IIQP NEWSLETTER
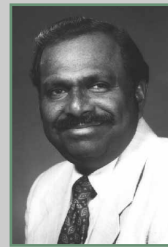
Management, Quality, and Statistics

B. Abraham

Bovas is the Director of the IIQP and has been a consultant with the Institute since its inception. His main areas of interest include Quality Improvement, and the management and implementation of statistical procedures.
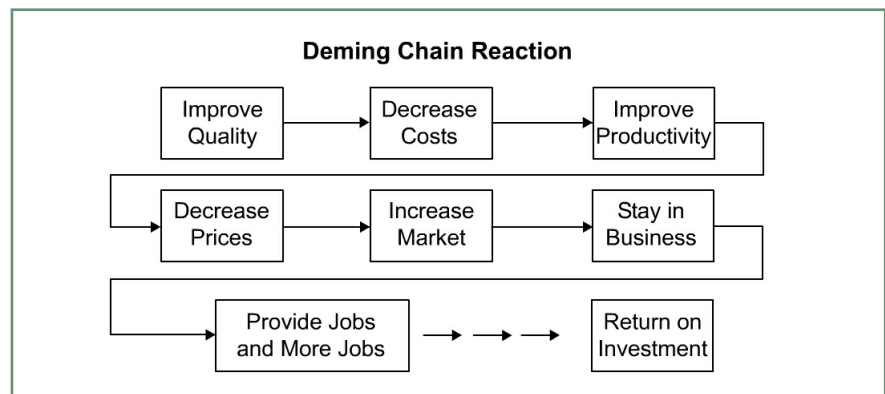
Bovas Abraham

Introduction
In the previous IIQP newsletter (Winter 2001) I concluded that Deming's management philosophy- Management by Facts - is still very much alive. It can also be said that this philosophy is based on Statistical Thinking (ST). This article is a continuation of the same theme. In addition to his fourteen points for management, his theories of variation, knowledge, and psychology and his PDSA cycle, Deming introduced the 'Chain Reaction':

This indicates that Quality Improvement (QI) is the key to Productivity Improvement and Return on Investment. David Garvin (Harvard Business Review, December 1987) discussed different dimensions of quality of products and services: Performance, Reliability, Serviceability, Durability, Features, Aesthetics, Perception, and Conformance to Design. For Quality Improvement and increased customer satisfaction one has to compete in all of these dimensions. The first seven of these fall under the responsibility of design and marketing and the last one under manufacturing.

In general there are two approaches for QI. The first is what we call the high-tech approach in which we replace the old process with a new one. This can be very costly. The other approach is to optimize the current process with existing

Deming Chain Reaction

| Improve Quality | → | Decrease Costs | → | Improve Productivity |

| Decrease Prices | → | Increase Market | → | Stay in Business |

| Provide Jobs and More Jobs | → → → | Return on Investment |

Management, Quality, and Statistics

(continued from page 1)

personnel and technology using data from the process. It is labor intensive but cost effective.

Statistics and Quality
In the latter approach to improvement mentioned before, we need to acquire knowledge from the process to improve it. Deming said, "Decisions should be based on facts supported by data". In other words process knowledge acquired from data is necessary to improve the process. Statistics deals with acquisition of knowledge from data. Statistical thinking is necessary for planning data collection, actual data collection, processing data into information, and communicating the acquired knowledge. Statistical thinking involves the notions of process, measurement, variation, certain statistical tools, and a systematic approach.

Measuring customer needs and process inputs/outputs, linking process inputs to those of process outputs, etc. involve statistical thinking. Variation is a fact of life and we have to understand its nature and sources, and have to deal with it. Variation reduction strategies need to be utilized. There are many statistical tools such as the Basic Seven tools and Design of Experiments that can be extremely useful in any improvement strategy. There are advanced tools such as Data Mining as well.

Quality systems such as QS-9000 and ISO 9000:2000 edition require Statistical Thinking and tools. These systems ask for Continuous Improvement that require

measurement of current status and the measurement after changes are made. It requires current knowledge to control processes and new knowledge to improve them. Thus Statistics forms a nervous system that senses data and communicates the knowledge.

Statistics and Six Sigma
Six Sigma is an improvement strategy with the objective of reducing the number of defects to 3.4 per million items. It is also seen as a business strategy which involves the heavy use of statistical tools within a structured system to gain the knowledge needed to obtain better quality products and services faster and cheaper. The model for improvement is: Define, Measure, Analyze, Improve and Control (DMAIC). Six Sigma also involves intensive training in statistical tools. For instance, the Black Belt program at GE and Honeywell (formerly Allied Signal) has four weeks of training. The success of Six Sigma or any such strategy depends heavily also on the commitment of very senior management.

