the Division leadership; however, that said, we need your input! What topics would be relevant to you? Remember, we are much more than a "statistical pharmacy." The philosophy behind the Tele-Classes and Webinars is "members teaching members". The Statistics Division will provide the systems and structure; the members will provide the content – think of them as "electronic Mini Papers, Basic Tools and Case Studies". We also invite members to share best practices and cutting-edge statistical methods. Mark Kiel (Chair-elect) and Bob Mitchell have led a significant, major redesign of our web site to facilitate video-streaming, product downloads, etc., and ongoing redesign is planned — What do you need?

And, ASQ needs your input as well — How do you feel about its current direction and new "member model?" Is it a matter of "too little, too late?" Is Quality Progress serving your needs? Is the prospect of going to a conference such as ASQ's Annual Quality Conference a nostalgic memory? Tell them!

What about the Statistics Division's co-sponsored Fall Technical Conference? Tell us! Ike Johns (Vice Chair – Out Reach) is pursuing new alliances to increase our member value in non-traditional areas of statistics and quality, such as education, government, service, healthcare, etc.

Jonathon Andell (incoming Membership Chair) will be looking at methods to solicit member input and evaluate importance & satisfaction rankings of our various products and services. Now, more than ever, we need member input! It's a co-commitment — trust our vision and commitment to help keep you employable and you agree to give feedback.

NEITHER of us can afford to become a victim of the current environment of constant change. I am

reminded of a conference I attended over 15 years ago where one of the keynote speakers said, to the effect: "The words 'statistical' and 'quality' should be dropped as adjectives from organizational initiatives because they should be 'givens'!"

Are we almost there? If that were true, how would that affect how we perceive our jobs and how people perceive our jobs? What if we used a lens of "excellence and value" instead? Talk to us!

## CALL FOR VOLUNTEERS

*By Bob Mitchell*

Opportunities exist on the Statistics Division Council for members to help the division leadership team deploy our tactical plans. (See below). Additionally, we are always looking for volunteers to serve limited roles on our various committees. This is a terrific opportunity to learn more about professional society operations, network with peers, and participate in driving the mission and vision of the Statistics Division. Please feel free to send an email or give a call to our activity contacts. (Contact information is available on our division website at <http://www.asqstatdiv.org>).

### **2004 FTC Short Course Chair:**

The Call for Papers has gone out for the 2004 Fall Technical Conference (October 14-15, Roanoke, VA). The Statistics Division is seeking a member whom has an interest organizing one or two short courses to be offered concurrent (pre- and post-) with the FTC. The FTC Short Course Chair will work with the FTC Program Committee to identify potential subjects of interest (basic to intermediate level statistics) and capable instructors.

See the job description on our website for more details

(<http://www.asqstatdiv.org/jobdescriptions.htm>).

### **2005 AQC Division Session Manager:**

The 2005 Annual Quality Congress will be held in Seattle on May 16-18. Divisions are offered up to 6 sessions – one full track – at the 2005 AQC. In years past the Statistics Division has sponsored 1- 2 sessions. We are sponsoring a 1/2 track (3 sessions) at the 2004 AQC in Toronto, Canada. We are looking for a member to serve as our session manager to coordinate 1 – 6 sessions for the 2005 AQC. See the job description on our website for more information (<http://www.asqstatdiv.org/jobdescriptions.htm>).

The Statistics Division has recently filled several strategic positions on the Division Council. The Division Officers extend a hearty welcome to:

Tom Bargerstock:	Vice Chair – Products & Services
Ike Johns:	Vice Chair – Out Reach
Jonathon Andell:	Membership Chair
Laura Augustine:	Division Management Program Chair
Daksha Chokshi:	2004 AQC Division Session Manager
Gordon Clark:	2004 FTC Program Committee Rep

# STATISTICS DIVISION TREASURER REPORT

## 9/30/03 YTD 2003/2004 Financials

Working Revenue (as of 8/30/03)	YTD Actual	Budget	Expenses	YTD Actual	Budget
Dues	\$32,689.40	\$60,000.00	Stat Thinking	0.00	
Retail Sales	141.00	1,500.00	Education		0.00
Interest/Royalties/ Dividends	3,413.24	2,000.00	Web/ECC	2,920.00	10,000.00
AQC Short Course		0.00	Outreach Projects	2,014.87	5,450.00
FTC		.00	RC Outreach		0.00
<b>Total</b>	<b>\$36,243.64</b>	<b>\$63,500.00</b>	<b>Tactical Plans</b>	<b>\$4,934.87</b>	<b>\$15,450.00</b>
<b>Expenses</b>					
New Member Mailings	1,397.30	4,000.00			
Teleconferences	145.16	1,500.00			
			Hunter Award		300.00
Metagraphix			FTC Student Grants		1,500.00
<b>General Fund</b>	<b>\$1,542.46</b>	<b>\$5,500.00</b>	<b>FTC Honorarium</b>		<b>1,250.00</b>
			Recognition		150.00
DAC/travel		500.00	<b>Awards</b>	<b>\$0.00</b>	<b>\$3,200.00</b>
Tactical Plan Mtg	111.50	9,000.00			
AQC Mtg		4,000.00	Misc/postage		100.00
AQC Travel		2,500.00	Misc/travel		0.00
FTC Mtg		0.00	Misc/other		150.00
FTC Travel	111.50	2,500.00	<b>Misc-Total</b>	<b>0.00</b>	<b>250.00</b>
Long Range Plan Mtg		0.00			
Officers Planning Mtg	5,458.87	4,000.00			
<b>Strategic Planning</b>	<b>\$5,570.37</b>	<b>\$13,500.00</b>			
Auditing		0.00			
Bylaws		0.00			
Certification		0.00			
Examining		0.00	<b>Total</b>	<b>\$16,539.73</b>	<b>\$63,500.00</b>
Membership	0.00	3,000.00	<b>Ott Scholarship</b>		
ASQ Div Ballot		0.00	<b>Assets</b>	<b>YTD Actual</b>	<b>Budget</b>
Exhibitor Fees		2,000.00	Scholarship Fund	\$218,708.92	\$200,000.00
Phone Survey		0.00	<b>Expenses</b>		
Promotional Items		1,000.00	Scholarship (2)	\$10,000	\$20,000.00
Misc		0.00			
Newsletter	1,040.00	12,600.00	<b>Ending Balances</b>		
Printing	1,040.00	0.00	Checking	\$59,659.15	
Postage/Misc		500.00	Money Market	\$65,367.38	
Sp Pub Printing		7,500.00	Accounts Receivable	\$2,739.80	
Sp Pub Postage		2,100.00	ASQ	\$2,739.80	
Sp Pub Reprints		2,000.00	Dividends		
Sp Pub Honorarium		500.00			
Nominating		0.00	<b>Current Assets</b>	<b>\$127,766.33</b>	
Programs		0.00	<b>Capital Assets</b>	<b>\$6,413.24</b>	
Publications		3,000.00	<b>depreciated to</b>	<b>\$117.03</b>	
Standards	3,452.03	5,000.00	<b>Long Term Assets</b>	<b>\$272,069.64</b>	
Promotions		2,000.00	from reserve fund	53,360.72	
<b>Committees</b>	<b>\$4,492.03</b>	<b>\$25,600.00</b>	Ott fund	218,708.92	
			<b>Total Assets</b>	<b>\$399,953.00</b>	

# CALL FOR PAPERS

## 48th Annual Fall Technical Conference Quality and Statistics: Leveraging for Success

October 14-15, 2004  
Roanoke, VA

The 48th Fall Technical Conference (FTC) is the premier forum for information on innovative statistical methodologies and quality tools to achieve and/or improve quality products and processes. If you're interested in presenting an applied or expository paper in any of three parallel sessions (Statistics, Quality Control or Tutorial/Case Studies) contact Gordon Clark, who is the Statistics Division representative on the program committee. You can contact him at [clark.17@osu.edu](mailto:clark.17@osu.edu) or 614-847-1394. Work should be strongly justified by application to a problem in engineering, manufacturing, physical sciences or services, and it should be relevant to the theme stated above. The mathematical level of the papers may range from basic to that of the Journal of

Quality Technology or Technometrics. Papers submitted to this conference typically include novel developments in the area of quality but may focus on the application of older approaches in an innovative way.

