STATISTICS Newsletter ©

Volume 16, No. 6 **Summer, 1997**

Outgoing Chair's Message

by Beth Propst

Why is it that so often we are faced with good news-bad news situations? The good news is that no matter how bad the news, there is usually some good news to encourage us. The bad news is that no matter how good the news, there are some undesirable things that diminish our joy. In my case, the good news is that I am writing the Outgoing Chair's Message. The bad news is that I am writing the Outgoing Chair's Message. The good news is that I am finished (almost) with the administrivia and paperwork that a Chair must deal with. The bad news is that I was just starting to be comfortable with the duties and responsibilities of leadership. I just get to know the ropes and then - poof - I'm gone and someone else has to learn them.

The good news is the Division has accomplished a lot this year. The Statistical Thinking Tactical Planning Team of **Roger Hoerl, Don Emerling, Lynne Hare, Galen Britz**, and **Janice Shade** have continued their excellent work with a session at the 1996 Fall Technical Conference and an article in the June, 1997, issue of Quality Progress. Past publications of this group are available through the Quality Information Center at ASQ, and demand to date has far exceeded our expectations.

Our Web Master (I think he's a wizard!) **Mark Kiel** has gotten our division web page (www.asqc.org/statdiv) up and running and it's absolutely fabulous. Education Chair **Chris Ayers** along with **Jacob Van Bowen** and **Don "Sparky" Williams** created the first modules of the "Statistical Thinking Virtual Academy" which debuted at Quality Congress and can now be accessed off our web page - minus some of the interactive portions which are not currently supported by the software. Please visit our Academy (we are looking for a better name - please contribute suggestions) and give us your comments and feedback. We need ideas for new modules as well as volunteers to develop material.

This year for the first time we sponsored sessions and a short course at the Rocky Mountain Quality Conference, thanks to the efforts of Region 13 Councillor **Rick Schleusener**. We hope to continue this relationship, perhaps expanding the number of sessions, next year. AQC Short Course Chair **Marcey Abate** did service above and beyond the call of duty to keep our short course afloat in the face of the "Orlando effect" and facilitated the crafting of an agreement between the Division and headquarters regarding the financial details of the AQC short course. Even though we had a small turnout at the short

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Incoming Chair's Message

by Don Emerling

I recently started a new job, with a new manager. In my first meeting with him, I mentioned that I would be the Chair of the Statistics Division of ASQ and that I would have some time commitments for the next few years. After asking incredulously, "Why would anyone want to be in a Statistics Division of anything?" (I obviously have some work to do in communicating the vital importance of statistical thinking), he asked a better question; "How much of your time will be spent on this job?" He was truly concerned about the amount of time commitment, between work and Statistics Division activity, throwing my life out of balance. I assured him I had thought this through, and was looking forward to the long hours! (Fortunately there is a lot of fun built in!)

His question did get me thinking about what "this job" is. What does it mean to be the Chair of the Statistics Division? What is "this job" and how would I know if I was doing a good job.

So I began to wonder…

…will I be an administrator, what

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Editor's Corner

First and foremost, I need to apologize for the tardiness of the 1997 Special Publication. Due to unforeseen circumstances regarding other personnel and professional commitments, the original author, Tom Swails, will be unable to complete the intended publication. Unfortunately, final verification that the article would not be completed occurred in June, several months past the expected deadline. We did find another author to pen the 1997 Special Publication.

Davis Balestracci, a Statistical Specialist at HealthSystem Minnesota, has agreed to write a Special Publication on the topic of "Data Sanity". What is data sanity? It is the practice of process-oriented thinking, understanding variation, and the intelligent use of data to make decisions. Davis will require approximately 6 months to write this piece. Timing for the Publication is slated for early December, between the Fall and Winter editions. Many thanks to Davis Balestracci for offering his time and support.

On the topic of the Special Publication, the Division is planning to issue these publications in the Winter instead of the Spring. We have learned that much of the detailed information for the Annual Quality Congress is not available for the Winter Newsletter. The move will permit the Division to better inform the membership of AQC events. This change will occur in January 1999. Please note that the 1998 Special Publication will be mailed in mid-March, and won't be affected by the late mailing of the 1997 Publication or the timing change in 1999.

Lastly to all members: The "article pool" has gone dry! If anyone has a Mini paper or Basic Tools article which meets the criteria listed on this page, please share it with our 12,000 readers. Having done some writing myself, I know the difficulties of finding additional time to complete and submit an article. However, many of our members will benefit from your writings. And trust me, there is a big sense of accomplishment when you are done. So come on.....Spark up that computer.....Get creative.....We will thank you! Δ

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:

1. Application oriented/not theory
2. Non-technical in nature
3. Techniques that can be understood and applied by non-statisticians.
4. Approximately three to five pages or less in length (8 1/2" x 11" typewritten, single spaced.)
5. Should be presented in "how to use it" fashion.
6. 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:

1. Application oriented.
2. More technical than Basic Tools, but contains no mathematical derivations.
3. Focus is on insight into why a technique is of value.
4. 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.
5. Not overly controversial.
6. 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. Δ

VISION

- Our customers' needs will be continuously anticipated and met.
- Our members will be proud to be a part of the 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.

MISSION

- Promote statistical thinking for quality and productivity improvement.
- Serve ASQ, business, industry, academia and government as a resource for effective use of statistical methods for quality and productivity improvement.
- Provide a focal point within ASQ for problem-driven development and effective use of new statistical methods.
- Support the growth and development of Division members.

STRATEGY

- Our primary customers are Statistics Division members. Other key customers are:
  - Management,
  - Users and potential users of statistical methods for quality and productivity improvement,
  - Educators of the above customers.
- Our orientation to customers is customer focused.
- Our markets, within which we intend to offer products, are weighted as follows: greatest weight on intermediate statistical methods, nearly as much weight on basic methods, and much less weight on advanced methods.
- Our primary products are educational services.

PRINCIPLES

- Focus on a few key things.
- Balance short-term and long-term efforts.
- Recognize that we exist for our customers.
- Value diversity (including geographical and occupational) of our membership.
- Be proactive.
- View statistics from the broad view of quality management.
- Apply statistical thinking ourselves (that is, practice what we preach).
- Uphold professional ethics
- Continuously improve

OUTGOING CHAIR'S MESSAGE

Continued from page 1

course, the response of the participants was very positive.

Another new venture this year was the Ott Scholarship, which is off and running under the capable leadership of Awards Committee Chair **Lynne Hare.** The first scholarships will be awarded for Fall, 1997.

The bad news is that there were some things we weren't able to accomplish. The Publications Committee under Chair **Don Strickert** suffered from lack of direction from Division leadership, our failure to involve Quality Press early in the process, and our inability to fill several key positions. At our tactical planning meeting in May we were forced to seriously rethink our approach to publications. We have backed off of our original plan and will be taking a different approach in the future. Our spring Special Publication (which, you recall, we initiated last year in place of the spring edition of the newsletter) fell through in spite of the work of Newsletter Editor **Janice Shade.** (The good news is that we are still working on it and plan to publish it as soon as we can, so next year you will receive two Special Publications instead of one.)

More bad news — an ongoing relationship with a local conference in Region 12 has been ended. For many years the Division has sponsored a track of speakers at Argonne Quality Day put on by Section 1208 (St. Charles) in conjunction with Argonne National Laboratories. Well, Argonne has reengineered its Quality Department out of existence and so this long-standing conference is no more.

But ... along comes the good news: a whole host of people have done a great job carrying out the day-to-day operations of the Division. First and foremost of these are my fellow officers - Chair Elect **Don Emerling**, Treasurer **Don Williams**, and Secretary **Bob Mitchell**. I couldn't ask for a better, more delightful group of people to work with - even if I did, I probably wouldn't get it. Without them I couldn't have done my job. Nor could I have done my job without coaching, advice, reminders, and support from Past Chair **Nancy Belunis**, who last year guided the Division once again to the highest level of the McDermond Division Management Recognition Program (threepeat!). We anticipate reaching Level 3 again for the 1996-1997 year. Of course, all of our achievements are based on the excellent work of all the Past Chairs who have laid the foundations upon which we continue to build, and from whom I have learned so much.

There are many others who have made the Division operations a success this year. In the interest of brevity, I will only mention those not previously mentioned. This year's Hunter Award was awarded to **Doug Montgomery** by Hunter Awards Chair **Steve Bailey**. Steve ended his term of office on December 31, and current Chair **Galen Britz** is busily guiding his committee in the selection of the 1997 recipient of this award. Helping organize our conferences and short courses (in addition to Marcey and Rick mentioned above), **Bill Bleau** shone as FTC Short Course Chair, **Jacob Van Bowen** as FTC Program Committee Representative, **Larry Haugh** as AQC Division Session Manager, and **Mel Alexander, Subir Chowdbury, John Clulow, Fred Spiring, Tsong-how Chang**, and **Elaine Allen** as AQC Technical Paper Reviewers, and **Frank Alt** as Deming Conference on Applied Statistics Program Chair. Helping Don Strickert with Publications were How-To Series Editors **Walter Liggett** and **Bob Brill. Nick Martino** continued to serve with distinction as Certification Chair with the help of countless volunteers. In fact, he has been told to slow down on the number of volunteers to work on the CQE exam. They cannot use all of the names we have supplied. But ... Nick will be investigating what Division input will be required for other certification exams (e.g., the CQT). Standards Chair **Ed Schilling** and his committee have done such outstanding work that the Division has now acquired responsibility for several new standards. **Bob Perry** continued as Examining Chair - a position he has held for many years - and ASA Q&P Liaison **Joe Voelkel** has kept us in touch with what our ASA colleagues are doing. Membership Chair **JL Madrigal** has moved into his new position with grace and aplomb and helped in the redefinition of the Regional Councillor position (which you'll all be hearing more about) and the institutionalization of ongoing member surveys. Many of the **Regional Councillors** participated in this effort.

The bad news is that two people are retiring from their positions because of job responsibilities and other conflicts. They are Education Chair **Chris Ayers** and How-To Editor **Bob Brill**. Both Chris and Bob contributed a lot to the Division. We are sorry to see them go and wish them well in their future endeavors. Other people are leaving their current positions to move into new positions in the Division, and that is good - for them and for us.

Some really good news - I am turning over the reins to Incoming Chair **Don Emerling**, who is so good he is already making significant improvements to the operation of the Division. (The bad news is that I didn't think of them a year ago so the Division could have benefitted sooner!) He has a capable group of officers to help him: **Don Williams, Bob Mitchell**, and **Janice Shade.** The bad news is that as Past Chair my involvement with this exceptional group will be tapering off. The good news is that I will now be free to pursue other activities within ASQ. Next year I will be serving on the Education and Training Board and as a GTC Facilitator. The bad news is that the Division won't be rid of me that easily — I'll be ba-a-a-ack to serve in other capacities.

One last piece of bad news - good news. The good news is that I've had many opportunities to share thoughts with all of you — the members, the reason behind all of the work we do. This has occurred through my Chair's Messages, phone conversations, e-mail conversations, and personal contact at conferences. I have really enjoyed that part of my job — it has been a wonderful experience. If that were the extent of the job description, I could be Chair for a lifetime and never tire of it! The bad news is that this is my last official opportunity to share with you and I've already filled my air time by recognizing the efforts of the volunteers that have enabled the Division to be successful. The good news is that conversations and relationships, once begun, can continue indefinitely and I look forward to continuing those I have begun this past year. I'd like to leave you with some profound words of wisdom, but I'm not feeling particularly wise or profound at the moment. Instead, a quote from Tennyson's Ulysses springs to mind:

I am a part of all that I have met;
Yet all experience is an arch wherethro'
Gleams that untravell'd world whose
margin fades
For ever and for ever when I move.

Even so, I am a part of everything I have done and everyone I have met, as you are all a part of me, but my job here is done and so I ride off slowly into the sunset in search of those untraveled worlds that are now before me. ***(That's the good news!)*** Δ

1996 Annual Evaluation, ASQ Statistics Division

Don Emerling, Chair-Elect

1. Introduction

This is the sixth annual evaluation of the Statistics Division.