Conclusion
All Quality Improvement programs and Management Systems involve statistical tools and thinking. In fact Statistics serves as a nervous system for any Improvement program. The success of any improvement program depends on the commitment of senior management.◆

Process Model - Is the Concept Really Understood?

G. Dennis Beecroft

Dennis is the Managing Director of the IIQP. He has extensive work experience both in industry and at the University of Waterloo. He works with many companies on their quality issues.
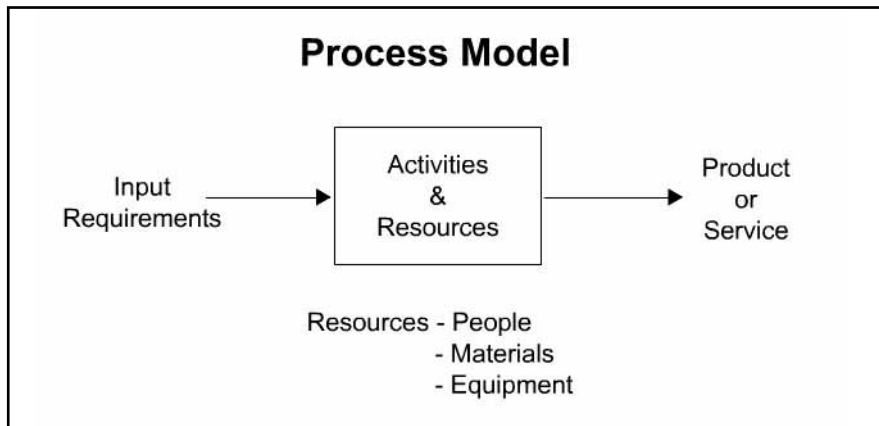
G. Dennis Beecroft

The concept of the "process model" has been around for many years. The introduction of this concept model into the ISO 9001:2000 Quality Management System Standard represents one of the standard's most significant changes. However, there is evidence that organizations do not understand the concept based on their behaviors.

H. James Harrington, in his book (*Business Process Improvement*), defines a process as "any activity or group of activities that take an input, adds value to it, and provides an output to an internal or external customer. Processes use an organization's resources to provide definitive results". The resources can include people, materials, and equipment. The output of any process is a product or service. The only way that a product or service can be changed is to change the process that produces it.

Too often when problems occur the solution to eliminate the problem is to "retrain the operators". How can this possibly work? If the initial training was not successful in preventing the problem, how can simply retraining make any difference. Maybe the operators were not trained initially or maybe the training was not effective. If either of these situations were the cause of the problem then the solution should be to address the training process. One would need to understand why the training had not been implemented, or if it had been implemented, then one would need to think about modifying the training process to ensure that the training is effective. It is impossible to achieve a different outcome unless the process responsible for producing that outcome is changed.

Another common response when the output does not meet requirements or expectations is to add another level of inspection to the delivery process. If the problem is serious or an important concern to the external customer, management may also get involved to ensure that the new inspection is being done, thereby adding again another level of inspection. These actions will likely result in less "problems" being delivered to the customer. However, the basic problem is still there and the "quality level" of the product or service is the same. These inspection activities are "non-value added" as they do not change the quality of the product or service being delivered. A "value added" solution would be to review the process and change either the design or the production process so that the problem is eliminated. This approach is one of prevention rather than inspection. This process is also called "error or mistake proofing" - changing the process so that the error cannot occur.

Shigeo Shingo in his book (*Zero Quality Control: Source Inspection and the Poka-Yoke System*), proposes 100% automated inspection as a "mistake proofing system". Since this is "after the fact" and focuses on controlling the parts rather than preventing the nonconformance by addressing the process, it is simply automated inspection. The automotive technical specification ISO/TS 16949 defines mistake proofing as "use of process or design features to prevent manufacture of nonconforming product". This definition is more consistent with most people's understanding of error proofing.

In conclusion, the solution to any problem is to change the current design or production process. By changing the process the problem can be eliminated, costs reduced, and customer satisfaction increased.◆

Process Model

Input Requirements → Activities & Resources → Product or Service

Resources - People
 - Materials
 - Equipment

SPC Online

This is a new online course developed for people working in industry who are involved in process control and improvement activities. The material covered in this course is equivalent to what is covered in a two day (14 hours) SPC course. Although it will show some calculations, the course will focus mainly on ideas and concepts in Statistical Process Control. Those who complete the course will have an understanding of the basic concepts of Variation, Stability, Charting, and Process Capability.