Submissions must follow the established abstract format. Gordon will send you the format by email. The program committee will select papers based on subject matter, technical correctness, usefulness, interest, clarity, and readability. The committee welcomes any suggestions for special session topics or speakers. If you have ideas, please contact Gordon. The submission deadline is **February 13, 2004**. Please refer to <http://www.cpid.net> for any updates to the Call for Papers.

## In2:InThinking Network Third Annual Forum - April 1-4, 2004 Pre-Conference Workshops – Boeing – Canoga Park (April 1-2) Woodland Hills Hilton (April 3-4) Los Angeles, CA

This year's conference theme is "Making a Difference From Where We Are - Better Thinking for a Better Future". The 4-day event includes 2 days of pre-conference workshops followed by a weekend conference. Again this year, the network's goal for the forum is to provide help to those who are working to improve their own situation (and that of their organizations) with better methods of thinking. All for the price of \$250, which includes all meals and conference handouts.

The In2:InThinking Network was formed in 2001 by a group of students of the work of W. Edwards Deming and related theorists. The aim of the network is to make 'thinking about thinking' more conscious. This focus, which network participants call "inthinking," enhances perception of relationships and interdependencies in

human endeavors, making these connections more valuable, satisfying and joyful.

In keeping with the aim of the In2:InThinking Network, the 2004 Forum will gather "leading edge" thinkers to share their efforts to "Make a Difference". Conference presenters include, Dr. Barbara Lawton, Rob Gray, Denise Howard OBE, Dan Robertson, Ivan Webb, Dr. Bill Bellows, Dr. Ed Chaplin, Ron Schultz, Dr. Sheila Sheinberg, Dr. Myron Tribus, Steve Pevette, Barry Frew, and Dr. Oscar Mink. In addition, pre-conference workshops will be led by Jon Bergstrom, Bob Poulton, Beth Thompson, Marcia Daszko, Phil Monroe, Joe Onstott, Dr. Elaine Johnson, Dr. Tom Johnson, and Dr. Bill Bellows. Additional forum details are available on-line at <http://www.in2in.org>.

# William Q. Meeker Receives ASQ Statistics Division's Hunter Award



The 2003 William G. Hunter Award was presented to William Q. Meeker at the 47th Annual Fall Technical Conference in El Paso, Texas this past October. The Statistics Division of the American Society for Quality established the Hunter Award in 1987 in memory of the Division's founding chair to promote, encourage and acknowledge outstanding accomplishments during a career in the broad field of applied statistics. The attributes that characterize Bill Hunter's career—consultant,

educator for practitioners, communicator, and integrator of statistical thinking into other disciplines—clearly applies as well to Bill.

Here are some excerpts from the award presentation:

Bill Meeker's career, as Bill Hunter's, has been largely devoted to the application of statistical thinking and methods in the engineering disciplines. Francis Pasqual, a former student of Bill Meeker's now at Washington State University, said in his letter of support, "... the most important lesson I learned from Dr. Meeker is that statisticians are put on this earth to serve practitioners...He instilled in me the philosophy that Statistics must be grounded on problems that scientists encounter." And, of Meeker and Pasqual's groundbreaking work in estimating fatigue curves with the random fatigue-limit model, a senior engineer from Pratt & Whitney had this to say. "High-Cycle Fatigue...is a multibillion dollar problem for the U.S. Military...The flight-propulsion industry...embraced the random fatigue-limit model as being fundamental to our understanding of high-cycle fatigue behavior. Meeker and Pasqual could see in their limited data what had eluded others for decades, and then posited, and developed, an analytical method for dealing with it." What a wonderful indication of Bill's contribution to this field!

Bill Meeker's honors are numerous—I will only mention a few of them. He is a three-time winner of both the Frank Wilcoxon prize (best application paper) and W. J. Youden Prize (best expository paper). Perhaps more significantly, his well-respected reliability text with Luis Escobar, won the 1998 award "for Excellence and Innovation in Engineering" from the Professional/Scholarly Publication Division of the Association of American Publishers.

Like Bill Hunter, Bill Meeker may be characterized as sincere, enthusiastic, and ethical. It is my honor to welcome William Q. Meeker as this year's recipient of the William G. Hunter Award.

Bill made the following remarks when he accepted the award:

I am grateful to have been chosen to receive this year's

W.G. Hunter Award. I want to thank the Hunter Award committee for their work that keeps alive the memory of Bill Hunter and for considering me for this award. I also want to thank the Statistics Division for their support of this award.

Bill and I crossed paths on several occasions, but I cannot claim to have known him well. I probably first met Bill in 1979, after I joined the *Technometrics* Editorial Board. I had read a number of Bill's papers and of course had studied carefully the well known and still immensely popular Box, Hunter, and Hunter textbook. After 25 years in print, we can see, in the rankings on Amazon.com, that BH2 is still one of the best sellers among all statistics books. I had also seen Bill make a number of presentations at various conferences. I remember one particularly spellbinding talk in which Bill described the quality improvement work that he did for the city of Madison in the early 1980's. Until that talk, my impression of quality was the application of a collection of statistical tools like control charts and acceptance sampling (which I had studied from Grant and Leavenworth while in school) to manufacturing problems. As in a number of other areas, Bill was a pioneer and an innovator in the important area of applying statistical methods to non-manufacturing quality problems.

A little-known fact is that Bill Hunter holds the record for the most years of service as a *Technometrics* Associate Editor. Being a member of the *Technometrics* Editorial Board requires a large amount hard work. Most individuals burn out early and end up serving only three to six years. A few long-survivors—Karen Kafadar, Roger Hoerl, and Luis Escobar immediately come to mind—served approximately 15 years before retiring. Bill served on the *Technometrics* Editorial Board for an amazingly long 21 years! His name appears on the *Technometrics* masthead from February 1963 to November 1983.

Bill Hunter passed away at the end of 1986. Rob Easterling, then Chair of the Technometrics Management committee, called to tell me the bad news. At that time, I was editor of *Technometrics*. Rob suggested to me that, because of Bill's long and outstanding service to *Technometrics* (as an author, referee, Associate Editor, and Management Committee member), he thought that it might be appropriate to publish an obituary for Bill in *Technometrics* (this had not been done before). I readily agreed and George Box was kind enough to write it for us. It appeared at the front of the August 1987 issue of *Technometrics*.