The annual evaluation is intended to "facilitate continuous improvement of the Statistics Division by measuring customer satisfaction and progress of the Division relative to McDermond guidelines and Statistics Division Vision, Mission, Strategy, Principles, Systems and Annual Tactical Plans" (Statistics Division Operating Manual).

Evaluation: The annual evaluation is not meeting it's intended purpose. We are not using it to facilitate continuous improvement of the Statistics Division.

Upgrade: Develop a tactical plan by this year's FTC to operationalize the continuous improvement process, based on the annual evaluation.

2. Vision, Mission, Strategy and Principles

Our vision is the desired end state the division is striving to achieve, and our mission is our reason for existence. The strategy defines our customers and markets. Our principles are rules to follow in the pursuit of our vision and mission. No changes have been made to these since the last evaluation.

Evaluation: The five-year plan is directed towards achieving our vision and fulfilling our mission. The plan is now three years old and needs to be revisited and revised to a new five-year plan.

Upgrade: 1. Review and evaluate the progress toward the five-year plan at this years' AQC tactical planning meeting.

2. Schedule a long-range planning meeting in the first quarter of 1998 to review our progress toward our vision and develop a new five-year plan.

3. Customer Satisfaction

Division Membership continues to remain flat or declining slightly. Our quarterly membership survey's indicate a high level of satisfaction and the exit interviews almost always give reasons other than dissatisfaction with the Statistics Division.

Evaluation: The membership survey will be important in assessing members' needs. The booth activity at AQC has been used to provide information on how the division could be more responsive.

Upgrade: Results from the survey and previous membership surveys should be included in the Operating Manual. Additional ways to measure customer satisfaction need to be identified. Information obtained from the booth activities needs to be reviewed.

4. Systems

4.1 Infrastructure Renewal

Purpose: Continuously renew and improve the organizational structure of the Division.

Procedure: Past Chair is responsible.

Evaluation: We should attempt to include as many past chairs as possible in the infrastructure meeting at the AQC. This will give us a better pool of possible future leaders of the division. We need to develop the process for responding to, and taking advantage of, members who complete member interest forms. This process should include metrics to track the quality of the process.

Upgrade: Develop a tactical plan by this year's FTC to develop the process for responding to members who complete member interest forms.

4.2 Conference Calls

Purpose: Facilitate communicate among division leadership outside of scheduled meetings

Procedure: Conference calls among division leadership are held on a monthly basis.

Evaluation: The conference calls have been a valuable process for keeping the division leadership communicating on a regular basis. We should include a regular review of the Statistics Division Table of Activities (pp. 4-7 of the Statistics Division Chair Job Description) as a means of "keeping on top" the activities throughout the year. We need to find a way to more actively manage the activities of the division, such as tactical plans, and committee activity.

Upgrade: 1. Incorporate a regular review of the Table of Activities into the conference call agenda.

2. Have a 1-2 day operational planning meeting (no later than July 15, 1997) of the division leadership to build a calendar-based operational plan for the fiscal year.

4.3 McDermond Division Management Recognition Program

Purpose: Encourage divisions to focus their efforts on meeting the needs of their members, customers and ASQ.

Procedure: Documented in ASQ's policies and procedures. Chair is responsible for submitting the application.

Evaluation: Statistics Division achieved the highest level - Level 3 for 1995-1996. We are applying for Level 3 in 1996-1997. We have designed our division infrastructure to achieve Level 3 every year.

Upgrade: Follow the process.

4.4 Operating Manual

Purpose: Provide the information needed to run the division.

Procedure: Updated by Chair-Elect in first quarter of the calendar year.

Evaluation: The system is working well.

Upgrade: 1. Put the operating manual on the Statistics division home page.

2. Provide an opportunity for members to receive an electronic copy of the operating manual.

4.5 Tactical Planning

Purpose: To develop and implement tactical plans supporting the division strategy.

Procedure: Tactical Planning meetings are held at the AQC and FTC. Follow-up meeting may be held as necessary.

Evaluation: A. The tactical planning meetings need to be balanced between providing time to work on tactical plans and providing time to review status and discuss new tactical plan candidates.

B. The tactical plans that have been generated from the five-year plan have tended to be multi-dimensional and

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ANNUAL EVALUATION

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lasting more than a year. They often have sub-plans imbedded in them and become complex and difficult to make progress on.

Upgrade: A.1. Split the AQC tactical planning meeting into two sessions. First, a review and evaluation session, where we review progress and evaluate direction. Second, a working session, where tactical plan teams can work on their specific plans.

A.2. Dedicate the FTC tactical planning meeting to working sessions, with a very brief wrap-up review at the end of the day.

B.1. We should have a discussion about tactical plans that are generated from the five-year plan (which I consider more strategic and complex) vs. tactical plans that are generated from other sources, such as this annual review (which I consider more operational).

The team working on the tactical plan "Enabling Broad Application of Statistical Thinking" made good progress this year. They presented at the FTC and are developing a "How-To" book. The FTC presentation is scheduled for publication in Quality Progress.

The team working on "Integrating Statistical Thinking and Tools into Educational Curricula" is planning to present the "Virtual Academy" at the Statistics Division booth at this years' AQC.

4.6 Annual Division Evaluation

Purpose: See Introduction

Procedure: See Introduction

Evaluation: This is the sixth annual evaluation. There is still no clear process.

Upgrade: See upgrade in Introduction.

4.7 Financial Requests

Purpose: Handle requests for donations in a manner consistent with our mission.

Procedure: Described in the Operating Manual.

Evaluation: Working well. Donations done on an annual basis our now included in the budget.

Upgrade: Follow the process.

4.8 Maintenance System

Purpose: Ensure that action items resulting from meetings are completed.

Procedure: Keep a separate flip chart for action items at meetings. Review at end of meeting and assign responsibilities and timing. Include all action items in a single list and include at the front of the minutes. Secretary will send at reminders at set intervals.

Evaluation: Working well. Modifications have been made to the system. All action items even those from conference calls are captured on one list. Thus the action item list changes on a regular basis as new items are added and others are completed.

Upgrade: Follow the process.

4.9 Budgets

Purpose: Ensure that expenses which the division incurs have been included in the annual division budget.

Procedure: Committee chairs and tactical plan leaders provide a budget to the treasurer by April 15 of each year.

Evaluation: The process works well. We have been running a deficit budget for several years. We have raised the dues to $8.00 this year to cover increased operating expenses.

Upgrade: Make sure we continue to add value to our members.

4.10 Reimbursement Policy

Purpose: Ensure that expenses are reimbursed in a standard manner.

Procedure: Section 4.10 of the Statistics Division Operating Manual describes the procedure for reimbursement.

Evaluation: The process works well.

Upgrade: Follow the process. Δ

INCOMING CHAIR'S MESSAGE

Continued from page 1

Beth calls "dealing with the administrivia…"? I really hope not! — If that's the most important job of the Chair, I'll be counting the days until next July 1!

…will I be leading an organization of 12,000 people? I don't really think so. — To be honest, I probably only know about 100 members, it's hard to imagine a leader who doesn't know 99% of the people he is supposed to be leading! That's why I've always had trouble with the concept of the President of the United States being the "leader of the free world." I personally have never felt that I've been led anywhere by a politician, unless it's down the primrose path!

…will I be the "keeper of the Mission?" That sure sounds like the job of more than one person. — The mission statement of the Statistics Division is to:

- Promote statistical thinking for quality and productivity improvement.
- Serve ASQ, business, industry, academia and government as a resource for effective use of statistical methods for quality and productivity improvement.
- Provide a focal point within ASQ for problem-driven development and effective use of new statistical methods.
- Support the growth and development of Division members.

That list tells me that a whole lot of people need to be working together if there is any hope that the mission will impact society.

OK, so now I'm really confused, WHAT IS "THIS JOB"??!!

To help me answer this question, that by now was burning in my mind, I looked up the purpose statement in the Chair's job description. It states, "The primary purpose of the chair is to integrate the diverse activities of the Division. The Chair must ensure these are supportive of the Vision, Mission, Principles, and Strategy. A secondary purpose of the Chair is to lead the annual and long term planning of the Division.

So I am an integrator ("…to integrate the diverse activities of the Division."), and an evaluator "…must ensure these are supportive…), and a planner (…lead the annual and long term planning…).

I'd like to discuss these roles by first addressing what is happening to support integration and planning, and then by addressing the subject of evaluation.

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BASIC TOOL

USING A GRAPHICAL TECHNIQUE FOR DETERMINING AND DISPLAY PROCESS CAPABILITY

Richard DeRoeck

Introduction

Capability indices seem to be the latest fad in judging product quality. As a Statistical Process Control (SPC) coordinator I am often asked questions such as, what is the Cpk of your process without any regard to process stability or distribution shape. One quick approach to assess the capability of your process is to calculate multiple capability indices (such as Cpk) over time and to plot these numbers on an XmR control chart, along with a histogram of the individual values. Although not an exact method, by calculating and charting capability ratios over an extended period of time instead of providing a one time value, a clearer picture of your processes' capability can be established. The following example uses 3 statistical tools in order to evaluate and display process capability of a die bond operation.

Basic Tools used to Perform the Capability Study

- $\overline{X}$ and R control chart
- XmR control chart
- Histogram

Formulas used to Perform Study

- Estimated standard deviation = $\overline{R}/d2$
- Cpk = $\overline{X}$ - LSL/3 ($\overline{R}/d2$)

Description of the Die Bond Process

An automatic die bonder picks silicon die from a wafer and places each die onto a thin layer of conductive epoxy which has been deposited on a ceramic substrate for bonding. After the die and epoxy have been cured for 1 hour, a sample is tested for bond strength. A die strength tester records the force required (in grams) to shear off a die. A 3 piece sample is sheared every 2 hours and the results are recorded on a $\overline{X}$ and R control chart (Figure 1). The resulting control chart displays statistical control and therefore qualifies for a process capability study. The capability study compares the natural process limits to the product test specification. For the die bond operation, the lower spec limit (LSL) is 400 grams. There is no upper spec limit (USL).

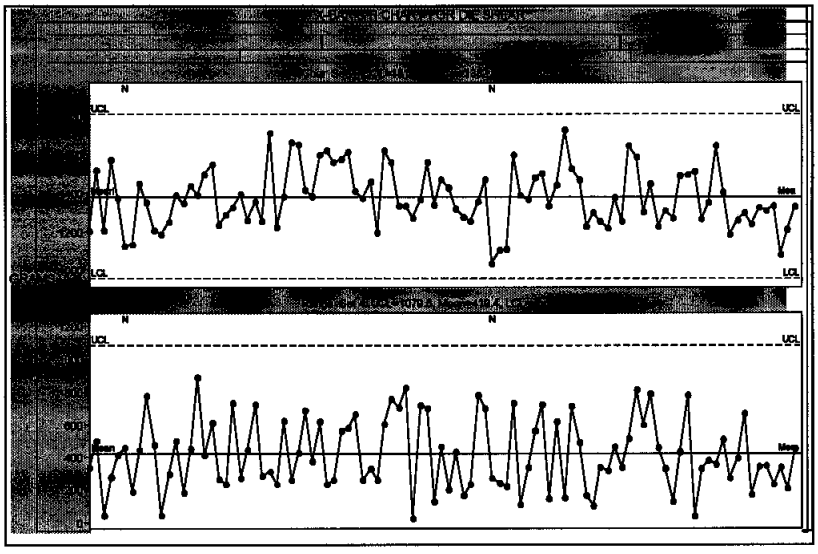

Figure 1

A Graphic Display of Process Capability for the Die Bond Operation

Step 1: Verify that the process displays a reasonable degree of statistical process control. Capability studies should only be performed on stable and predictable processes. Although there is no agreed upon definition among SPC practitioners as to what constitutes a stable process (statistical process control) because of the various detection rules and the fact that **no** process is always stable, for this example statistical process control will be defined as 35 consecutive subgroups of size 3 without any points outside the control limits (also known as Western Electric Zone Test 1). The last 100 subgroups from the die bond process show no values beyond the control limits on either the $\overline{X}$ or R control chart.

