

ASQ Statistics Division Newsletter

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Chairman's Message

Bill Mead

FTC: Strong Past, Exciting Future

On October 25th and 26th, the Fall Technical Conference was held In London, Ontario. Attendance was very good (nearly 400), and the program was excellent. The London and District Chapter of ASQC has every reason to be pleased with the results of its efforts; the Conference Committee, headed by Herman Sahrman is due high praise for the facilities and arrangements. To this observer, everything seemed to go as smooth as silk.



This FTC was the last to be sponsored only by the Chemical and Process Industries Division of ASQC and the Section on Physical and Engineering Sciences of ASA. Beginning in 1985, the FTC also will be co-sponsored by the Statistics Division. Some years back there was considerable discussion about the Statistics Division's holding a separate conference, but since the Fall Technical Conference has always had a strong orientation toward statistical applications, the request for co-sponsorship was made. CPID and SPES graciously accepted our application for co-sponsorship, and we believe it will be good for everyone. Quite a few of the people on the program in London were members of the Statistics Division, as well as a good number of the attendees. We believe the division can contribute strongly to the conference, beginning in 1985, and improve as we go.

Come to Corning

We'd like to see a lot of you at next year's conference in Corning, New York. I've heard a few faint-hearted complaints that it's too hard to get to Corning. Nonsense! If you can get to New York City from where you are, you can get to Corning. Next year's program looks good, and if you want to learn how to use statistics in Quality Control, make your plans to be there.

Thanks, Gentlemen!

Back in 1974, Harry Wadsworth suggested that the then Statistics Technical Committee should sponsor the development of a series of publications on the use of statistical techniques in quality control. From that beginning we are now anticipating the publication of the ninth volume of The ASQC Basic References in Quality Control, commonly known as the "How-to" series. A lot of people have done a lot of work since then to make all this possible; authors, editors, reviewers, and helpful people at ASQC headquarters. No one has received any payment for his or her efforts. I wouldn't attempt to name all the people who have contributed, but I do want to express publicly the appreciation of the Division to each and every one of them. Ed Dudewicz, the original editor of the series, and Sam Shapiro and John Cornell, the current co-editors, deserve our plaudits; and, of course, each of the authors, whose only reward is the satisfaction of a job well done, merits our gratitude. A round of applause for each and every one of them!

Tell Us Your Ideas

I've read somewhere that a five to eight percent response to a mail survey is considered to be very good; the response of less than one-twentieth of one percent I received from my request for input from you would seem to be a bit low. However, I will be glad to accept the thunderous silence as a kind of mandate. The present and past officers of the division have been doing such a good job that there's nothing you can suggest in the way of improvements. No, I don't really believe that. Your officers have several very good ideas working, and as they are ironed out we'll be telling you about them. In the meantime, help us out. Tell us your ideas about what the Statistics Division can and should be doing.

American Statistical Association Forms Committee on Quality and Productivity

Gerry Hahn

American industry is placing considerable new emphasis on the effective use of modern statistical methods for quality and productivity improvement. To mobilize its efforts in this area, the American Statistical Association recently formed a Committee on Quality and Productivity to foster

- improved awareness by non-statisticians of the role of statistics in quality and productivity improvement,
- improved training programs for those within and outside the statistical community, and
- improved communication among statisticians.

Specific activities and plans for the committee are described below. Members of the Statistics Division of ASQC are cordially invited to contribute to this exciting new activity.

The committee has been organized into seven sub-committees and various task forces. In particular,

- The Sub-Committee on Awareness has formed task forces concerned with the development of (1) short presentations to management, (2) short presentations to statistical groups, and (3) a "what-to-look-for" list for a plant manager who wishes to hire a statistician. The sub-committee is headed by Ed Schilling of the Rochester Institute of Technology.
- The Sub-Committee on Education/Training is capitalizing on the significant accomplishments of the recent working conference on "Statistical Education for Engineers," organized and led by Bob Hogg (University of Iowa, Iowa City, IA). Task forces, dealing with statistical education for universities, industry, and continuing education have been formed. The subcommittee is headed by Blan Godfrey (AT&T Bell Laboratories, Holmdel, NJ). The task force leaders are Bob Hogg, Bert Gunter (RCA, Princeton, NJ) and Pete Jacobs (3M, St. Paul, MN), respectively. The statistical education task force includes an activity concerned with programs for business schools, headed by Harry Roberts (University of Chicago); the continuing education task force includes an activity on community college and technical institute programs, headed by Neil Ullman (County College of Morris, Randolph, NJ).
- The Sub-Committee on Measures of Productivity, headed by Jerome Mark (US Dept of Labor, Washington, DC) is focusing on methods for productivity measurement that meet current industrial needs.
- The Sub-Committee on Meetings, headed by Dave Moore (Purdue University, W. Lafayette, IN), is concerned with programs for statistical and non-statistical societies. Effort is currently focused on developing case studies and continuing education sessions for the 1985 ASA meetings. Other task forces are concerned with (1) cooperation with other technical communities, (2) gathering information on relevant recent national meetings, and (3) investigating the potentials of a "Gordon Research-type" conference.
- A short-term Sub-Committee on Policy Statement, headed by Bill Golomski (Golomski &

Associates, Chicago, IL) is finalizing a policy statement for submission to the ASA Board of Directors.