***As most of us know, Bill Hunter had a passion for helping others, inside and outside of our discipline, to benefit from the use of statistical methods. He did this by imparting a sense of excitement about the systematic use of statistical thinking, including experimentation, data analysis, and clear methods of presentation to help solve important problems in a wide variety of application areas. It is nice to see that this memory is being kept alive. Thank you.***

# THE EMBEDDED STATISTICIAN

## 2003 Youden Address:

### 47th Annual Fall Technical Conference

Sponsored by ASQ CPID and Statistics Divisions,  
ASA SPES and Q&P Sections

Gerald J. Hahn

Manager, GE CRD Statistics (Retired) and  
Rensselaer Polytechnic Institute (Adjunct Faculty)

[gerryhahn@yahoo.com](mailto:gerryhahn@yahoo.com)

#### RETRACING THE PAST

I felt most honored, and somewhat surprised, when I was invited to give this year's Youden Address. I had the privilege of being the Youden Speaker in 1987. When I mentioned this to the conference organizers, they said that, perhaps, I will get it right this time. Also, it was felt that what I would say today might be very different from what I had to say then. I'll give it a try—but I am not making any promises.

The invitation prompted me to search my records for my 1987 talk. Fortunately, and to the consternation of my wife, I hardly ever throw anything away. This was the second time that this practice has paid off. The other time was when a former research chemist for whom I had done a project in 1956, and who had since risen in the company ranks, re-emerged in my life as our Vice-President. I was able to retrieve and send him a copy of the report that I had written for him many years earlier—although I am not sure that this necessarily evoked happy memories.

I had the distinct pleasure of having dinner with Jack Youden shortly after I joined GE in 1955. I believe he was in town to talk to the local chapter of ASA. As a young statistician, I was wide-eyed and awed by this great man—and especially impressed by his gentle and unassuming manner. Around that time, Youden wrote a series of articles in *Industrial and Engineering Chemistry* to explain statistics to his fellow chemists and chemical engineers. These demonstrated his outstanding skills in making this then obscure subject intelligible. I began my 1987 presentation by recalling some of Jack Youden's wisdom, shown in Figure 1, from these articles, and pointing out how relevant his comments still were, which, indeed, they are even today.

#### THE WISDOM OF JACK YOUSEN (1900-1971)

- The responsibility for adopting statistical techniques will often rest on individuals who know relatively little about these techniques.
- There is one sure way for a company to acquire a well-trained statistician. Select a ...(promising) engineer or scientist...and send...to a statistical school for a year.
- Most statistical procedures are quite simple and intuitively acceptable once they have been pointed out in context.
- A good statistical design is like a blueprint for a construction job.
- Statistical techniques are most productive when incorporated into projects at the planning stage.
- Much of the impact of a statistical quality control chart depends upon its presentation.
- Industrial application of statistical design requires more active support from management.

Source: *Statistical Design—Articles in Industrial and Engineering Chemistry* by W.J. Youden. 1954-1959.

Figure 1

I then turned to a discussion of the then changing environment—both technical and non-technical—and a description of the associated challenges, see Figures 2A to 2E. These have been characterized recently by Davis Balestracci as moving from a philosophy of “if we build it, the customer will buy it” to one of “integrated customer feedback into product design and process control.”

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# THE EMBEDDED STATISTICIAN

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## THE CHANGING ENVIRONMENT: NON-TECHNICAL (from 1987 Youden Address)

	CONVENTIONAL QUALITY CONTROL	THE NEW VISION
MAJOR EMPHASIS	Inspection to cull out defects	“Up front” quality assurance to prevent bad product
WHOSE RESPONSIBILITY?	QC engineer and statistician	Everybody – Led by top management
WHEN?	Mainly on finished product	Continuously, throughout the process, including design and vendor
TECHNOLOGY	Relatively simple	Often highly complex
THE ARENA	Manufactured goods	All goods and services

**BASIC GOAL OF THE NEW VISION:**  
Understand and be responsive to  
Customer needs — while steadily improving  
products and productivity

Figure 2A

## SOME NON-TECHNICAL CHALLENGES (1987)

- Hear/read the “gurus:” Crosby, Deming, Feigenbaum, Golomski, Juran, Shainin, Taguchi et al (and past Youden speakers)
- Optimize our limited resources
  - Work on important problems (not necessarily technically most challenging)
  - Work with right partners (receptive, activists, complement our understanding)
- Play active role
  - Understand real problem
  - Short-range fix is only starting point
  - Focus on what need be done for quality improvement (even if not statistical)
- Use SPC training as starting-point — not end goal
- Understand limitations of statistics
  - Fallacy of hypothesis tests
  - Differentiation between analytic and enumerative studies (statistical inference may provide optimistic bounds)
- Radically change the introductory statistics course, e.g.,
  - Show the excitement of statistics
  - Emphasize the planning of investigations
  - Emphasize graphical methods
  - Emphasize concepts
  - De-emphasize formal methodology and mathematics

Figure 2B

## SOME NON-TECHNICAL CHALLENGES (1987) (cont’d)

- Make it easier for others to use statistical concepts effectively
  - “Statistics too important to be left to statisticians”
  - Learn from Japanese
  - Example: Computer-aided experimental design
- Continually improve communications skills
  - Listen to customers/understand their needs
  - Banish statistical jargon
  - Don’t expect value of our good ideas to be self-evident

P.S. 77% of respondents in survey of members of (then recently formed) ASA Q&P Committee felt major challenges were mostly non-technical or more non-technical than technical (based on 107 responses of 220 members surveyed)

**CONCLUSION: GOOD  
UNDERSTANDING OF STATISTICS IS A  
NECESSARY, BUT NOT SUFFICIENT,  
CONDITION**

Figure 2C

## THE CHANGING ENVIRONMENT: TECHNICAL (1987)

	CONVENTIONAL QC	THE NEW REALITIES
THE GOAL	“Squeeze” maximum information from sparse data (data-poor)	Extract information from voluminous/continuously changing/frequently automated data base (data-rich)
A RESULT	Concern with statistical efficiency	Concern with comprehensiveness and robustness
THE MECHANICS	Manual: Requires simplicity in calculation	Computerized: Requires simplicity in interpretation (often by lean staff)

**THE CHALLENGE: OBTAIN AND  
COMMUNICATE THE KEY  
INFORMATION TO DRIVE QUALITY  
IMPROVEMENT**

Figure 2D

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# THE EMBEDDED STATISTICIAN

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## KEY TECHNICAL CHALLENGES (1987)

- **Build on Taguchi Fervor**
  - Capitalize on renewed interest in planned investigations
  - Advocate/apply useful concepts, e.g., robust product design
  - Improve where appropriate, e.g., signal-to-noise ratio
- **Address realities of statistical process control, e.g.,**
  - Few processes in control—but some come closer than others
  - Differentiate among uses of control charts, e.g., to trigger corrective action, provide management summary information, provide data to ship to customer
  - “Out of control” performance often ignored if process is meeting specs
  - Further practical complications, e.g., auto-correlation, legitimate batch variability
- **Guide search for root causes of variability: An exciting “statistical detective story with many likely culprits”**
- **Respond to needs of data-rich computerized environment (and remember continuing need for simplicity, timeliness, and process understanding)**
- **Make acceptance sampling responsive to current needs**
- **Guide product life assurance (most engineers/many statisticians lack needed training)**

**THE AIM: Provide/help implement tools that are responsive to our customers’ needs; narrow gap between theory and practice**

Figure 2E

I also noted the results of a survey, conducted in 1987, of members of the recently created ASA Committee on Quality and Productivity, then led by Tom Boardman and myself. 77% of the respondents felt that the major challenges were either mostly technical or more non-technical than technical. This number goes up to 84% when we considered only those respondents who claimed that at least 60% of their work was in quality and productivity applications. So, as our mathematician friends might say, a good understanding of statistics (and, for that matter, mathematics) is a necessary, but far from sufficient condition, for success.