Step 2: For the die bond process each weeks' data from the $\overline{X}$ and R control chart is collected and the following statistics are calculated:

- The estimated process standard deviation ($\overline{R}/d2$)
- The process mean ($\overline{X}$)

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Step 3: Calculate a Cpk value for each weeks' data using the following formula:

$$Cpk = \overline{X} - LSL / 3(\overline{R}/d2)$$

Cpk values for weeks 1 through 8

Week 1: 1.253	Week 4: 1.201	Week 7: 1.579
Week 2: 1.900	Week 5: 1.364	Week 8: 1.454
Week 3: 1.294	Week 6: 1.242	

Step 4: Plot each weeks Cpk numbers on an Individuals Control chart (also known as a XmR chart). The X axis represents time (weeks) while the Y axis represents Cpk values (Figure 2).

Step 5: Calculate control limits and averages lines for both the X chart and the mR chart. Wait until you have collected about 8-10 weeks worth of data before setting limits. (Figure 2).

Step 6: Construct a histogram of the individual values (Figure 3). Here the last 100 subgroups (300 individual readings) covering approximately 2 months worth of data were used to generate this histogram. Note: When the raw data is skewed, as in this example, there will be a slight skew in the sample means of the control chart, resulting in control limits which are rough approximations.

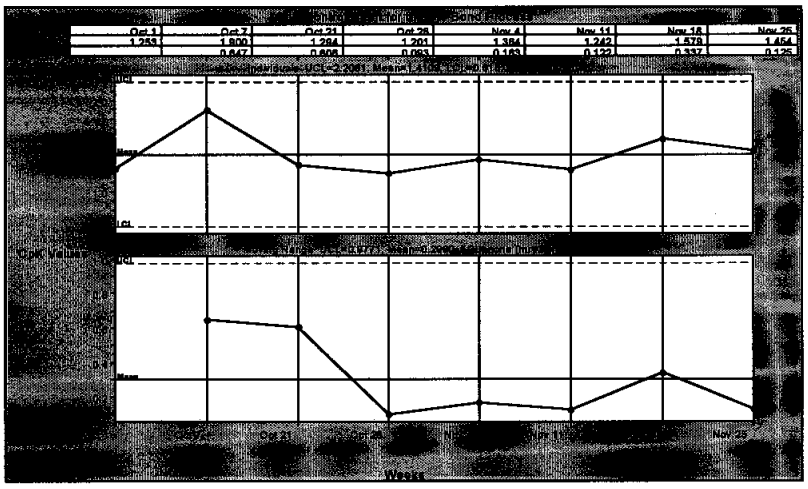

Figure 2

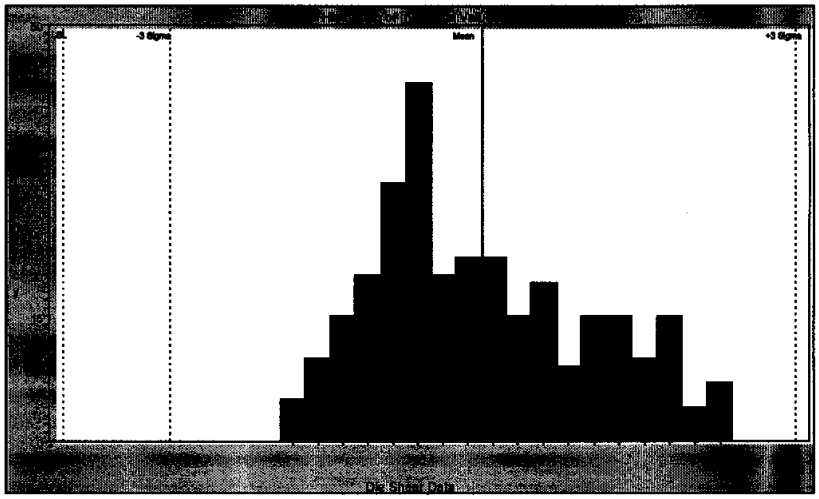

Figure 3

Interpretation of Cpk Control Chart and Histogram

The XmR control chart of the Cpk values displays a predictable capability. The mean of the X chart is 1.41. This is the best estimate of process capability for the die bond operation. The histogram of the individual values (300 readings) show all the values well within the specification limit (400 grams). It also shows a distribution shape that is skewed to the high side. This suggests that the average Cpk value of 1.41 is most likely a conservative estimate of process capability.

Summary

All statistics vary over time, capability indices such as Cpk are no exception. In order to help establish a more realistic picture of your processes' capability, one should always use multiple values. A large sample size is required to ensure a valid estimation. By using graphs which show the performance of your process over time (such as an XmR control chart) one can easily generate meaningful capability indices. In addition, knowing the shape of your distribution of data by constructing a histogram will help you to better interpret these capability values. Finally, one should always keep in mind that only stable and predictable processes can be used when one is performing a capability analysis. Δ

BIBLIOGRAPHY

Wheeler, Donald J. "Advanced Topics in Statistical Process Control" (Knoxville, Tenn: SPC Press, 1995)

Meet Your Officers for 1996-1997

Don Emerling
Chair

Don is currently the Continuous Improvement Manager for Imation Corp, a spin-off of 3M's information and imaging businesses. Prior to joining Imation, he had 20 years experience in 3M Company. Don is located in Oakdale, Minnesota.

Don has been active in the Statistics Division of ASQ since 1989. He led the tactical plan team which developed the Statistics Division "House of Education" special edition of the newsletter and one of the authors of the special publication on Statistical Thinking. He has served as the Secretary of the division for the last two years.

Don has a BS in Chemistry from the State University of New York at Brockport and a MS in Applied Statistics from the Rochester Institute of Technology (RIT). Δ

Don Williams,
Chair Elect

Don Williams is founder, president, and senior consultant of Process Improvement Consultants, a management consulting firm specializing in assisting clients in continuous improvement of their processes, products, and services. He is a former senior consultant with Process Management International, and is the founder and former director of the Center for Quality and Productivity at the University of North Texas.

He has a doctorate in mathematics and statistics from Oklahoma State University. Don is a Senior Member and previously served asCertification Chair of the Statistics Division. Δ

Bob Mitchell,
Secretary

Robert (Bob) Mitchell is a Quality Specialist with 3M Company's Personal Care & Related Products Division. Bob has held a variety of positions with increasing responsibility during his 16 year career with 3M, including Quality Assurance Engineer, Product Development, Process Development, SPC Coordinator, Statistical Consultant, Supplier Relations Manager, and Technical Supervisor. Bob is active in his community as TQM consultant.

Bob, a Senior member of ASQ, is a Certified Quality Engineer and has been active in the Statistics Division for 5 years serving as Membership Chair and Secretary. Bob has led several tactical plans including development of a member needs survey and revision of the Section Liaison & Regional Councilor job descriptions.

Bob has a B.S. in chemistry from the University of Minnesota-Morris, and is an inaugural member of 3M's "Statistical Practitioners' Forum". Δ

Janice Shade,
Treasurer

Janice Shade has worked for Nabisco for the past 14 years. She is currently the Manager of Continuous Improvement for the US Foods Group in Parsippany, New Jersey. Janice has experience in several areas of Quality; including Vendor Quality, Specifications Development, Packaging Design, Quality Systems Analysis and Statistical Process Control.

Janice has a BS degree in biology from the College of New Jersey, an MBA in Quantitative Analysis from Fairleigh Dickinson University in New Jersey, and is currently enrolled at Rutgers University in New Jersey in the Applied Statistics Program. She is a Senior Member of the American Society for Quality, a member of Strathmore's Who's Who for Business Leaders. Other Division activities include Newsletter Editor and is one of the authors of the Special Publication on Statistical Thinking. Δ

Second Annual Deming Lecture

Deming Lecture Title Announced

Dr. Noriaki Kano will present "Attractive Quality Creation" for the second annual Deming Lecture at the 1997 JSM in Anaheim, CA on Aug. 12. Dr. Kano is professor in the Department of Management Science at the Science University of Tokyo.

Kano first introduced the idea of Attractive Quality in 1979 and has since frequently spoken and written about the topic.

The story begins in the 1970s when the Konica camera company realized that to remain competitive its new camera must be something completely different from what was available at the time. However, when the R&D and Sales departments began talking to customers, it sounded like they were asking for only minor modifications in the existing model. When they went to a photo processing lab, however, they saw that there were many failures—such as blurry images, under and over exposures, and blank rolls. Working to solve these problems led to many features available in cameras today (such as auto focus, built-in-flash, automatic film winding).

As Kano points out, the key to success was to not just listen to what customers were saying but to develop a deep understanding of the customers' world and then to address these latent needs. He will build on this example and describe the fundamental notion of "attractive quality" as well as discuss how to go about achieving it.

Kano holds a Doctoral degree in engineering from the University of Tokyo. For many years, he studied directly under the supervision of Kaoru Ishikawa. Dr. Kano has been one of the most active figures in the quality movement for nearly three decades. He is involved with numerous quality organizations, consults with companies world-wide, and

Continued on page 19

STATISTICS DIVISION
AQC ANNUAL BUSINESS MEETING
Omni Rosen Hotel, Orlando, FL
MAY 5, 1997

INTRODUCTION

Beth Propst	Chair	St. Charles, IL	(315) 123-4567
Don Emerling	Chair Elect	Oakdale, MN	(612) 704-4606
Don Williams	Treasurer	Denton, TX	(940) 243-1147
Bob Mitchell	Secretary	Forest Lake, MN	(612) 736-8684
Galen Britz	Past Chair	Maplewood, MN	(612) 736-6499
Rick Lewis	Past Chair	St. Louis, MO	(314) 694-7735
Janice Shade	Newsletter Editor	Andover, NJ	(201) 682-6236
Ed Schilling	Standards Chair	Rochester, NY	(716) 889-5041
Marcey Abate	AQC Short Course Chair	Albuquerque, NM	(505) 844-9424
John Ferrante	Member	San Jose, CA	(510) 353-4846
Glen Fondaw	Member	Wichita, KS	(716) 475-6129
Joe Pignatiello	Member	Texas A&M Univ.	(409) 862-2081

I. GENERAL

Review Agenda Beth Propst

Review Mission, Vision, Principles, Strategy, Ground Rules: Beth Propst

Treasurer's Report Don Williams

Total Assets:	$320,312
Total Liabilities:	$ 1,036
Fund Balance:	$319,274 *

Includes $220,000+ for the Ott Scholarship account. Publication and distribution costs of the Newsletter is our major operating expense, and is the primary communication vehicle to our members. Expanded use of the electronic website for member communications is being explored.

Membership Report: Bob Mitchell

11,011 members as of 3/31/97
Membership Satisfaction rating = 89% approval
Mail-in membership surveys are conducted quarterly
Telephone interviews of our members will be conducted semi-annually by the Division Council
Feedback from surveys, interviews, and telephone logs will be fed into the Division planning processes.

Announcement of 1997-1998 Officers: Beth Propst

Chair:	Don Emerling
Chair-elect:	Don Williams
Secretary:	Bob Mitchell
Treasurer:	Janice Shade

Committees: Standards Committee - The Statistics Division "inherited" 3 additional Standards to shepherd: 'Q3'- Inspection of Isolated Lots; 'S2'- Introduction to Attributes Sampling, and ANSI Z1.4 & Z1.9- the ASQC equivalent to the discontinued MIL STDS 105E & 414.

Certification Committee - Continued excellent support by members to improve, revise the CQE Body of Knowledge and design of new exam questions. The CQT and CMI exams are also being reviewed.

Conference Update: Marcey Abate, AQC Short Course Chair, reported that the participants in the "Statistical Thinking for Health Care" Short Course responded very favorably to the material and that Davis Balestracci is a dynamic speaker.
Marcey Abate has volunteered to serve as the 1998 AQC Short Course Chair!

Other conference chairs:
Susan Albin- 1997 FTC Program
Rick Schleusener- 1997 Rocky Mtn Quality Conf
The 1997 FTC is in Baltimore, MD on Oct 16-17; the FTC Council Meeting is scheduled for Oct 15.
A Long Range Planning meeting will be scheduled in place of the customary FTC Tactical Planning Session.

Booth Activity: Demonstration of our www homepage and the initial pages of the Virtual Academy. Our intent is to seek input and suggestions from the participants for future improvements.