- The Sub-Committee on Publications is concerned with promoting the writing of appropriate papers, especially on case studies, for statistical and non-statistical journals. Task forces are developing (1) an annotated bibliography of the available literature, (2) guidelines for case study articles, and (3) a list of journals that would be appropriate for such publications. The sub-committee is headed by Bob Easterling (Sandia, Albuquerque, NM).
- The Sub-Committee on Research, headed by Nozer Singpurwalla (George Washington University, Washington, DC) is assembling for publication, a list of significant research problems for quality and productivity improvement.

Activities are being closely coordinated with various other societies. Dick Freund (Rochester Institute of Technology) is coordinator with ASQC.

Members of the ASQC Statistics Division who would like to participate in the above efforts or can provide useful inputs are urged to contact the appropriate subcommittee chairmen, task leaders or activity leaders directly.

General suggestions or expressions of willingness to work in other areas should be addressed to committee chairman:

Gerry Hahn
3A27, K1
P.O. Box 8
GE CRD
Schenectady, NY 12301

Two New How-To Booklets Available

Two new volumes in the ASQC "Basic References in Quality Control: Statistical Techniques" booklets series have recently been published, bringing the total number of volumes available to nine. The two new volumes are:

Vol. 8: *How to Apply Response Surface Methodology*, by John A. Cornell, and

Vol. 9: *How to Use Regression in Quality Control*, by Douglas Crocker.

Booklets may be purchased by contacting Sandra Shed at ASQC Headquarters (414) 272-8575. Ordering information and forms also appear monthly in the Bookmart section of *Quality Progress*.

Juran, Seminars at '85 Ellis Ott Conference

The second annual Ellis R. Ott Conference is scheduled for March 18 through 21 at the Hyatt Regency Hotel in New Brunswick, New Jersey. The purpose of the conference, which honors the statistical quality control pioneer who taught at Rutgers University, is to promote quality management and applied statistics in industry.

This year's conference features a one-day seminar on the 18th entitled "Upper Management and Quality" by Dr. Joseph M. Juran.

Two days of talks on a variety of statistical and quality issues will follow on the 19th and 20th. Topics include experimental design, exploratory data analysis, acceptance sampling, process control and troubleshooting, computer application and the management of quality. Conference coordinators have assembled recognized experts in each area to speak and answer questions on these and other topics.

Six simultaneous seminars will be presented on the 21st. The topics for these are basic statistical quality control, analysis of means, experimental design, quality management, company-wide quality assurance, and statistical graphics.

The conference will also feature an exhibition of computer hardware and software, primarily related to statistics and quality control.

Conference attendees have the option of selecting any combination of the Juran seminar on the 18th and/or any of the seminars on the 21st (or omitting all seminars) in addition to the two-day program. For details and registration, contact:

Ken Weaver
Bristol-Meyers
225 Long Avenue
Hillside, NJ 07207
(201) 926-9344.

Minnesota Quality Conference to Feature Hands-on Workshops

In response to the tremendous interest in last year's meeting, the annual Minnesota Quality Conference, hosted by the Minnesota section of ASQC, has been expanded to two days. It will be held on Tuesday and Wednesday, February 26 and 27, at the Radisson South Hotel, in Bloomington, Minnesota.

The conference will begin on Tuesday afternoon with three simultaneous "hands-on" workshops. The three workshops are: "Factorial Experimental Designs" presented by Rosann Klutzke of 3M, "Taguchi Methods" presented by Jim Baker of 3M, and "Experience with 'Just-in-Time' Production Scheduling" presented by Floyd Burghard of Northern Telecom.

Thirty-two presentations within eight simultaneous sessions will be offered on Wednesday, with topics ranging from statistics to the management of quality. Featured speakers will include Jagen Hagan of ITT and H. James Harrington, president-elect of ASQC.

Advance registration fees will be \$50 for the Tuesday workshops (specify your choice upon registering) and \$60 for the Wednesday presentations. These will increase to \$60 and \$75, respectively, at the door. Further information may be obtained by contacting Doris Martinson at the following address:

Doris Martinson
3M Center
230-B-06
St. Paul, MN 55144
(612) 733-3170.