Youden’s comments from the fifties of the last century and many of my remarks from a mere 16 years ago, are still as pertinent, and, perhaps, even more so today, as they were then. I was tempted, in fact, just to play back the tape from my 1987 Youden Address and see whether the repetition is noted—in the unlikely circumstance that anybody who heard me last time would want to come back to hear me again. I could do equally well, or better, by repeating some of the comments of other past Youden speakers. We convey similar messages year after year—a real tribute to our goal of reducing variability. In fact, the Youden Addresses, available for the last 17 years on the Web page of the ASQ Statistics Division Newsletter,

provide wonderful reading for eager students who want to know what the real world is all about.

There is only one of my 1987 comments that I would change today. That is the remark about the prominent role of quality “gurus,” such as Crosby, Deming, Feigenbaum, Golomski, Juran, Shainin and Taguchi. Sadly, only Feigenbaum, Juran (now almost 99 years old), and Taguchi are with us today. The others do not seem to have been replaced by individuals with comparable stature. We can only speculate to what degree the emergence of the Internet has made the identification of such authority figures less vital.

And let me hasten to add that the teachings of these gurus had a profound effect on our professions and continue to warrant our attention. We are still discussing Dr. Taguchi’s ideas avidly today—as evidenced by this conference. In addition, many of the key concepts on which Six Sigma is based, can be tracked back to Deming and the others. The DMAIC (Define, Measure, Analyze, Improve, Control) process has a striking similarity to the PDSA (Plan, Do, Study, Act) paradigm proposed by Shewhart and Deming.

This is so despite the fact that there are many things about Six Sigma that Deming would be very unhappy about (Hahn 2002b), including the Six Sigma metric itself. Quoting Lloyd Nelson, he told us “the most important figures are unknown and unknowable.” He asserted that if we set up competitive measurements, we will have people work towards meeting the measurements in whatever way possible—instead of improving the underlying system. And, undoubtedly, Deming would have some choice words about the current practice of using student test scores to rate schools.

We have also made some important progress since 1987. A glowing example is the work in statistical literacy and the efforts to bring statistics into K1 to K12 education, as evidenced by the rapidly growing popularity of the high school advanced placement course in statistics. Also, some neat motivating introductory texts have appeared in recent years, and are being used in elementary courses. And, certainly, there has been a vastly increased recognition of the value of statistics in companies like GE. More on that shortly.

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# THE EMBEDDED STATISTICIAN

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## THE NEW DYNAMICS

I will resist the temptation to quit at this point—despite your obvious dismay at this decision—and, instead, use my previous comments as a preamble. Despite the continued relevance of Youden's observations and those of past Youden speakers, much in our environment *has* changed and continues to change—and this has had a profound impact on us. So let me turn to the new dynamics that are driving us today that were not evident, at least to me, back in 1987—and the challenges and opportunities these present.

### Globalization

Globalization has effected us in various ways.

Manufacturing is now on a worldwide scale. The production by GE of lighting devices, a relatively simple product, illustrates “in series” integration. GE combines parts production and assembly in Hungary, England and Ohio to put together a final product. In an “in parallel” mode, GE Plastics manufacturing in the U.S. is replicated by similar products in Holland and Japan. As a result, the traditional plant statistician becomes a worldwide ambassador who helps synchronize and integrate best practices in data acquisition and analysis globally.

One reason for this global expansion has been the availability of cheap labor off-shore. And this is not limited to manufacturing. It applies increasingly, especially in India, to people with technical skills, including statistics. Shortly before I retired from GE in 2001, we established a sibling statistical operation in Bangalore, India. We hired an Indian resident, with a Ph.D. in statistics from Michigan State. He has since assembled his own organization of 12 people, including six statisticians—and the group is still growing. Not only do these people attend to the needs of GE's Asian operations, but they also provide statistical number-crunching support to our U.S. operations at a radically reduced cost—relieving the people back here of some responsibilities.

Finally, globalization provides us a whole new set of potential offshore customers, with different cultures—and the challenge of learning these.

Some of us may be more pleased with globalization than others. But, irrespective of our personal views, we need recognize that globalization is here to stay and understand its impact.

### Instantaneous Communication

Another major change has been the speed with which we communicate.

Email has provided us a much used, and occasionally abused, mechanism for communication. It has allowed me to re-establish contact with cousins in New Zealand with whom I lost touch about 40 years ago. Email was not much more than an interesting curiosity to many in our profession in 1987. Today, it follows us wherever we go, as I discovered recently on a trip to the wilds of the Yukon.

Detailed written project reports are mostly out in industry—and snappy Powerpoint presentations are in. Not only do we use these for oral presentations, but they also serve as our written documentation. And we continue to advance. Most recently, we have introduced computer chats as another way of avoiding personal conversation.

Another important development—and one that ties in closely with globalization—has been the emergence of Web-based telephone conferences that allow us to communicate simultaneously with our working partners around the world, having, right in front of us, the technical materials being presented.

All of this requires our students to learn whole new ways of communicating that differ from the traditional—and places an even greater premium on sizing up our audience, and clearly and speedily conveying our message.

### Information Gathering and Analysis Tools

And, of course, there has been the continued dramatic explosion in our ability, and that of our customers, to gather information. This has been triggered by advances in instrumentation and computations, and has led to our being able to obtain and utilize vast amounts of data. This, in turn, has led to some great new opportunities and some big challenges, especially in helping ensure good data acquisition. More on that shortly.

The ready access to user-friendly software has provided our customers greater ability to perform their own analyses—further relieving us of routine number-crunching activities. In GE, for example, professional employees, learn Minitab as part of their standard Six Sigma training.

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Coupled with this is the rise of the Internet as a source of information. This provides our colleagues an easily accessible source of information, and possibly misinformation, 24 hours a day, 7 days a week. As a result, our phones ring less frequently with simple questions.

## The “democratization” of statistics

All of this, together with the impact of Six Sigma, has led to what some have characterized as the “democratization” of statistics. At companies like GE, our working partners are more knowledgeable, and more appreciative of statistics as an integral tool in their work. They are in a position to do many of their own analyses and have become sensitive to, if not knowledgeable in, such subjects as the design of experiments and the impact of measurement errors. In addition, with advances in technology, engineers and computer scientists have developed some of their own statistical-type tools, such as neural nets.

A further consequence of the new environment is the continued speeding up of everything we do. Statisticians, in the past, might have retreated to their offices with the data, emerging, say, a week, or even a month, later with the results. Today, we need on-the-spot analyses and the ability to act thereon rapidly.

## SIX SIGMA IN PERSPECTIVE

A discussion of the new dynamics is not complete without consideration of Six Sigma. It is both an outgrowth of our environment, and a key contributor to the consequences, such as the democratization of statistics.

Six Sigma was an active force in Motorola in 1987, winning the Baldrige Award the next year. Most of us, however, were not aware of it until the mid-90’s when it was hailed and passionately embraced by top management at Allied Signal, GE and other companies. And although not all companies have adopted Six Sigma per se, many have adapted its key concepts to their needs. Most of you are fully aware of Six Sigma by now. So I will limit my remarks to putting Six Sigma into perspective, tracking its progress, and commenting on its impact.