Current Tactical Plans - "Becoming More Effective at the Local Level"

1. The role of the Regional Councilor within the Statistics Division is being modified and responsibilities increased to make this position a "feeder" group to potential Division leadership.
2. A new position, the Section Liaison, is being created to assist the Regional Councilor. The Section Liaison's role will be to communicate Division products and services to the Section membership and to identify opportunities for the Division at the Section level.

"Integrate ST^2 into Education Curricula"

1. Chris Ayers is leaving as Education Chair due to limited availability
2. The Virtual Academy will be demonstrated in the booth. Volunteers are being sought to work on future modules.

"Improve the How To… Series"

1. The Publications Committee needs to be redesigned. Need to re-think the How To… series.

"Enable Broad Application of Statistical Thinking"

1. A "Special Publication" was published in 1996.
2. Last year's Stats Division-sponsored AQC session was presented by Tom Swails; a follow-up "Special Publication" is due this summer.
3. This year's AQC Short Course, "Statistical Thinking in the Health Care Industry" was presented by Davis Balestracci.
4. A Statistical Thinking "How To…" is being planned.

Tactical/Strategic Planning: Don Emerling

A 3-day Long Range Planning Session has been planned in place of the usual Tactical Planning associated with the Fall Technical Conference: October 18, 19, 20 in Baltimore

New Business: None

Benefits and Concerns: (as expressed by Division member attendees)
Benefits:

1. All the officers were present
2. Good informal communications vehicle
3. The Statistics Division has its act together

Concerns:

1. This year's Annual Open Business meeting conflicted with the extended AQC exhibit hours and an ASQC meeting.

Beth Propst adjourned the Annual Business Meeting to the Hospitality Suite.

Respectfully Submitted,
Robert Mitchell
Statistics Division Secretary

AQC Statistics Division Session Summary

A very successful two hour session, "The Power of Statistical Thinking", was held for the Statistics Division in Orlando during the Annual Quality Congress on May 6, 1997. Larry Haugh (University of Vermont) was the Session Manager and Mary Leitnaker (University of Tennessee) organized the speakers and moderated the presentation.

Marjorie Green (Allied Signal Aerospace) and Tony Cooper (Six Sigma Associates) gave a joint presentation which revolved around their personal experiences in the dramatic improvement in productivity that occurred at a manufacturing site. Designed experiments played a critical role in the overall improvement process, but a more general perspective was emphasized. Knowledge of the technical or statistical aspects of the experimentation alone would not have been sufficient in implementing the experimentation process in the manufacturing environment.

Then Wes Anderson (Eli Lilly) discussed the critical role of the measurement process in improving "value adding" manufacturing processes. The specific tools and methods used at his pharmaceutical company to evaluate and improve measurement processes were presented, including the complementary roles of the CPK and the discrimination ratio statistics.

This session was very successful in supporting the mission of our Division: "Promote statistical thinking for quality and productivity improvement". The large audience was able to ask a number of questions and to meet with the speakers after the presentations. I hope you were there; but if not. see you in Philadelphia in 1998! Δ

1997 AQC Short Course Summary on Statistical Thinking

The AQC Statistics Division sponsored short course, Statistical Thinking as a Conduit to Quality Transformation in Health Care, Service, and Management, received rave reviews from this year's attendees. The course was taught by Davis Balestracci, an accomplished instructor, author, and Statistical Specialist at HealthSystem Minnesota. Davis is a dynamic speaker whose highly interactive course emphasized the concept of variation and the use of Statistical Thinking, not merely statistical techniques. Although the short course attendees were diverse in their past experience and professions, ranging from registered nurses to US Air Force pilots, all left with an expanded awareness of the importance of becoming process-oriented in regard to problem identification, becoming chart-oriented in regard to data collection and display, and reacting appropriately in response to variation.

Topics covered in the short course are also provided in a book co-authored by Davis Balestracci, Quality Improvement: Practical Applications in Group Medical Practice, 2nd Edition, 1996 (published by the Center for Research and Ambulatory Health Care, Englewood, CO, call 303-397-7888 to order). The authors successfully demonstrate that despite perceptions of healthcare personnel, healthcare is no "different" from manufacturing, service, or administration. The first four chapters of the book develop the implications of Statistical Thinking through process-oriented thinking, understanding variation, and the intelligent use of data. Chapter 5 introduces some of the human psychological factors lurking in any organizational change process and ways to deal with them. Chapter 6 is an excellent summary of an approach to understanding variation in everyday work through the use of "tools". The emphasis is on the thinking needed to understand a situation, the tools are almost presented as afterthoughts. Chapters 7 and 8 present extremely useful techniques, run charts, control charts, and a valuable innovative adaptation of these known as "analysis of means". The ends of these chapters contain extensive and varied exercises (with detailed answers) based on real data. Chapter 9 brings it all together to show how data skills are indeed a conduit to transformation. Chapter 10 discusses learning as a process along with common training and education traps. Chapters 11 and 12 illustrate "typical" quality improvement efforts with case studies. The book concludes with an exhaustive bibliography and detailed curriculums for a transformation-based approach to quality education and another for a quality improvement seminar aimed at front-line practitioners. This book can benefit anyone involved in quality improvement regardless of past experience or industry of employment.

The Statistics Division is committed to further enabling the broad application of Statistical Thinking by informing division members, and others, as to the benefits of applying it to their work. In pursuit of this commitment, the 1995 Statistics Division AQC presentation and the 1996 Special Publication which defines and discusses the philosophy, broad application, and implementation of Statistical Thinking in an organization, is still available from the Quality Information Center (1-800-248-1946) at ASQC Headquarters for a nominal cost to cover materials and handling. Additional division sponsored instruction on Statistical Thinking is planned for the future including a pre-conference short course being offered in conjunction with the 41st Annual Fall Technical Conference (October 16-17, 1997). Watch the newsletter for further details and announcements. Δ

Ellis R. Ott Scholarships Sponsored by the Statistics Division

In grateful memory of Ellis R. Ott, Honorary and Founding Member of the American Society for Quality, the Statistics Division is pleased to announce the availability of up to three $5000 scholarships to support students who are enrolled in, or are accepted into enrollment in, a masters degree or higher program with a concentration in applied statistics and/or quality management. This includes the theory and application of statistical inference, statistical decision making, experimental design, analysis and interpretation of data, statistical process control, quality control, quality assurance, quality improvement, quality management and related fields. The emphasis is on applications as opposed to theory. Funds supporting these scholarships were donated to ASQ by the Ott Foundation with the understanding that the scholarship program would be administered by the Statistics Division.

Qualified applicants must have a grade point average of 3.25 or higher on a 4.0 scale, or equivalent standing on another scale, in any field of undergraduate study. Scholarship awards are based on demonstrated ability, academic achievement, involvement in student or professional organizations, faculty recommendations, and career objectives.

Application instructions and forms may be downloaded from:

www.asqc.org/about/divisions/stats

Alternatively, they may be requested by writing:

Lynne B. Hare
Statistical Engineering Division
Building 820, Room 353
National Institute of Standards and Technology
Gaithersburg, MD 20899-0001

Email: lynne.hare@nist.gov

Scholarship applications are due to the governing board no later than April 1, and awards are announced by June 1. Δ

Becoming More Effective at the Local Level: The Creation of Section Liaisons

The Statistics Division leadership has struggled with finding ways to be more effective at the local level. Our division has approximately 12,000 members, most of which cannot attend annual conferences and meetings across the country.

Our current infrastructure has tried to deal with local representation by assigning Regional Councilors in the 15 regions of North America as defined by ASQ. The regional councilor position has been the focus of dissatisfaction within the Statistics Division and indeed throughout ASQ. At the last several General Technical Council (GTC) meetings there have been breakout groups discussing ways to make the Regional Councilor position more effective. Regional Councilors have been challenged with big geographical areas to cover, with many Sections in each region and, in many cases, poor expectations and follow-up by the division leadership. In the Statistics Division, we created a tactical plan titled "Becoming more effective at the local level" to address the issues facing the Regional Councilors. Bob Mitchell and JL Madrigal were the primary contributors to this tactical plan and deserve the credit for the creation of a system that should make the Statistics Division much more effective at the local level.

We have decided to create a new position in the Statistics Division called Section Liaison. There are over 240 local sections of ASQ, all of which have regular section meetings and local conferences and educational offerings. We are hoping, by identifying a liaison within these sections, we will have a better way to spread the message of statistical thinking and the tools and techniques of statistics. As stated in the job description the purpose of the Section Liaison is "To communicate to Section membership and leadership the products and services that the Statistics Division has to offer; and to identify opportunities to deliver those products and services within the Section." Their primary responsibilities will include active participation in Section activities, pursuing joint activities between the Statistics Division and the Section, presenting Statistics Division products and services to the Section, participating in communication with other Section Liaisons in your region.

The regional councilor position will continue with a significantly modified role. The purpose of the regional councilors will be "To be the voice of the Section Liaisons to the Statistics Division." Regional Councilors will either be serving as an active section liaison or have been a section liaison. Their primary responsibilities will include actively recruiting Section Liaisons in their region, coordinating and leading section liaison communications in their region, and participating in communications with other regional councilors. The current leadership of the Statistics Division envisions the Regional Councilor position as a primary source of future leaders of the Statistics Division. Depending on the size of a region and the interest level, we may consider creating more than one Regional Councilor position in a given region.

If you are interested in becoming a Section Liaison or a Regional Councilor complete the job interest notice in this newsletter. Δ

Statistics Division Presents Testimonial Awards

At this year's Annual Quality Congress, the Statistics Division awarded 4 past chairs for their superior service to the Division by providing guidance in strategic planning and divisional leadership. Awardees are:

Dr. Roger W. Hoerl, General Electric R&D, Chair, 1990-91, Technometrics Management Committee, Technometrics Associate Editor, Fellow of ASQ and ASA.

Dr. Conrad A. Fung, Consultant, Chair, 1991-92, Hunter Award Committee (3 years), FTC Program Chair (2 years).

Dr. Joseph O. Voelkel, Rochester Institute of Technology, Chair, 1992-93, AQC Program Chair.

Ms. Nancy Belunis, Merck and Company, Chair, 1995-96, past Bylaws Committee Chair, Nominating Committee Chair, Auditing Committee Chair, Program Committee Chair, Strategic Planning Committee Chair, previous Newsletter Editor.

Heartfelt thanks and congratulations to them all! Δ

Thursday, October 16, 1997

7:30 Registration Desk Opens

8:00

8:00-9:00
WELCOME / PLENARY SESSION
Topic: Quality, The Future and You
Speaker: Steven P. Bailey, ASQPresident, DuPont Company
Presiding: Kymm K. Hockman, DuPont Company

9:15-10:00

A. Case Study DOE	B. Customer Satisfaction	C. Outliers
A Case Study in DOE in the Manufacturing of Film Stephen J. Caffrey, Eastman Kodak Co. Moderator: Wayne Taylor, Baxter Healthcare	**Analyzing Customer - Satisfaction Data Using Dual Scaling** Daniel R. Lawrence, Rochester Institute of Technology Moderator: Janice Shade, Nabisco, Inc.	**Identifying Multiple Outliers and Influential Subsets in Linear Regression: A Clustering Approach** David M. Sebert, Intel, Douglas C. Montgomery, Dwayne A. Rollier, Arizona State University Moderator: Bob Brill, Monsanto Chemical Group

10:00-10:30 COFFEE BREAK

10:30-12:00

A. Reliability & Measurement	B. Data Mining	C. Analysis of Experiments
Attributes of a Successful Reliability Improvement Metric John A. Conte, DSC Communications **Measurement Error Studies Using Sequential Sampling** Richard W. Andrews, University of Michigan and Andrew J. Barnett, Ford Motor Company Moderator: Michael D. Mead, Newport News Shipbuilding	**Statistical Process Control for Massive Datasets** George C. Runger, Arizona State University, Thomas R. Willemain, Rensselaer Polytechnic Institute, James M. Grayson, Augusta State University, William W. Messina, Chrysler Huntsville Electronics Division **Estimate of the Size Distribution of Particles: A Data Mining Success** Walter Liggett, Robert Fletcher, NIST Moderator: Christine Mastangelo, University of Virginia	**Follow-up Designs That Make the Most of an Initial Screening Experiment** Robert W. Mee, University of Tennessee **Identifying Ridge Behavior in Response Surfaces** Bruce Ankenman, Northwestern University, Soren Bisgaard, University of Wisconsin-Madison Moderator: Dragan Kornicer, J.M. Huber Corp.