SQC Question, Queries, and Quandaries

Two-Stage Nested Designs-Revisited

Editor's note: Following the publication of our SQC Questions, Queries, and Quandaries column in the last issue of this newsletter, we received a number of letters pointing out two flaws. We now present excerpts from some of these.

Letters

Dear Dr. Pignatiello:

The September 1984 issue of the Statistics Division Newsletter has just come to hand and I was interested in your piece entitled "Two-Stage Nested Designs." I do not believe that you have answered the question posed, namely, "The question is: How does one test the hypothesis that the variance of the quality characteristic is the same for both lots?"

The question you have answered is "Is the variance due to parts significantly larger than that due to measurement error?" In carrying out this analysis you have assumed that the variances of the quality characteristics in the two lots are same.

I don't wish to be picky, nor am I writing for publication, but I think this is a good example of a statistician immediately recognizing a two-stage nested design and providing an analysis for it without sufficient attention to the experimenter's question. We all have to be careful about this. It is not possible to go into numerical detail because the sums of measurement pairs for Lot 2 do not seem to be correct. It might prove interesting to consider how the analysis for a difference between Lot means would be carried out if the variabilities within the Lots were significantly different.

On behalf of all readers I thank you for your efforts in making the *Statistics Division Newsletter* more interesting.

Sincerely yours,
(Name withheld)

Dear Dr. Pignatiello:

No technique, no matter how theoretically competent, should override obvious conclusions. My professor, Ellis Ott, once said that it does not matter how sophisticated an analysis may be, if it does not agree with common sense, question the analysis.

The conclusion of the author is that the means are the same but that there appears to be some differences in variability. There is no way in which that statement can be true! The largest observation in Lot 1 is 10.5, the lowest in Lot 2 is 10.7. In simple language, the lots do not overlap, and hence cannot be the same unless the degree of sloppiness is such that any test is meaningless.

Sincerely yours,
Bernard A. Sobel

Response

By Joe Pignatiello

One of the objectives of this column was to initiate a two-way dialog between members of the Statistics Division. Although such an objective has now been met, the means used for accomplishing the objective were not what I had in mind.

As our readers have pointed out, I did respond to the wrong question and the sums of measurement pairs for Lot 2 are incorrect. The arithmetic errors are corrected in the revised [Tables 3 and 4](#) which accompany this discussion. Let me now explain the situation behind the former problem.

Due to the initial lack of questions, queries, and quandaries, I used a problem that was based upon a conversation I had with an engineer about two years ago. My response to him was similar to the one that appeared in the last issue. I took too many liberties, however, in paraphrasing the question and conversation from two years ago. I neglected to notice that the question and conversation given at the beginning of the column were inappropriate for the response.

I appreciate the efforts of those who wrote in catching my blunders and thank them for taking the time to write.

TABLE 3: Example Data

	Lot 1 (i = 1)					Lot 2 (i = 2)				
	Parts (j)					Parts (j)				
	1	2	3	4	5	1	2	3	4	5
y_{ij1}	10.2	8.4	9.2	10.5	11.3	10.9	14.1	11.8	12.8	13.3
y_{ij2}	9.1	10.4	9.1	10.1	10.4	12.6	11.5	11.4	10.7	12.5
$y_{i.}$	19.3	18.8	18.3	20.6	21.7	23.5	25.6	23.2	23.5	25.8

TABLE 4: ANOVA Table—Example Data

SOURCE	SS	df	MS	F	α^*
LOTS	26.2205	1	26.2205	29.63	0.0006
PARTS(LOTS)	7.0800	8	0.8850	0.84	0.5896
ERROR	10.5250	10	1.0525		
TOTAL	43.8255	19			

Hypothesis Testing: An Analogy with the Criminal Justice System

**By James M. Kenney, ASQC-CQE
Senior Quality Assurance Engineer
Polaroid Corporation**

After introducing new students to a few chapters of descriptive statistics and sampling distributions, most texts move quickly into the subject of hypothesis testing. Many students find the somewhat convoluted logic of this subject difficult to grasp and often without clear applicability to the situation at hand. After plowing through a few problems (usually applications of the popular t and F tests), if you begin to get the feeling that you've seen this all before-you're right! It turns out that there is an almost perfect analogy between statistical hypothesis testing and the criminal justice system.

The material which follows presents a point-by-point comparison that includes a treatment of where the alpha and beta risks come into play. A refresher of alpha and beta risks is also offered. The best advice is to use the definitions you feel most comfortable with.