### What Six Sigma is not

First, Six Sigma is not a branch of applied statistics. It employs statistical methods extensively—but statistics is

considered, as it should be, to be a tool, rather than a driving force or an end in itself. Also, the Six Sigma toolbox includes many other useful tools, such as quality function deployment, that are not principally statistical.

Secondly, and this is somewhat controversial, Six Sigma today is not principally about achieving 3.4 defects per million opportunities. Yes, that is how it was originally defined, together with the infamous 1.5 sigma shift in the mean from short-term to long-term operations. But this narrow definition tends to get us into the kind of numbers game against which Deming warned us. How, in practice, does one define an “opportunity,” and what is a “defect?” All products are not created equal. The failure of an aircraft engine has more severe consequences than that of a toaster. Also, an aircraft engine has a lot more components and defect opportunities than a toaster. Thus, 3.4 defects per opportunity might be overkill for toasters, but quite appropriate for jet engines. Thus, we need to calibrate our goals to the practical situation at hand.

The concept of 3.4 defects per million opportunities was always more of a rallying slogan than a practical objective. And as Six Sigma practitioners have become more sophisticated, they have come to realize this.

### So what is Six Sigma?

OK, if Six Sigma is not a branch of statistics and not the pursuit of 3.4 defects per million opportunities what is it?

First, it is the sincere recognition of the significance of customer-oriented quality improvement by top management, and the passion to do something about it throughout the organization.

Secondly, Six Sigma emphasized the need for a disciplined approach to achieving quality improvement. This is encapsulated in the original Define, Measure, Analyze, Improve, Control (DMAIC) and the Define, Measure, Analyze, Design, Verify (DMADV) paradigms for manufacturing and design, respectively.

Finally, Six Sigma is a highly data-oriented approach based on the slogan, attributed to Brian Joiner, “In God we trust—All else bring data.” Thus, it makes extensive use of statistical and management/quality tools, such as the design of experiments, and measurement error assessment.

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## What Six Sigma Emphasizes

In its application, Six Sigma emphasizes

- The need for meaningful metrics that allow us to quantify progress, preferably in \$'s or other currencies. Statisticians participate in helping establish useful and consistently quantifiable goals. This is a particular challenge in dealing with product design. How can we quantify the savings associated with averting a severe problem that might not assert itself for many months, or even years, hence?
- The importance of a common language for communication. This is especially relevant for a conglomerate like GE in which Six Sigma is applied in such diverse businesses as the manufacture of aircraft engines and plastics materials, the granting of consumer credit and the running of a television network.
- The importance of training at all levels of the organization. Statisticians can play an important part both as trainers and in helping make the Six Sigma curriculum maximally useful.
- A team approach to addressing problems—with, hopefully, a statistician, or statistically knowledgeable person, as an important participant from the start.

## The Evolution of Six Sigma

As we approach a decade of Six Sigma in the limelight, how has it changed and what have been some of the key lessons learned (see also Hahn 2002a)?

- **Recognition of the applicability of Six Sigma throughout the business and beyond.** Six Sigma was applied, at first, principally to reducing scrap and rework in manufacturing. This made sense because manufacturing is the area in which “big hits” could, most likely, be achieved most rapidly and quantified most easily—an important factor in building credibility. It soon became clear, however, that there is just so much that one can do to improve a product in manufacturing, and that product quality and performance is often a hostage to product design. This naturally led to Design for Six Sigma (DFSS). The emphasis in DFSS is on (1) quantifying customer needs and translating these into measurable product requirements and then (2) designing a product that consistently meets or beats these requirements. Businesses came to realize that Six Sigma has much to offer beyond the development and building of products per se. This in GE led to its application to improving businesses processes and transactions, helping customers

directly, and tying Six Sigma to digitization initiatives. A major challenge today is to adapt Six Sigma to the needs of smaller businesses who do not have the same resources as a GE—and continuing to take Six Sigma to sectors beyond business, such as hospitals, banks, government and schools.

- **Greater Systems and Multivariate Orientation.** At the beginning, most Six Sigma projects came with a specified CTQ. Usually, there was a single criterion for improvement, such as the loss due to a part being outside specifications. Black belts addressed their assigned CTQ to achieve improvement. This often also led to improvement of other CTQ's. This, however, was not always the case. Scrap, for example, can be reduced by widening specs on parts—but this, in turn, can have a detrimental impact on reliability. There is now a greater recognition of the importance of considering the impact of a change on the entire system, rather than focusing on a single CTQ. We can help encourage this trend and provide appropriate tools for addressing multivariate problems.
- **Statistical Tools.** On the technical side, there is an increasing recognition of the need for tools beyond those originally proposed by Mikel Harry et al. These include life data analysis and simulation, and greater emphasis on incisive graphical methods over formal statistics. There is also an improved understanding of the need to target methods to particular business sectors. Typical examples are the use of mixture designs for chemical processes and of tools for taming large data sets, such as CART and MARS, for financial applications.

## Six Sigma Today

Six Sigma is alive and well—but moving to the backburner, at least in places like GE. It has received much favorable publicity, and there have been numerous quantified successes. With the increased scrutiny now being given to all accounting measurements, these savings will be looked at even more closely. In some companies, Six Sigma may, indeed, have become “the way we work.” It is, therefore, no longer headline news, and we can expect to see less fanfare over the years. And, with training being more in the distant past, there might be some loss of confidence by practitioners in their own skills. This may lead to a revival of a consulting role for statisticians. This revival will be modest, however, since other forces, such as continued improvement in computer-based knowledge resources, act against it.

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## CONCERN: STATISTICS AND QUALITY HAVE NOT BEEN RECENT GROWTH AREAS

### Professional membership statistics

So far, my comments have been pretty upbeat. However, there is a fly in the ointment. Figure 3 gives membership statistics for the sponsoring organizations of this conference for 1987, for the high point in membership since then, and for today. These numbers show

- A precipitous rise in membership from 1987 to a peak in the mid-90's, especially for ASQ and its divisions.
- A distinct downturn in membership since the mid-90's.
- ASQ's total membership is still double that of 1987 and ASA is 10% above 1987. This, however, is not the case for the two ASQ Divisions that sponsor this conference. Reliable data were not available prior to 1998 for the sponsoring ASA Sections, but there has been an appreciable drop since then.

### CONCERN: STATISTICS AND QUALITY NOT PROFESSIONAL GROWTH AREA IN RECENT YEARS

Some membership numbers:

	1987	High	Most recent	% change from 1987	High
ASQ Total	54,780	134,868 ('95/6)	107,121	+96%	-21%
ASQ CPID	2,948	6,133 ('92)	2,373	-19%	-61%
ASQ STAT.	8,750	16,843 ('91/92)	6,802	-22%	-60%
ASA Total	15,108	18,251 ('94)	16,402	+ 9%	-10%
ASA Q&P	n/a	431 ('99*)	300	n/a	-30%
ASA SPES	n/a	424 ('99*)	322	n/a	-24%
versus					*since '98
ASME Total	95,856	100,116 ('95)	91,861	-4%	- 8%

Some possible reasons:

- Economic downturn (drops abated during past year)
- Reaction to the high of early-90's (and age of gurus)
- "Democratization" means professionals not needed—contradicted by software analogy

**GOLDEN AGE FOR STATISTICS – BUT NOT FOR STATISTICIANS**

Figure 3

The membership of other professional organizations has also gone down. I show the figures for the American Society for Mechanical Engineers. Their gain from 1987 was not as impressive as ours, but their recent drop has been much smaller; their total membership, however, is now slightly below that of 1987. Overall, their numbers have been much more stable than ours. It seems that the societies that are committed to reducing variability have not succeeded in removing variability from their membership statistics!