12:15-1:45
LUNCHEON
Topic: TBD
Speaker: TBD
Presiding: Marvin D. Young, Phillip Morris, USA

2:00-3:30

A. Quality Management	B. JQT	C. Sequential Experimentation
The Fuzzy Front End of the New Product Development Process Ken Scheffel, Thomas Hsiang, Universal Foods Corporation **Polishing the Gems** Mike Donnelly, The Dow Chemical Company Moderator: Van Bowen, University of Richmond	**Design of Multi-Level Fractional-Factorial Experiments** Thomas C. Bingham, Boeing Commercial Airplane Group **Estimating Common - Cause Sigma in the Presence of Special Causes** Russell A. Boyles, Statistical Consultant Moderators: Douglas C. Montgomery, JQT Editor, Arizona State University and G. Geoffrey Vining, incoming JQT Editor, University of Florida	**Sequential Simplex Design: Modifications and New Applications** George Zeliger, Trilogy Consulting Corporation, Boris Khurgin, Anvical-Simplex **Sequential Experimental Designs for Sensitivity Experiments** Joseph O. Voelkel, Rochester Institute of Technology Moderator: Josef Schmee, Union College

5:00-5:00
W. J. YOUDEN ADDRESS
Topic: Contexts of Statistical Practice
Speaker: Gipsie Ranney, Massey Graduate School of Business, Belmont University
Presiding: Don Emerling, Imation Corp.

8:30-10:00 A. Multiresponse

Response Surface
the Use of Noise V
Kristi Griffiths, El
Raymond H. Myers
Multiresponse C
Techniques: Role
Variance on the O
Robin Wurl, Rutger
Moderator: John Da
Corning

10:30-12:00 A. Process

Applying Technol
Process Control
Douglas Wreath, W
Simplified Method
Control Chart Des
Michael D. Mead,
Shipbuilding
Moderator: Robert
Houghto
Internati

2:00-3:30 A. Design of Ex

Finding Winning
with Hyper-Greco-
James L. Hansen,
Technical Center
Running Experi
Multiple Error Ter
Experiment Is Run
James M. Lucas, J
Associates, Malco
Campbell Soup Co.
Moderator: Jim Stua
Eastma
Compar

OFFICERS OF SPONSORING ORGANIZATIONS

ASQ - C&PID
r: Marvin D. Young, Phillip Morris USA
r-Elect: Kymm K. Hockman, DuPont Co.
etary: Dorothy E. Sempolinski, Corning Inc

ASQ - STAT
Chair: Don Emerling, Imation Corp.
Chair-Elect: Don Williams, Process Improvement Consultants

ASA - SPES
Chair: Greg Piepel, Battelle-Northwest
Chair-Elect: John Cornell, University of Florida

1997 FALL

General Conference Chair: Kymm K. Hock
Local Conference Chair: Pete Kosmides,
Treasurer: Mary Ann Gorko, DuPont Merc
Registration: Marg Bailey, Patterson-Schw

Inner Harbor Hotel, Baltimore, Maryland

, October 17, 1997

gistration Desk Opens

B. Sources of Variation	C. Optimization
Variation Reduction in Multi-Stage Processes R. Agrawal, GE Corporate Research and Development, J.F. Lawless, R.J. MacKay, University of Waterloo	**A Data-Analytic Approach to Global Optimization** Matthias Schonlau, William J. Welch, University of Waterloo, Donald Jones, General Motors
Identifying Sources of Variation in Sheet Metal Stamping Karl D. Majeske, Jay Baron, University of Michigan, Patrick Hammett, University of Michigan	**Simulation-Based Optimization of Complex Processes Via The Simultaneous Perturbation Method** James C. Spall, The Johns Hopkins University
Moderator: David Rumpf, GE Aircraft Engines	Moderator: Peter Fortini, Cytec Industries

COFFEE BREAK

B. Measurement	C. Technometrics
Implementing GR&R for a Semiconductor Wafer Fab Start Up Joseph Conklin, Jennifer Trittschuh, TwinStar Semiconductor	**A Systematic Approach to the Analysis of Complex Interaction Patterns in a 2-Level Factorial Design** James J. Filliben, NIST, Ker-Chau Li, UCLA
ESD and Q-Q Plot: Two Prerequisite Statistical Treatments for Interlaboratory Exchange Data Alex T. C. Lau, Imperial Oil, Canada	**Monitoring Wafer Map Data from Integrated Circuit Fabrication Processes for Spatial Clustered Defects** Mark H. Hansen, Bell Laboratories - Lucent Technologies, Vijayan N. Nair, University of Michigan, David J. Friedman, Integral, Inc.
Moderator: Bryan Olin, The Procter & Gamble Company	Moderator: Max D. Morris, Editor Technometrics, Oak Ridge National Laboratory

LUNCHEON
Topic: Massive Data Problems
Jon Kettenring, ASA President, Bellcore
ding: Greg Piepel, Battelle-Northwest

B. Health Care	C. Multivariate Process Control
The Role of Performance Measurement in Assuring Managed Care Quality Randall K. Spoeri, NYL Care Health Plans, Inc.	**Modeling and Monitoring of Multivariable Dynamical Systems under Feedback Via Canonical Variate Analysis** Wallace E. Larimore, Adaptics, Inc., Dale E. Seborg, Yi Wang, University of California
Health Care Quality Tools, Techniques and Applications David Simmons, Health Care Engineering, Inc.	**Nonparametric Control Procedures for Multivariate Processes** Carlos D. Paternina, Eduardo Lerin, Tapas K. Das, University of South Florida
Moderator: Melvin Alexander, GloboMax	Moderator: Stefan Steiner, University of Waterloo

CAL CONFERENCE COMMITTEE

any Lloyd Dixon, Northrop Grumman, Beth Reigel, Environmental Elements, Frank Vojik. SCM Chemicals
Program/ASQ-C&PID: Sharon Fronheiser, Eastman Kodak Co.
Program/ASA-SPES: Randy Tobias, SAS Institute, Inc.

CONFERENCE REGISTRATION FORM

41st Annual Fall Technical Conference

Attention: M. A. Bailey
P.O. Box 249
Hockessin, DE 19707-0249

Please circle the sessions that you will most likely attend:

Thursday, October 16: 1A 1B 1C 2A 2B 2C 3A 3B 3
Friday, October 17: 1A 1B 1C 2A 2B 2C 3A 3B 3

Name:_____
Badge Name:_____
Company:_____
Address:_____
City/State/Zip:_____
Telephone:_____

Please circle whichever categories apply:

I am a: Member, Senior, Fellow, of ASQ
I am a: Member, Senior, Fellow, of ASA
I am in Division: C&PID STAT ASA-SPES
I am *NOT* a member of ASQ or ASA

Registration Fees:

Please submit one form for each person attending.

Two Days.....$190___
Thursday, October 16th only.....$150___
Friday, October 17th only.....$150___
Student (ID Required).....$ 75___
Late Registration Fee (after September 15th).....$ 10___

Pre-Conference Short Courses, October 15th
Using Designed Experiments to Shrink Health Care Costs .$150___
Course Text (ASCQ members).....$ 36___
Course Text (non-ASQ members) .....$ 40___
How to Apply Statistical Thinking to Improve Results.....$150___
Tour of Baltimore, October 16th.....$ 45___
Habor Dinner Cruise, October 16th.....$ 40___
Tour of Annapolis, October 17th.....$ 45___
Total .....$_____

MAKE CHECKS PAYABLE TO FTC-1997.
No credit cards/purchase orders accepted.
All fees payable in U.S. Dollars only.

Federal Tax ID #390912502 DETACH HER

HOTEL REGISTRATION FORM

41st Annual Fall Technical Conference

Mail to: Omni Inner Harbor Hotel, Reservation Dept.
101 W. Fayette Street • Baltimore, MD 2120
(410) 752-1100

Name: _____
Company:_____
Address:_____
City/State/Zip: _____
Telephone:_____
Please reserve _____ (# of rooms) for _____ (# of peop
For arrival on _____Depart on_____
Name(s) of person(s) sharing accommodations:
_____
_____
Check or money order enclosed in amount of $ _____
Credit Card # _____- Exp. Date _____
Circle One: AMEX MasterCard VISA Other (specify) _____
I authorize the Omni Inner Harbor Hotel to charge my account for o night's deposit and all applicable taxes.

Signature

INCOMING CHAIR'S MESSAGE

Continued from page 5

A lot of the activity of Division leadership is focused on integrating and planning. We just completed a two day operational planning meeting where we laid out all of the work that needs to be accomplished to support the FTC and AQC and to publish our newsletters. We also started some detailed planning for a long range planning meeting this fall, were we will revisit the mission, vision, principles, and strategy of the Division and align our strategic and tactical plans to our mission and vision. We have a current five year strategic plan, which will be reviewed, revised, and updated during this long range planning meeting. At every FTC and AQC we have a tactical planning meeting to review the work accomplished and identify new opportunities and opportunities for improvement. I really think the past leadership of the Division has done a great job at setting up the systems, processes, and improvement cycle to deliver on the "integration and planning" part of the job. All I have to do is not screw it up!

Finally, I'd like to address the subject of evaluation. I believe evaluation is the "job" of all of us, but mostly it's the "job" of the members of the Division. The leaders of the Division can evaluate how proposed strategies, tactics, products and services fit with the mission and vision of the Division. But the members of the Division must evaluate how well they believe that the selected strategies, tactics, products, and services fill their individual need to be more effective in their lives. The Statistics Division of ASQ is a big organization, about 12,000 of you have chosen to become members of the division. At a very basic level, the purpose of any volunteer organization is to add value to every person who chooses to become a member. Otherwise, why be a member. You have made a decision to spend some of your money on membership with the tacit assumption that you will receive sufficient benefit for that money. This is a definition of value. One of our members, Bert Gunter, sent the officers an e-mail last year that challenged our focus. A phrase from that letter sticks in my mind as I think about the purpose of a division and the "job" of the Chair. He wrote, "What we seem to lack is the foggiest idea of why people join, stay, or leave the division…" That seems to be a real important statement. Those of us involved in the leadership of the Division all would respond (with the appropriate amount of indignation!) that we have spent a great deal of time and energy trying to understand members reasons for joining, staying, or leaving but I wonder if Bert isn't right, that we don't have the foggiest idea of why. And maybe the "why" can be discovered by probing the purpose of a division. So I'm asking you, the current members of the Statistics Division; What is the purpose of a division? Why do you chose to stay as a member of the Statistics Division? Is it inertia? – I just fill out the ASQ membership form the same every year. Or do you make a value decision? – I choose to spend my $8.00 on the Statistics Division because it delivers more than $8.00 in benefit to me. Assuming you are in the second group, What benefits do you receive? What do you think of our current mission and vision? If you were the Chair of this Division, what is the one change you would make in the first week to better serve the members? What other questions come to your mind?

I encourage you to send me answers, questions, or comments to any of these questions or call me to discuss them. Send me your answers, questions, comments, etc. I can be reached by e-mail – dwemerling@imation.com, by surface mail – 1 Imation Place, Oakdale, MN 55128, or by phone – 612-704-4606.

I've decided! My job is to work with as many other members (yes, I'm a member too) as possible to make this Division a valuable resource for all of us and, through our work, make this Division a valuable resource to our society. Help me do "this job." Δ

41st Annual Fall Technical Conference
PRE-CONFERENCE SHORT COURSES

The Statistics Division will sponsor two short courses on Wednesday, October 15th, from 8:30 a.m. to 5:00 p.m. The $150 fee for each course includes coffee breaks and lunch. Registration is limited, so

Register Early!!

Using Designed Experiments to Shrink Health Care Costs

M. Daniel Sloan, Quality Health Systems of America, Inc.

During the first fifteen minutes of this course, participants will complete a factorial experiment, including data analysis! No algebra. No computers. No fooling. Sloan's unique model makes it possible for managers, nurses, and doctors to use classical, designed experiments in all aspects of health care. With the required course text, **"Using Designed Experiments to Shrink Health Care Costs"**, (Quality Press, 1997), participants will spend the day mastering designed experiment principles for health care management. Case study and success stories will be presented. (Participants are encouraged to bring a ruler, a pair of scissors, a virus free 3.5" data disk, and a hand held calculator.)