CRIMINAL JUSTICE SYSTEM	HYPOTHESIS TESTING
1. Trial	1. Experiment
2. Defendant	2. Effect
3. Assumption: The defendant is innocent	3. Null Hypothesis (H_0): The effect is not real
4. Charge: The defendant is guilty	4. Alternative Hypothesis (H_1): The effect is real
5. Prosecutor	5. Designer
6. Prosecutor's Task: a. Show the assumption is not true b. Show the defendant is not innocent c. Show the charge is true d. Show the defendant is guilty	6. Designer's Task: a. Show the null hypothesis (H_0) is not true b. Show the effect is not real c. Show the alternative hypothesis (H_1) is true (reject H_0) d. Show the effect is real
7. Nature of the Trial <i>Lenient Jury</i> a. High confidence that when the defendant is judged to be guilty, he is <i>truly</i> guilty. b. Low risk of 6.a-d above (when not guilty). c. High risk of incorrectly judging a guilty defendant innocent. d. Will tend to correctly judge an innocent defendant to be innocent. e. A poor trial for judging that a <i>truly</i> guilty defendant is guilty.	7. Nature of the Experiment <i>High Confidence/ Low Power Test</i> a. High confidence ($1-\alpha$) that when the effect is found to be real, it is <i>truly</i> real. b. Low risk (α) of 6.a-d above (when not real). c. High risk (β) of incorrectly showing a real effect not to be real. d. Will tend to correctly show an effect that is not real not to be real. e. A poor experiment (low power) for showing that a <i>truly</i> real effect is real.

Vengeful Jury

- a. Low confidence that when the defendant is judged guilty, he is *truly* guilty.
- b. High risk of 6.a-d above (when not guilty).
- c. Will tend to incorrectly judge an innocent defendant to be guilty.
- d. A good trial for judging that a *truly* guilty defendant is guilty.

*Low Confidence/
High Power Test*

- a. Low confidence ($1-\alpha$) that when the effect is shown to be real it is *truly* real.
- b. High risk (α) of 6.a-b above (when not real).
- c. Will tend to incorrectly show an effect that is not real to be real.
- d. A good experiment (high power) for showing that a *truly* real effect is real.

ALPHA RISK

- Risk of rejecting a true null hypothesis (H_0)
- Risk of detecting an insignificant effect
- Error of the 1st kind
- Producer's Risk
 - Risk of calling good material bad
 - Risk of saying a process is out of control when it is not
- $(1-\alpha)$ = Probability of accepting a true null hypothesis
 - = Probability of calling good material good
 - = Confidence of the test

BETA RISK

- Risk of accepting false null hypothesis (H_0)
- Risk of not detecting a real effect
- Error of the 2nd kind
- Consumer's Risk
 - Risk of calling bad material good
 - Risk of saying a process is in control when it is not
- $(1-\beta)$ = Probability of rejecting a false null hypothesis
 - = Probability of calling bad material bad
 - = Power of the test

After six years as a nuclear submarine officer, James M. Kenney joined Polaroid as a Quality Control Supervisor. He is currently responsible for statistical process control and reproducibility of the company's negative manufacturing operation. Jim has played a leading role in the development and teaching of Polaroid's Statistical Engineering Training Program- 184 hours of intermediate and advanced level studies- designed to enhance the knowledge and application of statistical and experimental design techniques.

Editor's Corner

A Large and Exciting Issue; New Editor Sought

By Ed Mykytka

This issue contains three special items which are very exciting to me as the editor of this newsletter. The first is the text of the Youden Memorial Address which was delivered by Dr. Brian Joiner at the 1984 Fall Technical Conference in London, Ontario. This address was very well received at the conference and we are extremely pleased to be able to share it with you.

The second item is the minipaper prepared by James Kenney. Like the Youden address, it contains good food for thought and should be of interest and value to our readers.

The third item is, perhaps, even more exciting since it contains a valuable exchange of ideas which, after all, is the purpose of this publication. Joe Pignatiello and I are both chagrined that our last SQC Questions, Queries, and Quandaries column contained a couple of errors. However, we are both excited that our readers responded to these in such a positive manner and conveyed valuable thoughts which we are passing along to you.

I would like to thank all readers who wrote to us about this column. Your comments are, as always, quite welcome. It is rewarding to know that our members are not only reading, but are thinking carefully about what is published in this newsletter.

Help Wanted: EDITOR

As much as I enjoy editing this newsletter, it is time for me to step down and pass this pleasant duty along to another. If you are interested in serving as the editor, most likely starting in June of this year. Please contact me as soon as possible.

I have found this position to be rewarding one as it is an excellent means for getting to know a number of outstanding people within ASQC, and I can assure you that, as editor, you will receive the enthusiastic support of the officers of the Division as well.

Advances in SQC is Theme of Manitoba Conference

"Advances in Statistical Quality Control" will be the theme of a conference to be held this summer at the University of Manitoba. W. Edwards Deming will be a featured speaker at the conference which will run from noon on Tuesday, June 4 to noon on Thursday, June 6.

More details will be provided in the April issue of this newsletter but, in the meantime, further information may be obtained from

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