### Some explanations

I recognize that society membership is not necessarily a direct measure of vitality, but I would expect some correlation.

Undoubtedly, one reason for the drops in recent years is the economic downturn—in fact, the declines have abated somewhat recently. The previously mentioned utilization of off-shore resources may also be a contributing factor. The decline may also be a reaction to the sharp increases of the mid-90's and the lessening influence of quality gurus promoting our professions.

Arguably, we may also be experiencing a weakening in the commitment to quality. The investigation of the recent space shuttle disaster certainly made us realize that expediency still can beat out good judgment, despite everything we have learned from the past.

The democratization of statistics may provide another explanation. The increased acceptance of the concept that quality is everybody's business might suggest less of a need for quality professionals. I have some trouble with such reasoning. We have seen similar trends in making computer programming easy for all—and yet the computer science profession has thrived.

In any case, and whatever the explanation, even though this may be the Golden Age of Statistics, it is not necessarily a golden age for statisticians—as one of my 17 managers at GE pointed out to me when I asked him for a raise.

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## So what can we do about it?

Irrespective of the explanation, how can we reverse the perceived downturn?

The following comments from some previous Youden speakers, though not addressing this question directly, have some bearing:

- Lynne Hare (1993): “There are no easy answers. There is only hard work.”
- Ray Myers (2001): “Pay close attention to who our audience is and what their needs are...Show passion when communicating.”
- Gipsie Ranney (1997): “The right to be consulted is earned and re-earned by demonstrating the capacity to be helpful.”
- Doug Montgomery (1998): Form a “Society for Industrial and Applied Statistics.”
- Geoff Vining (2000): “Have industrial statisticians serve as vice-presidents.”
- Roger Hoerl (1994, quoting an old Chinese proverb): “If we do not change direction we are likely to end up where we are headed.”

I will add my own somewhat superficial list:

- Recruit the right people,
- Teach them the right stuff,
- Embed them in the right places,
- Have them employ best practices for success

I will try to provide some elaboration, especially on the last two points, in my remaining comments.

## THE EMBEDDED STATISTICIAN

Today’s environment calls for what I would like to refer to as the embedded statisticians.

The embedded statistician is an integral member of the business team. This contrasts with the traditional, and more remote, role of statisticians as statistical consultants—always ready to sprinkle pearls of wisdom, but reluctant to roll up their sleeves and get fully involved. It calls for a highly proactive role. I talked about this in my 2001 ASA Deming Lecture, and in a subsequent paper (Hahn 2002b). Successful embedded statisticians

- Participate in those problems that have maximum impact on their business and to which they can make the greatest contribution.
- Stress basic concepts and look at problems from a systems perspective.
- Think proactively and seek opportunities for improvement and problem avoidance.

- Strive to become involved in projects up front, and especially at the data acquisition process.
- Are conveyors and ambassadors of best practices, leveraging across-the-board involvement by helping bring good ideas from one operation to the next.
- Leave much of the actual number-crunching to knowledgeable colleagues, but provide guidance to them.
- Continue the move from supporting principally manufacturing endeavors to contributing in all important areas, and especially in design and process improvement.

From a more technical perspective, the embedded statistician

- Works towards making statistical methods easy to use and robust to misuse by practitioners, emphasizing especially graphical and simulation methods.
- Focuses training on important concepts that are not well understood, for example, the prevalence of analytic studies (as ingrained upon us by Deming), the sequential design of experiments as part of the scientific process (advocated by Box and others), and the integration of automatic process control and statistical process control (discussed by John MacGregor in his 1995 Youden Address).
- Leverages the new environment by building on web-based learning tools such as the NIST/Sematech Handbook.
- Participates with colleagues in computer science, electrical engineering, etc. to contribute, from the start, in statistical-type initiatives, such as neural nets and fuzzy logic.

Finally, the embedded statistician, instead of thinking of a problem in principally statistical terms (e.g., design of experiments, regression analysis, analysis of variance), takes a process-oriented approach. I will illustrate this concept with a specific example.

## PROCESS FOR DATA ACQUISITION

Helping ensure the acquisition of good data is one of the most important things we do. Yet, data acquisition continues to take a back seat in our teaching and in the thinking of most practitioners. Courses, directed at statisticians and non-statisticians alike, focus on data analysis tools—making perfunctory, and frequently unrealistic, statements about the underlying assumptions, e.g., assume a random sample from some (often vaguely defined) population.

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# THE EMBEDDED STATISTICIAN

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In the words of Kati Illouz, one of my former colleagues at GE, “Data owners tend to be overly optimistic about the quality of their data.” We spend an inordinate amount of time in trying to understand and clean bad data. Yet, as we all know, our analyses can only be as good as the data upon which they are based.

To help address this concern, Necip Doganaksoy and I have suggested a five-step process for the data acquisition process:

- D: Define the problem
- E: Evaluate the available data
- U: Understand the data acquisition opportunities and limitations
- P: Plan data acquisition and implement
- M: Monitor, clean data, analyze and validate

The process is spelled out in detail and applied to an example (shown in the slides of the presentation) dealing with validating the 10-year reliability of a newly designed washing machine.

## IN CONCLUSION

### **What the Embedded Statistician brings to the Ball Game: 2003**

So what does this all add up to?

As in 1987, the added value that statisticians provide is their expertise in defining problems quantitatively and precisely, getting the needed data proactively, analyzing the results appropriately, and communicating them in an understandable manner.

In so doing, we strive to take a systems-oriented approach, based upon an understanding of the big picture. We are specialists in and have an appreciation of, variability, and are catalysts and advocates for change.

Many eminent statisticians have conveyed these ideas. Tom Boardman has characterized us as quantitative facilitators and Don Marquardt described statisticians as purveyors of the scientific method. I have found Bill Hunter’s story about how he brings together leaders of a project and asks them what they see as the project goals as an especially poignant example of helping thrash out a problem definition.

Some areas of application that seem especially fruitful (see Hahn 2002b) include

- Up-front reliability improvement, or what Bill Meeker in his 2002 Youden Address called the “other dimension of quality,”
- “Just-in-time” maintenance, focusing, in particular, on remote monitoring and diagnostics,
- Businesses processes and commercial transactions—often characterized by vast databases.