How to Apply Statistical Thinking Effectively

Lynne Hare, NIST, Roger Hoerl, General Electric Company, and Ron Snee, Bell Atlantic Corporation.

The purpose of this course is to better prepare attendees to apply Statistical Thinking effectively within their own organizations. It will begin by discussing the need for widespread understanding of Statistical Thinking as a precursor to utilizing formal statistical methods properly, in a systematic way. The philosophy will be formally defined, and contrasted with statistical methods per se. Attendees will work in teams to address problems, and suggest specific ways in which Statistical Thinking could be applied more broadly in business, government or academia. Suggestions for overcoming typical barriers in its application will also be provided. Lastly, each attendee will develop a plan to increase the application of Statistical Thinking in their own organization. Δ

Mini Paper

A Note On EWMA

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Part I

1. Introduction

It is well known in the world of statistics that the Exponentially Weighted Moving Averages (EWMA) was initially developed as an empirical model for forecasting based on real-life data. It can also be shown that EWMA is a very special case of the Auto Regressive Moving Average (ARMA) model. The relationship between ARMA and EWMA was addressed by many and discussions on this can be found in a plethora of articles and books (see for instance, Box and Jenkins 1970, 176, Pandit and Wu 1983, Chatfield 1983).

EWMA has been found to be a powerful and sensitive method which can be used as an effective process monitoring technique, as well as a useful prediction tool for short term forecasting. It is based on exponential smoothing.

In order to use exponential smoothing, (sometimes also called Geometric smoothing), we assume that the data set is free of any trends but there are short oscillations present. Time-series found in real life often contain components such as seasonal patterns and trends, which can be measured. Established filtering techniques are available to reduce or to remove these components from the data that produces a trend free and stationary time series. The EWMA, an asymmetric filter, is computed by taking a weighted average of past observations with progressively smaller weights over time. This procedure is effective, when the zone of acceptance for processes is very narrow, and we need a more sensitive method to detect smaller shifts. On the other hand, if the acceptance zone of the process is not that narrow, using EWMA to detect small shifts will not be an efficient or an economical method. The most important advantage of EWMA comes from its flexibility in using data on the history of the process. This is done by selecting a weight factor and effectively using it to achieve the desired balance between the older data and more recent observations.

Ordinarily, the weight factor or the prediction parameter is selected arbitrarily or on the basis of some strong intuition or "gut" feelings. In order to come up with a reasonably good prediction, the weight factor needs to be selected more precisely. Different approaches have been developed to do this. In this short note, the prediction parameter is selected by minimizing error in the predicted values, which seems to be a simple approach for practice purposes.

2. EWMA

The EWMA, in its basic form, is computed by choosing a number ν, where $0 < \nu < 1$ such that for ν^j, we can have the decaying or decreasing weights by adjusting the value of ν carefully. However, if we multiplied x_{t-j}, by these weights ν^j and added them to get the forecast, it is no longer an average, since the weights do not add to one ($\sum \nu^j \neq 1$). In fact, they add to $1/1 - \nu$). So, if we want a weighted average, we should take the weights $(1 - \nu)\nu^j$, which add to one. We can then write a recursive relationship between an observation x_{t+1}, at time instant $t + 1$ as a function of previous observations x_{t-j} for all j,

$$x_{t+1} = \sum_{j=0} (1 - \nu)\, \nu^j\, x_{t-j}$$

or

$$x_{t+1} = \sum_{i=0} (1 - \gamma)^j\, \gamma\, x_{t-j}$$

By substituting $\gamma = 1 - \nu$, $0 < \gamma < 1$

This simple mathematical manipulation allows us to expand the power series. It therefore ensures exponentially decaying weights assigned to the observations and the sum of weights equal to unity. This exercise can be found in any time-series book with a discussion on EWMA. Prediction of a new forecast can be easily generated by using the recursive nature of EWMA updating the old forecast and it is not necessary to use the entire past data set every time. The time series model for which exponential smoothing yields optimal predictions was pointed out by Muth (1960).

The statistic Z_t, is a weighted average of the current observation and all the past observations. This Z_t is plotted in the EWMA chart, and is defined by the recursive relationship:

$$Z_t = (1 - \gamma)Z_{t-1} + \gamma X_t,\ 0 < \gamma < 1$$

where X_t is the sample observation at time t. It has been assigned a weight factor, γ. The weighted Z_t defined above has the auto regressive nature and is a normally distributed variable (by central limit theorem). An EWMA chart with two-sided control limits can then be constructed to monitor Z_t.

In plotting the EWMA control chart, the central line represents the target value μ_0 for the process average μ in a controlled process with no fluctuations. Also, $E(Z_t) = \mu$.

The upper and the lower control limits are plotted at the levels $\mu \pm \kappa\sigma_{xt,}$ where κ denotes a suitable constant and $\sigma_{x,}$ the standard deviation of the process. The variance $\sigma^2_{z\,t}$ of Z_t can be derived to be as

$$\mathrm{Var}(Z_t) = \sigma^2_{zt} = \sigma^2_x\left(\frac{\gamma}{2-\gamma}\right).(1-(1-\gamma)^{2t}),$$

and the two-sided EWMA 3-sigma control limits are given by

$\mu \pm 3\sigma_{\bar{x}} \sqrt{\frac{\gamma}{2-\gamma}}$ in the limiting form as $t \to \infty$ (see reference Roberts 1959, Montgomery 1996).

Remark 1 It might be worthwhile to mention, that in a data set from a given process, the observation might be an individual observation at time t or an average of a sample

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or a subgroup at time t. In case, X_t represents the average of a subgroup, the standard deviation used in the control limits have to be modified based on the subgroup size. This situation will occur, when the EWMA chart is being constructed by modifying a Shewhart control chart already in use and the initial data was collected in the form of subgroups.

2.1 An Application in Production

We now describe an easy application of EWMA for short prediction in an industrial setting, in the line of Hunter (1995).

In this application, we need to make a forecast for the average weekly production of a particular consumer item. A Shewhart chart was already in use to monitor this average. By the nature of this average, older observations are less important to the forecast than the recent ones. To express this mathematically, let us assume that the next week's forecast values for the average production is given by

- $\hat{Y}_{t+1} = \hat{Y}_t + \gamma e^t = \hat{Y}_t + \gamma (Y_t - \hat{Y}_t)$

Where,

- Y_t = current week's actual average production
- $\hat{Y}_t$ = current week's predicted average production
- $\hat{Y}_{t+1}$ = next week's predicted average prediction
- e_t = current week's error in prediction, $e_t = Y_t - \hat{Y}_t$

In this simple application, we assume that a weighting factor of $\gamma = 0.5$ is selected to weight the error. We also assume that a predicted value (which can also be a target value) for the current week is given as 40 units. We set the initial predicted or target value as $\hat{Y}_1 = 40$. Suppose the actual observed value on the current average production is $Y_t = 42$ units. So the first predicted value is given by the relationship as

- $\hat{Y}_2 = 40 + 0.5(42 - 40) = 41.$

Suppose that the next observation is given by $Y_2 = 45$, then

- $\hat{Y}_3 = 41 + 0.5(45 - 41) = 43.$

These observed and predicted values can be plotted on a graduated chart to show the relationship between them.

In this application, the 3σ limits (Shewhart) for the observed values were 40 ± 12, where the average weekly production, Y_t had a standard deviation of 4. The modified 3σ limits for the EWMA would be 40 ± 4.63 with the weight factor $\gamma = 0.5$. We find that these are much tighter limits. In using the EWMA, the Shewhart limits become less and less important.

In this application, the initial purpose was to use the EWMA to get a forecast value and by choosing $\gamma = 0.5$ midway between 0 and 1, ensures a fairly acceptable prediction. [This also happens to be consistent with the fact that EWMA lies between the CUSUM and the Shewhart charts (see Part II)]. However, the selection is still arbitrary. In order to select γ, one looks for a simple and practical method and how to make this selection.

In Part II of this article, we discuss this with an application, and include a list of references cited in the text of this note.

Part II

1. How to Select the Weight Factor?

In selecting the weight factor, one makes a decision on how much of the previous data influences the present decision. The larger the value of γ, the smaller is the effect of the past history of the process and the more recent values become more important for the prediction process. If we set the weight factor, γ, equal to 1, then the properties of the EWMA control chart resemble more and more that of the Shewhart chart. The closer γ is to 0, the more the properties resemble the Cumulative Sum Control Chart (CUSUM) chart. From this, we can safely conclude that the EWMA chart lies in between the Shewhart chart and the CUSUM chart, and one can choose its position between the two charts, by adjusting the weighting factor, γ. Values of the weight factor γ depend on the properties of a given time-series. Lower values, say between 0.1 and 0.3 are used in a prediction or forecast where past observations are given more importance than the recent observations. It is a common practice to select a high value of γ closer to one, when the most recent observation will have the maximum weight.

One practical approach is to focus on the prediction error generated in the prediction process and to select a value of γ, which produces the minimum mean square error, $\sum e^2$ (MSE) (see Box and Jenkins, 1970, 1976, Chatfield, 1983). This is similar to the least square method which is commonly used to estimate the parameters in a regression fitting. In the following section, summary of an application is described in which the value of γ has been selected by minimizing the MSE.

1.1 A Second Application

One area in which we wanted to use the EWMA technique for short term prediction was on a set of data from the NASDAQ stock volumes, a well accepted example of a time-series with Auto Regression properties. These two components are the time-sequenced average daily values (D) and the Closing Values (C). The data set showed no trends and very few erratic oscillations. We first tabulated (Table 1.1) and plotted (Fig. 1.1) a sample of the data from these two series to study their nature, and found that they have slightly different patterns as was intuitively expected.

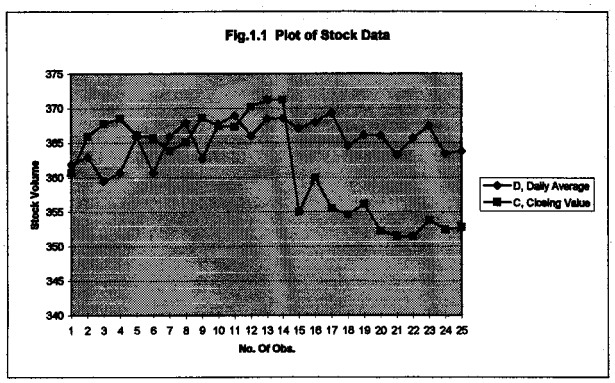

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Table 1.1 Data on Daily (D) and Closing (C)

#	Daily-D	Close-C
1	361.90	360.70
2	363.0	365.9
3	359.5	367.7
4	360.7	368.5
5	365.9	366.1
6	360.7	365.7
7	365.9	363.8
8	367.9	365.1
9	362.7	368.6
10	367.7	367.4
11	368.9	367.3
12	366.0	370.2
13	368.5	371.2
14	368.50	371.20
15	367.0	355.0
16	368.0	359.9
17	369.4	355.5
18	364.5	354.6
19	366.1	356.1
20	366.1	352.2
21	363.2	351.4
22	365.7	351.4
23	367.4	353.8
24	363.4	352.4
25	363.8	352.7

A short program (in C language) was written to compute the predicted values for C and D. The program first generates a series of values for γ, and then computes the predicted values for each of the observed values for C and D, and then interactively generates individual plots for these predicted values for all $\gamma = 0.01$ to 0.91 at an interval of 0.1. These plots demonstrated different patterns for the predicted values and showed how the oscillations slowly smoothed out with the change in the γ values. The program also computed the MSE for the C–values and the D–value MSEs, which were stored in a data file and then plotted with the help of an interactive graphical software package.

The plots and the analysis clearly displayed the patterns of the mean square error (MSE). The arrows in Table 1.2, indicate the values which appear as the minimum points in the plot (Fig. 1.2). The corresponding values of γ, indicated by the asterisk, *, are the values selected as the prediction parameters.