### **Conjecture: What We Will be talking about in 10 to 20 Years**

I’d like to get a head start in the improbable event that I will be asked back in 16 years hence to give another Youden Address. So with the help of Davis Balestracci, Necip Doganaksoy, Roger Hoerl, Tim Keyes, Ramon Leon, Bob Mitchell, Wayne Nelson, Dean Neubauer and Bill Tucker, I’d like to speculate on some of the things we will be talking about then. First for some application areas:

- Leveraging embedded databases will become increasingly important. I have already mentioned remote monitoring and diagnostics as one example. I was fascinated by an article in a recent New York Times about miniature radio frequency devices (RFIDs) that can be implanted into products and transmit a digital response when contacted by radio signals from scanning devices. We are already using such technology for automated toll collection systems and for tracking everything from automobiles to cattle. I can see its use in providing much improved information, for example, on product use, subject to privacy considerations.
- Nanotechnology (a word not recognized yet by my computer spell-checker) is an emerging area with applications from semiconductors to immune response modifiers in pharmaceuticals.
- Massive experimentation will become increasingly more important as our capability for running large-scale experiments increases. Current applications are in high throughput screening for drug discovery and combinatorial chemistry for identifying promising materials.
- Medical imaging, financial transactions and security enhancement—areas that we are already talking about today.

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Statisticians will also continue to work on methods for acquiring and taming massive data sets, real-time computing, and “smarter” tools (embedded analytic agents) for practitioners.

## Elevator Speech

The past, as they say, is prologue. Nevertheless, Jack Youden’s wisdom and much that previous Youden speakers have said is still highly relevant today. Rapid technical advances have led to some added new dynamics and the democratization of statistics—providing us all some important new challenges and opportunities. We can add significant value to our businesses, and bring much to the ball game. Or, as I said in my concluding comments in 1987, we don’t hold all the cards, but we hold some pretty good ones. It is essential that we play these right.

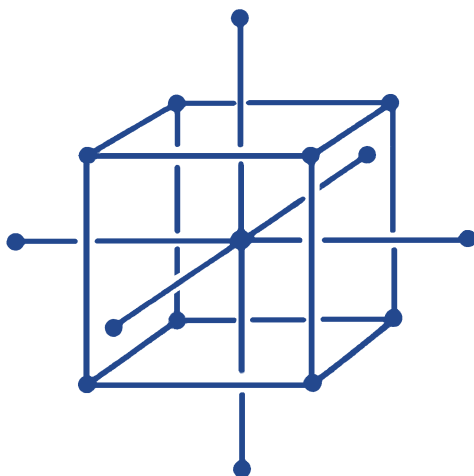
I look forward to giving another Youden Address in 2019. It is unlikely that I will say anything new—but I should have the same old things to say to some new people.

Finally—and here comes the commercial message—Necip Doganaksoy and I expand on some of the ideas presented here in a forthcoming book tentatively entitled “Statistics in the Corporate World: Connecting the Dots.” We hope to get this to Wiley by the end of 2004. If you would like an advance peek, and provide us your comments, please contact me at [gerryhahn@yahoo.com](mailto:gerryhahn@yahoo.com). I can also provide the complete slides for this talk.

## REFERENCES

Hahn, G.J. (2002a), 20 Key Lessons Learned, *Six Sigma Forum Magazine*, May 2002, 28-34.

Hahn, G.J. (2002b), Deming and the Proactive Statistician, *The American Statistician*, November 2002, Vol. 56, 290-298.



# Minutes of Fall Technical Council Statistics Division Council Meeting

October 16, 2003 – El Paso, Texas

Following a brief review of the mission and vision, Bob Mitchell reviewed the **minutes from the AQC Council meeting**. They were accepted.

There was no **membership report**

Marcey Abate gave the **Treasurer's report** and indicated that we are on track for the year. Income is ahead of expense. The Treasurer's report was accepted.

The Statistics Division again won the top level of achievement in the **McDermond recognition**. We needed 350 points and had 642. We have won the top level every year that the McDermond has been in existence.

Service awards will be given at the 2005 AQC.

Information sharing included a number of items.

- First was a review of our operational planning and the results to date:
  - o The first **e-zine** has been published. Members must “opt-in” for division publications to receive it. The ultimate goal is to have more frequent communication with members. We're exploring a different avenue for publication (A-Weber) since some e-mail systems have had trouble receiving it. Officers will write future e-zines until others express interest. Mark Kiel will write the next one.
  - o In the spirit of moving from a teaching organization to a learning organization – members learning from each other – we plan to start **Teleclasses**. There are many options for topics, and the Statistics Division will provide infrastructure. We're developing a memo of understanding (MOU), which is currently being reviewed by ASQ Legal. There will be online registration, and the teleclasses will cost no more than \$29. The service we're using will record them as .wav files, which can go on our website. The first few will be audio only, but we're looking into video options. We plan to launch teleclasses Q1 2004.
  - o The **website** has been redesigned and now has all our newsletters and many other publications. We had 119,000 hits in September alone. A “Free Stuff” link is there (although it is currently listed as “under construction”. The Runts data from the 2003 AQC is also on the website.
  - o We are seeing more activity on our **discussion boards**. They currently reside on Yahoo, but our web designer is building the capability to have them reside directly on our website.
- Mark Kiel reported that recent **DAC** (Division Affairs Council – formerly GTC) meetings have had technical problems and problems due to changing roles in ASQ. Once these are resolved, they should be on track.
- Daksha Chokshi reported that the **2003 Fall Technical Conference** had 150 people in attendance.
- Doksha Choshi also gave an update for the **2004 AQC** in Toronto during May 24-26. It included:
  - There will be three sessions by the division
    - Multivariate SPC & Industrial applications – John McGregor & Mike Dudzic
    - A DOE-related workshop – Davis Balestracci
    - Six Sigma & Statistical Leadership – Roger Hoerl, Ron Snee, Bill Rodebaugh

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# DIVISION COUNCIL MEETING

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- We're still waiting to hear if ASQ will have short courses in 2004. If so, Rick Lewis's short course on forecasting will be considered.
- The **2004 Fall Technical Conference** will be in Roanoke – Gordon Clark of Ohio State University will be the Statistics Division program representative. We are still looking for a short-course chair.
- Karin Chu announced that the **Summer newsletter** has been published and is on website. Evelyn Varner will take over the newsletter duties from Karin Chu. They will jointly publish next newsletter to ensure a smooth transition.
- Bill Rodebaugh reported that the next **Special Publication** will focus on Six Sigma and Lean topics. It originated with some work by Forrest Breyfogle on Lean Six Sigma. The scope has been broadened to add two additional authors. It will be published in 2004.
- Rudy Kittlitz is leading the team that is developing the 3rd edition of **Glossary & Tables** is in progress. They have divided the terms among themselves for review and redefinition where necessary. In addition to bringing definitions up to date, they plan to reduce number of tables. They have scheduled a 2-day meeting in January to finalize definitions, with a publication goal of July 2004.
- Harry Koval, Certification chair announced that a certification exam review workshop held in October with good participation from the Statistics Division. A revised exam will be held in December.
- The Examining committee chair, Howard Swartz, reported that Jeff Wu elected as fellow last year. There are three candidates this year: Tom Ryan, Bob Mitchell, and an anonymous individual.
- Ed Schilling, Standards committee chair, informed us that ASQ has lost accreditation with ANSI, so the Statistics Division doesn't have formal responsibility for any standards. ASQ is working to regain accreditation.
- Lynne Hare, Awards committee chair reported
- The Youden address was presented by Gerald Hahn (ret. GE). Joe Voelkel presided at the address.
- The Hunter Award went to Bill Meeker of Iowa State University.
- Student award grants to the Fall Technical Conference were given to five students:
  - Carla Vivacqua, University of Wisconsin
  - JD Williams, Virginia Tech
  - Willis Jensen, Virginia Tech
  - Andre dePinho, University of Wisconsin
  - Jing Cheng, Purdue University.
  - Ellis R. Ott scholarship format has been changed to award one scholarship to a Ph. D. student and one to an M.S. student. There were 43 qualified applicants this year. 2003. \$5000 awards made to: Bonnie-Jeanne MacDonald, Heriot-Watt University (M.S. Category) and Margaret Polinkovsky, Duke University (Ph.D. Category). The Governing Board members were Susan Albin, Rutgers University; Nancy Belunis, Merck; Galen Britz, 3M (ret.); Lynne Hare, Kraft Foods; Stu Hunter, consultant; Tom Murphy, consultant; Robert Perry, 3M; Ron Snee, Tunnell Consulting.

# LETTERS

To the stats division newsletter editor,

It is with great consternation that I read Mr. Akio Miura's "Suggestions for Improvement to ASQ Certification Exam and ASQ Foundation for Quality Engineer/Manager" in the Newsletter, Vol. 21, No. 3 (Fall 2003).

Though we share a certain perspective on the problem, born perhaps of a common historical legacy, I must object that his call to eliminate a number of terms from the lexicon of quality professionals reflects a failure to appreciate the clear value of the concepts these terms represent. Formed of the sweat of those who worked in the ruins to achieve Japan's postwar recovery, they represent an unforgettable, and lastingly valuable, contribution to industry.

First of all, I would like to clarify some of the concepts Mr. Miura refers to.

- A) Kanban: It is misleading to suggest that Toyota learned this from Ford. It is well known that Mr. Kiichiro Toyota rallied his employees in 1945 to catch up to the US Big Three within three years, at which time Toyota was employing a modified version of the Ford production system. Kanban was derived from Toyota's observation of supermarket stock replenishment procedures, which he carried out on his study tour of US industries, and constituted a clear departure from the Ford system.
- B) QC Circle (Note: This, not "Q circle," is the original term.): What Dr. Deming brought Japan was not the QC circle concept, but simply the Deming cycle (design, production, inspection, sales/service). The QC circle was installed by Professor K. Ishikawa and his colleagues at Kawasaki Steel in 1962. The term "Quality Circle" was coined by US industry after it adopted the Japanese QC Circle program into its operations after 1976.
- C) Poka-yoke: The term highlights a particular kind of error, caused by absent-mindedness which inevitably arises in the performance of repetitive processes, and is thus useful for eliminating such error.

- D) Ishikawa Fish-bone diagram: Whoever may have used or advocated "cause and effect diagrams," the "Ishikawa diagram" or "Fish-bone diagram" was named by Dr. J.M. Juran, who observed the tool in application during his 1960 visit to Japan. My colleague is quite right to note that fish-bone diagrams can be used by kindergartners for simple problems, and that many real-world problems faced by quality engineers and managers call for other conceptual tools. But there are uses for simplicity. Fish-bone diagrams help managers to view large and complex problems in broad terms and to identify detailed sub-problems which may call for far more sophisticated analytical tools.
- E) Kaizen: It is very funny to hear "kaizen" described as a useless action item, as it simply indicates an integrated action-set, the "Plan-Do-Check-Act" work cycle, which is absolutely fundamental to cycles of "maintaining and improving" needed in all phases of production management. The poor practices my colleague describes as application of "kaizen" are rather failures to follow the P-D-C-A cycle. There is no reason to abandon the term.
- F) Kano Model: Eliminating this in favor of a unidimensional conception of customer satisfaction is proposed. The Kano model, however, is a conceptual advance; it represents an undeniable element of what actually satisfies customers: the element of surprise, the unlooked for allure of a superior product.
- G) Hoshin Kanri: "Hoshin" indicates a direction in which to proceed to achieve a "strategy." "Hoshin" ultimately consists of two components: objectives (mokuhyou), with numerical indicators to be achieved, and major action items (housaku). If "hoshin" is simply a slogan for some companies, they have a problem, but the concept of "hoshin" actually involves an integration of policy and action, cascading to every organizational level. In saying that "hoshin" means "policy" my colleague reflects an error which would indeed cause managers great embarrassment: the development of policy without concrete objectives and action items.

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# LETTERS

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H) Mr. Miura calls the above terms useless for CQAs and CQ managers in Japan and the US. In the US, however, they are in fact being used. Hank Czarnecki, Bernard J. Schroer, Mel Adams and Mary S. Spann have picked up “poka-yoke” and “kanban” as tools in their industries. (See Table 1 in “Continuous process improvement tools in process improvement when it counts most” (QP, May 2000, p. 76). Similarly, “Quality Glossary” (QP, July 2002, p.43-61) lists “Fish-bone chart (Ishikawa diagram), kaizen, kanban, poka-yoke, and quality circle” as popular tools. As just one more of many possible examples, I refer readers to Mr. Stanley Marash’s “Integrating Six Sigma, Performance Excellence and ISO 2001-01-111.”

In short, blame should not be laid on the Japanese terms, but on practices founded on poor understanding of essential concepts.

So far, I have for the most part simply defended the terms against a claim of complete uselessness. But let me say a little about their positive usefulness.

**Poka-yoke:** Effective tools for eliminating absent-minded error from repetitive processes are essential for a no-failure, no-defect policy, which is of obvious value to customers.

**Kanban:** Anything that has proven this valuable to Toyota is worth understanding. In fact, while, as the Harvard Review (April 2000) shows, employing it successfully is extremely difficult, there is simply no way to survive without it.

**Kaizen:** Given that ISO 9000:2000 specifies continual improvement as mandatory, kaizen is here to stay, and would be in any case, as no corporation can survive long without it.

**Kano Model:** The precious customer demands and deserves to be treated not as a pebble, but as a jewel. It’s no use pretending the customer will be satisfied if you score high on some unidimensional measure of consumer satisfaction.

**Hoshin Kanri:** Every top manager must communicate his or her own vision, strategy, and policy, and to deploy it through lower management ranks with definite numerical indexes and process action items. Specifying control and check items for

all management processes facilitates evaluation, identification of problems, and corrective action needed for continual improvement.

**Ishikawa Diagrams and QC Circles:** 1400 QC circle participants from 14 Asian countries gathered in Tokyo for ICQCC 2003 to communicate and exchange QC C experiences, and every presentation utilized Ishikawa diagrams. Everyone who has participated in this event, held annually since 1984, knows the value of the tool. However, as Edward E. Lawler and Susan A. Mohrman warn in “Quality circles after the fad” (Harvard Business Review, Jan-Feb 1985, pp 64-71), we must take care not to fall into a rut, but to keep thinking and searching for the right path.

For your readers’ reference, there are other Japanese tools worth noting as supporting quality improvement.

For top management:

*Top Shindan* (top management diagnosis of policy deployment status)

For engineering:

Seven strategic tools, and

Seven tools for new product planning.

For culture change:

The three *mu* to be eliminated (*muda*, wastefulness; *muri*, overstressing; and *mura*, wide dispersion)

The five *gen* to be respected (*genri*, principle; *gensoku*, rule; *genba*, site; *genbutsu*, the product itself; and *genjitsu*, fact)

Five WHYs and Five HOWs planning

QC story processing

I thank you for this chance to set the record straight, and invite discussion from any unsatisfied with the use of these vital concepts in their organizations.

Ichiro Miyauchi, Senior member, 00022971

Member of ASQ since 1961

25 October 2003



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**UPCOMING  
NEWSLETTER  
DEADLINES FOR  
SUBMISSIONS**

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