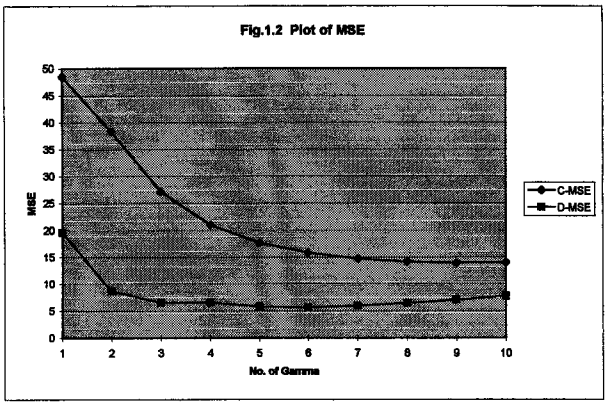

Table 1.2 MSE for C and D

γ	MSE–C	MSE–D
0.01	48.53	19.58
0.11	38.37	08.61
0.21	27.15	06.52
0.31	20.97	06.52
0.41	17.64	05.77
0.51*	15.75	05.57 ←
0.61	14.67	05.97
0.71	14.09	06.43
0.81*	13.91 ←	07.02
0.91	14.05	07.74

2. Concluding Remarks

The minimum error points in Table 1.2 corresponded to $\gamma = 0.81$ for C–values and $\gamma = 0.51$ for the D–values, show that these values correspond to the 9th and the 6th values of γ in the MSE plot given in Fig. 1.2. This concludes the C–value has more weight to the recent observations than the D–value does. Such conclusion can also be intuitively agreed upon. A closing value ought to have more weight toward the next prediction than the daily average value.

Main interest in this note has been in using EWMA for short term prediction, where large amount of data satisfying basic assumptions was available. In recent years, additional techniques based on neural network (generalized non-linear models) are being explored by many for time-series data form the financial world.

Simulation was not used in this method. A fairly large number of data points were available from the same process. Plotting control charts was not one of the objectives, but we do mention in subsection 2.1 of Part I, how the weight factor relates to the control limits, in case one is interested in doing so.

Over the years, numerous papers based on EWMA have been published in statistical journals and it is a formidable task to include an exhaustive bibliography here. Books and articles cited in the body of the text are listed in the references.

A short talk based on this topic was presented at the Santa Clara ASQC section in 1994. The author may be contacted for further details on this study in which other methods were compared to the EWMA predictions.

The author wishes to acknowledge helpful discussions with her husband Sailes K. Sengupta, Ph.D. Δ

3. References

1. Box, G.E.P. and Jenkins, G.M. (1970, 1976) Time-Series Analysis, Forecasting and Control, Holden Day Publications, San Francisco, CA.
2. Chatfield, C. (1984) The Analysis of Time-Series-An Introduction. Third Edition, Chapman and Hall, New York, NY.
3. Hunter, Stuart (1995) "Just What Does An EWMA Do?" Mini-paper, Part 1 & 2, ASQC Statistics Division Newsletter, N.J.
4. Montgomery, Douglas (1996), Introduction to Statistical Quality Control. Third Edition, John Wiley & Sons, New York, NY.
5. Muth, J.F. (1960), "Optimal Properties of Exponentially Weighted Forecasts." J. Am. Stat. Assoc., V.55, P. 299.
6. Pandit, S.M. and Wu S.M. (1983), Time-Series and Systems Analysis with Applications. John Wiley & Sons, New York.
7. Roberts, S.W. (1959), "Control Chart Tests Based on Geometric Moving Averages." Technometrics, pp. 239-250.

Joint Statistical Meeting Continuing Education Courses

The Quality and Productivity section of the American Statistical Association will offer seven continuing education courses at the 1997 Joint Statistical Meetings in Anaheim this August. A brief description of the courses follows. Please visit the Q&P page on the internet for more complete information and full abstracts at http://funnelweb.utcc.utk.edu/~asaqp

Designs and Models for Experiments with Mixtures
August 10, 8:30 AM - 5:00 PM
Optional evening session 6:30 PM - 8:00 PM

A one day course by John Cornell, Univ. of Florida and Greg Piepel, Battelle. This course will provide an overview of various approaches and techniques used in designing mixture experiments and analyzing the resulting data. The course will conclude with an evening consulting/discussion session using real examples submitted by attendees.

Analytical Tools for Assessing and Using Customer Satisfaction Surveys
August 13, 8:30 AM - 12:30 PM

A half day course by Susan Devlin, Bellcore. This course will explore a variety of analytical methods for extracting information from customer quality assessments. Using examples drawn primarily from communications service companies, the fundamentals of these methods will be reviewed with an emphasis on their strengths and weaknesses for supporting business decisions.

How to Create a Course Homepage that Makes Classroom Instruction More Effective
August 12, 9:00 AM - 1:00 PM

A half day workshop by RAMon Leon and Lance Milner, Univ. of Tennessee. The many advantages of having a course homepage will be discussed on the basis of real examples. Participants will learn how to create a course homepage using new easy-to-use authoring tools. Techniques for working with images, mathematical notation, and computer screen shots will be presented.

Creative Methods for Teaching and Explaining Statistics and Quality
August 11, 9:00 AM - 5:00 PM

A one day workshop by Carl Wetzstein and Sharon Fronheiser, Eastman Kodak Company. Anyone who teaches or needs to explain statistics and quality tools has struggled with the fact people are less than enthusiastic about these topics. What can we do? Let people discover that statistics and quality methods do apply to their work, are useful and that learning them can be fun! Statistics can be fun! In this workshop you will participate in a large variety of activities that you can use to teach or explain SPC methods, basic statistics and design of experiments.

Statistical Models for the Reliability of Repairable Systems
August 12, 1:00 PM - 5:00 PM

A half day course by Steve Rigdon, Southern Illinois Univ. at Edwardsville. This course will cover the differences in notation and terminology between repairable and nonrepairable systems. Several models for repairable systems will be discussed. In addition, statistical inference for the power law process will be examined in detail. Inference for other distributions will also be covered. Graphical methods of displaying data from repairable systems will be emphasized.

Hotelling's T-Square: A Control Statistic for Multivariate Processes
August 9, 9:00 AM - 5:00 PM

A one day course by Robert Mason, Southwest Research Institute, John Young and M. Pam Langley, McNeese State Univ. This course focuses on using industrial examples to demonstrate the versatility of the T-Square as a control statistic for multivariate processes. Recent developments in the use of the T-Square charting statistic will be explored, and the various aspects of this statistic will be examined using computer software. Students will be shown how to apply and interpret the T-Square procedure.

A Problem Resolution Toolkit: Invention Machine Lab (IMLab) Software Tools to Aid Concept Selection for Robust Design
August 14, 8:30 AM - 12:30 PM

A half day computer technology workshop by Val Tsourikov, Invention Machine Lab, and Stephen A. Zayac, Ford motor Co. The emphasis of this course will be on application to practical problems and all concepts will be illustrated using real world examples. The workshop is intended for the applied statistician wanting to master the toolkit's functional analysis process. Δ

Fall Technical Conference Scholarships

This year, the Statistics Division will offer up to 5 scholarships to cover the cost of attending the Fall Technical Conference in Baltimore. The conference will be held on October 16-17, 1997. The conference is sponsored jointly by the Chemical and Process Industries Division and the Statistics Division of ASQ, and the Section on Physical and Engineering Sciences of the American Statistical Association.

Scholarship covered expenses include the cost of conference registration, meals (up to $50), lodging for two nights and transportation to and from the conference location. To qualify, applicants must be currently enrolled in undergraduate or graduate program in statistics or quality management. Recipients may be asked to serve as room monitors for a session at the conference and will be asked to write a brief article about their conference experience for this newsletter.

Applicants should send a letter of interest together with a letter of recommendation from a major professor by August 1 to:

Lynne Hare
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Building 820, Room 353
Gaithersburg, MD 20899

Notifications will be mailed by September 1. Δ

SECOND ANNUAL DEMING LECTURE

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works as both an academic and a practitioner to further enhance our understanding of quality and how to achieve it.

Kano Named Second Deming Lecturer

Dr. Noriaki Kano has been selected to give the second annual Deming Lecture at the JSM on 12 August 1997 in Anaheim, CA. This selection is particularly appropriate in light of Dr. Deming's long association with the Japanese quality movement.

Over the course of nearly three decades, Dr. Kano has established a reputation well beyond his native Japan as a premiere practitioner and academician in the quality and productivity arena. Indeed, he is a much sought-after management counselor throughout the world. He has worked closely with leading Japanese corporations, including such household names as Honda Motors, Komatsu, and Matsushita. In the U.S., he was one of the lead consultants for Florida Power & Light when it became the first non-Japanese company to win the coveted Deming Prize. Kano has also consulted with Hewlett-Packard, Goodyear, Xerox, 3M, and a number of other leading American firms. In addition, he has worked with other firms throughout Asia, Europe, and Latin America.

A living example of Dr. Deming's principle of balancing theory and practice, Kano has maintained an active academic career. He received his Doctoral degree in Engineering from the University of Tokyo in 1970. From 1970 until 1982 he was with the faculty of the University of Electro-Communications. He then moved to Department of Management Science at the Science University of Tokyo where he became a full professor and then head of the department in 1988. Six of his papers and one book have received Japan's prestigious Nikkei Quality Control Literature Prize.

Kano has been a member of Japan's highly esteemed Deming Prize Committee since 1973. He is perhaps best known internationally for his work on "Attractive Quality Creation", developed in the 1970s and published in 1984. This work has had a profound effect on how organizations define and understand quality from a customer's viewpoint. As part of this work, he defines three levels of customer perceptions, including aspects that "must be" present to avoid disappointment, those where "more is better", and those that result in delight if they are there at all.

He is currently a councilor for the Japanese Union of Scientists and Engineers (JUSE), where he has also served as a Board member and editor of Hinshitsu. He is on the International Editorial Board for the European Organization for Quality and has supported numerous organizations in Central and South America. In 1995, he became a fellow of the American Society for Quality Control.

Kano's influence around the world takes on other forms as well. He is a frequent keynote speaker and invited lecturer for quality and productivity organizations on four continents. He has played an active role in many international agencies including the United Nations Industrial Development Organization, the Agency for Overseas Technical Scholarship, and the International Standards Organization.

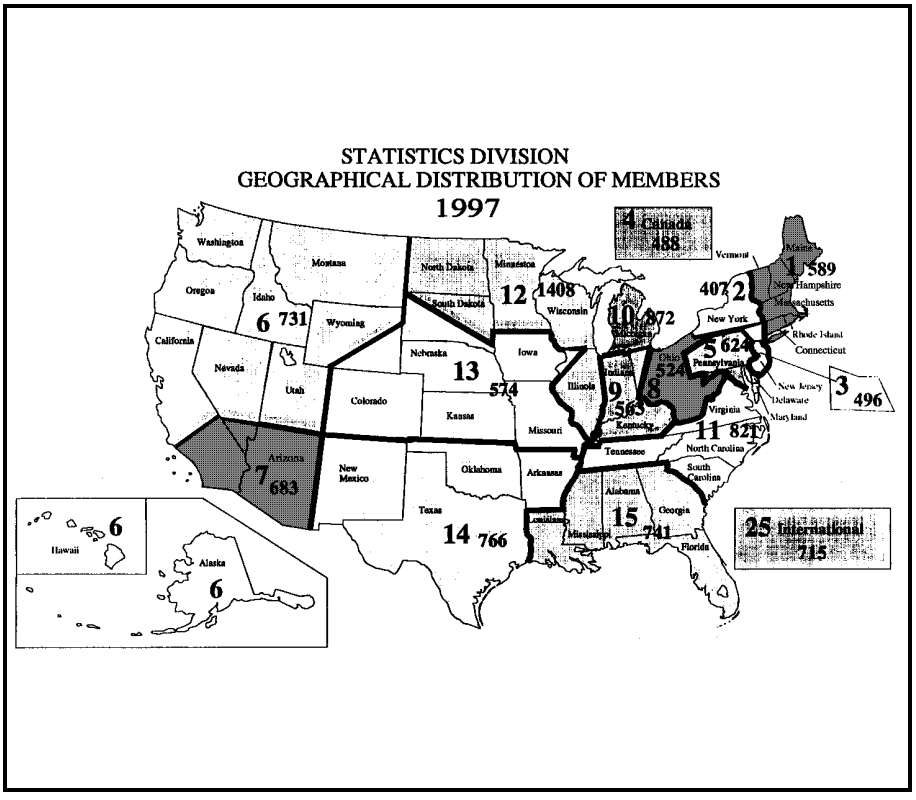
"Dr. Kano is one the most important management consultants in the world today," says Dr. Brian Joiner, last year's Deming Lecturer and now chair of the Deming Lecture Committee. "We are honored to recognize his contributions to both the theory and practice of management." Δ

Membership Report

For the first time in the last five years, the total number of members of our division (July 1996 - June 1997) did not decrease. Statistical analyses of the data suggest the number of members is leveling off. We believe that this is a result of Division efforts to provide better services to our members.

Beginning on July 1, we will have local section representatives. This new position will allow us to further increase communication with all of you, our members. We need your support. If you are interested in becoming one of the local section representatives, please complete the open position request form and forward to Beth Propst (Past Chair).

Finally, I would like to take this opportunity to thank all the members (and non-member friends) that stopped by our booth to experience our Virtual Academy. Your comments and suggestions were greatly appreciated. Δ



SPAIG Workshop A Success

The Statistics Partnerships among Academe, Industry, & Government (SPAIG) Workshop was held in Raleigh, NC on 30-31 May. Eighty senior-level statisticians from academe, industry, and government attended, with an approximately equal number attending from academe and industry/government organizations.

Bob Starbuck (Wyeth-Ayerst) opened the workshop by mentioning the opportunities that could be achieved by better and more widespread partnering relationships, including expanding and improving the use of statistics; increasing the value of statistics to society; improving the educational experience of students; improving the career decision process & outcome; increasing communications among all statisticians; enabling greater awareness of each other's needs, issues, & concerns; improving the self-image of statisticians; making statistics a more rewarding profession; and ensuring that statistics is a growth field.

Ron Iman (Southwest Technology Consultants) provided an overview of partnering models and the great success that partnering has had and is having in the semiconductor industry. Ron presented several partnering models and also provided data that show that over 90% of new PhD statisticians are employed in industry and government rather than in academe, thereby emphasizing the importance of training statisticians to achieve the skills required to be successful in industry and government.

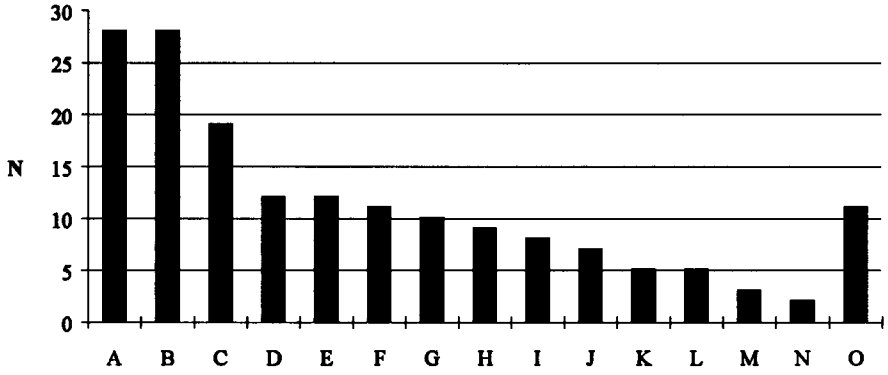
G. Rex Bryce (Brigham Young Univ.), Dean Isaacson (Iowa State Univ.), John Spurrier (Univ. of South Carolina), and Bob Hogg (Univ. of Iowa) followed with success stories of partnering with industry through internships, partnering with other departments on campus, a capstone course in statistics, and partnering with engineering, respectively. The needs of industry, government, and academe were then expressed by Gene Meieran (Intel Corp.), Cynthia Clark (US Bureau of Census), and Dan Solomon (NC State Univ.).

Ron Snee (NYNEX) presented the keynote speech He pointed out that global competition and advances in computer technology are forcing changes in how US corporations are managed. The result is an expanding role for statistics and statisticians. This expansion also results in changing roles for statisticians because the needs of industry have changed. In short, the needs are managerial as well as technical. The managerial needs are less well defined and are challenging to satisfy.

Ron concluded by saying that partnering with industry is needed to effectively and efficiently identify how to align statistical education and research with these new needs. Personal change is required to take advantage of the expanding role. We are reminded that those who do not respond to their changing world will have decreasing influence in their world. George Bernard Shaw noted that "If you can't change your mind, you can't change anything."

Workshop participants were asked to identify the consequences of maintaining the status quo, i.e., doing nothing to improve the partnering relationships between academe and industry/government. Their responses are summarized in the following Pareto chart:

Consequences of Maintaining Status Quo of Statistical Partnering



A Statistics as a discipline viewed as irrelevant; decline in influence
B Non statisticians will do statistics
C Decline or elimination of statistics departments & professional societies
D Students not prepared to solve future problems
E Slow growth in technical advances in statistics
F Industry/government will do in-house statistics training
G Reduced contribution of statistics to society
H Failure to attract good students
I Reduced $, resources, support
J Good applied statisticians not available to hire
K Fewer employment opportunities
L Continued alienation among A/G
M Outside forces will determine the direction of the discipline
N US industry will be less competitive
O Miscellaneous

There was clearly a strong belief among those present that the role of statistics and statisticians will diminish if the status quo is maintained. Negative consequences would include fewer students choosing statistics as a career, decline or elimination of statistics departments, and fewer employment opportunities for statisticians.

Participants were then divided up into four groups to address the following four topics:

1. Short-term visits between statisticians in academe and industry/government
2. Long-term collaboration between academe & industry/government statisticians
3. Partnering with other disciplines
4. Industry/government input into academic statistical programs & curricula

Andy Kirsch (3M Co.), Lynne Hare (Nat'l. Inst. of Standards & Technology), Roger Hoerl (General Electric), Dean Isaacson, and Susan Schall (Dupont Engineering Polymers) assisted individual groups in the use of affinity mapping, interrelationship digraph, and multi-voting TQM tools to:

1. identify why partnering was not occurring or not occurring as much as it could be
2. group identified causes into related clusters (root causes)
3. determine which root causes exerted the most influence on other root causes
4. identify solutions for addressing the most influential root causes
5. determine which solutions would be focused on to develop specific action plans.

SPAIG SUCCESS

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This process led to the development of the following specific action plans:

WHAT	WHO
Create Contact Lists to Facilitate Partnering and Make Available As Appropriate * Academic consulting list	Ron Randles (Univ. of Florida) Ron Bosecker (USDA Nat'l. Ag. Stat. Service) Rita Patwardhan (SmithKline Beecham)
* I/G internships * Speakers bureau * I/G contacts * Academic department heads * Include web sites in every Amstat Newsissue	Bruce Rodda (Schering-Plough) Bill Rolfes (3M Co.) Jim Rosenberger (Penn State Univ.) Bob Starbuck (Wyeth-Ayerst) Bill Wilson (Univ. of North Florida)
Conduct I/G Salary Survey * Improve understanding of value of statistics & statisticians in I/G * Improve recruitment of students into statistics field * Provide evidence to academic administrators of value of statistics	**Ray Waller** (ASA) Rich Allen (USDA Nat'l. Ag. Stat. Service) Alan Hopkins (Genentech) Bob Starbuck (Wyeth-Ayerst)
Regional SPAIG Workshops Designed and Implemented * A/I/G Statisticians * Other Disciplines * Determine regional I/G continuing education needs * Identify and publicize successful models of A=>I/G courses	**Ray Waller** (ASA) Robert Ahlbrandt (Hoechst Marion Roussel) William Caldwell (Univ. of North Florida) Anne Parkhurst (Univ. of Nebraska-Lincoln) Jim Rosenberger (Penn State Univ.) Nancy Smith (US FDA) Ron Snee (NYNEX) Kathleen Stralka (Science Appl. Int'l. Corp.)
Include I/G Statisticians on Academic Advisory Boards and and Review Teams	**John Spurrier** (Univ. of South Carolina) William Caldwell (Univ. of North Florida) Tom Gerig (NC State Univ.) Doug Kelly (Univ. of North Carolina) Dick Kryscio (Univ. of Kentucky) Andy Kirsch (3M Co.) Anne Parkhurst (Univ. of Nebraska-Lincoln) Kathleen Stralka (Science Appl. Int'l. Corp.)
"How To" Manual on Short-term Visits Between A/I/G Statisticians	**Paul Tobias** (Sematech) James Colaianne (Merck) Geetha Ramachandran (CA State Univ.-Sacramento)
Incorporate Collaboration into A/I/G Job Descriptions and Job Goals	**Tom Gerig** (NC State Univ.) Yahia Ahmed (US IRS)
ASA Award for Partnership	**Alan Hopkins** (Genentech) James Colaianne, Merck
Assess Past and Current Long-term Collaboration Between A/I/G and Develop Process for Long-term Collaboration	**Robert Kushler** (Oakland Univ.) Robert Ahlbrandt (Hoechst Marion Roussel) Ron Iman (Southwest Technology Consultants) Andy Kirsch (3M Co.) Jon Lemke (Univ. of Iowa) Ron Snee (NYNEX) Mark West (Auburn Univ.)
Survey Collaboration with Other Disciplines • How Measured? • Incentives	**Bob Hogg** (Univ. of Iowa) Dipak Dey (Univ. of Connecticut) Robert Jernigan (American Univ.) Geetha Ramachandran (CA State Univ.-Sacramento) Robert Rathmacher (Eli Lilly)
Collect and Edit Partnering Success Stories	**David Fitts** (SmithKline Beecham)
Manage SPAIG Web Site	**Bill Parr** (Univ. of Tennessee)
Chairperson for action item indicated in bold text.	

Participants who expressed at the conclusion of the workshop an interest in working on one or more of the action items are identified in the above table. Anyone who would like to participate in or contribute to an action item (including workshop participants not listed above) should contact the appropriate chairperson for the action item.

Volunteers participating in these initiatives will be developing detailed action plans with milestones, responsibilities, and measures of success. The action plans will then be implemented, and progress reports will be provided at the JSM and in Amstat News articles.

Additional information on the results of this SPAIG Workshop, including full text of many of the presentations and content of overheads summarizing the results from work sessions held during the workshop, can be found on the SPAIG web site at http://funnel-web.utcc.utk.edu/~wparr/spaig.html. Information on detailed action plans, milestones, responsibilities, measures of success, and progress as it occurs will be regularly posted to the web site.

We greatly appreciate the financial support of the NSF for supporting the planning of this workshop (cf. Amstat News, 235, pp. 19-20) and of the following professional societies to cover the costs of coffee breaks and continental breakfasts: ASA Section on Physical & Engineering Sciences, American Society for Quality Control, ASA Biopharmaceutical Section, and ASA Section on Quality & Productivity. Thanks go also to Lynne Hare and Susan Schall for developing the workshop agenda, to Tom Gerig for his excellent job of doing the local arrangements for the workshop, and to all those who facilitated and participated in the workshop. Δ

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ASQ Statistics Division
Job Openings and Member Interest Form

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- ☐ ***Section Liaison***

If you are interested in volunteering for one of these positions, please fill out the form below and send it to:

Past Chair Beth Propst
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In addition, proposals for newsletter Mini-Papers and Basic Tools articles are always welcome.

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The ASQ Statistics Division Newsletteris published quarterly by the Statistics Division of the American Society for Quality.

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Issue	Vol.	No.	Due Date
Fall '97	16	7	Aug. 29, 1997
Winter '98	16	8	Nov. 14, 1997
Summer '98	16	8	May 15, 1998

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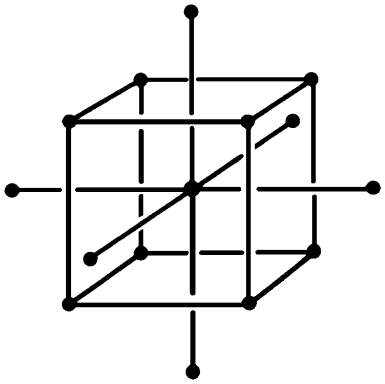

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