In order to complete the course requirements, students have to pass a final test given at the end of the course material.

A 'Certificate of Accomplishment' will be issued to those who complete the course successfully. This will enable you to get 2 continuing education units from the American Society of Quality (ASQ).

Course Contents

Chapter 1: Introduction to SPC
Chapter 2: Control Charts for
 X Bar and R
Chapter 3: Sampling for Control
 Charts
Chapter 4: Process Capability
Chapter 5: Control Charts for
 Attribute Data
Final Test

For course contents and registration details visit:

http://www.math.uwaterloo.ca/IIQP/SPC/main.htm

CLDS Workshop

The Institute for Improvement in Quality and Productivity (IIQP) at the University of Waterloo is hosting a research workshop; its goal is to present and promote research dealing with Classification of Large Data Sets (CLDS).Recent advances in computing and information technology have revolutionized the field of statistics and enable us to tackle complex problems in business, industry and technology such as pattern recognition, process control and system optimization.

The first day of the workshop will consist of a 6 hour session on Classification led by Professor David Hand of Imperial College, London, England. The second day consists of four invited talks in the areas: Tree Models in Marketing, Data Mining, Mining Text Data and Drug Discovery. There will be ample time allotted for discussion.

For more details, visit

http://www.iiqp.uwaterloo.ca/cldsworkshop.html

New Corporate Sponsor

Continuous Colour Coat Ltd., which also uses the trade name Metal Koting, was founded in 1965, and is a premier quality producer of coated metal coils. Metal Koting operates two coating lines in a 144 000 square foot facility located in Rexdale, Ontario. Their coil coating line is one of the most flexible in North America, with painting, laminating, adhesive, and printing capability. It can coat metal up to 0.094" (2.39 mm) thick with a variety of pretreatment options, and has a flexibility to paint cold rolled steel, galvanized steel, stainless steel, and aluminum. The electrogalvanize line is unique in Canada, economically providing corrosion-protective zinc coatings on steel at thicknesses not attainable using the conventional hot dipping process. The electrogalvanize line also provides the unique electrogalvanize-paint option, ideal for products with both corrosion and aggressive forming requirements. Their products are used in a variety of applications including swimming pools, HVAC equipment, garage doors, and automotive trim.

Upcoming IIQP Courses

Meet some of our Seminar Leaders....

Bovas Abraham
Director, IIQP

G. Dennis Beecroft
Managing Director, IIQP

Hugh Chipman
Consultant, IIQP

Jock MacKay
Consultant, IIQP

Stefan Steiner
Consultant, IIQP

Gary Waller
Associate Provost, Academic and Student Affairs, UW

STATISTICAL PROCESS CONTROL

ONLINE COURSE

This new course is equivalent to a 2 day (14 hrs) short course on Statistical Process Control (SPC).

Course contents include:

- Understanding variation
- Charts for X Bar and R
- Charts for individuals
- Sampling for charts
- Process capability
- Charts for attribute data

For more details please visit:

www.math.uwaterloo.ca/IIQP/SPC/main.htm

During the course, help will be available by email:
babraham@uwaterloo.ca

Registration Information

Use the online registration form to register. Once we receive the registration form and payment a username and password will be sent via email which are required to login.

The course will be available online to login from June 15 to July 31. Registrants will have 3 weeks to complete the course from the day the userid and passwords are received. Receiving these before June 15th will give you 3 weeks from June 15th to complete the course.

Cost
$195 + GST

Cost of Quality for Continuous Improvement

Two Day Seminar

Cost of Quality (COQ) is an excellent continuous improvement (CI) management tool. COQ can be used effectively to indentify, prioritize and then track CI projects by breaking down quality costs into four standard categories: prevention, appraisal, internal failure and external failure.

You will learn how to:

- Categorize elements of COQ
- Select and track projects
- Choose vendors and price products using COQ
- Use Cost of Quality for CI in QS-9000 / ISO 9000

Who should attend:

- Financial Officers
- Quality Managers and Professionals
- Continuous Improvement Team Leaders

Course Dates

June 19 - 20, 2001

October 16 - 17, 2001

Cost
Only $695 +GST

Cost includes: Tuition, course notes, handouts, lunches, coffee and refreshments

Design of Experiments

Two Day Seminar

A designed experiment is a special type of process study that involves changing one or more process characteristics to investigate their effects.

Designed Experiments (DOE) are one of the required continuous improvement tools in QS-9000. This 2 day course will teach you to effectively use this key methodology to improve quality and reduce costs.

This course will provide you with the right tools to understand, plan and execute an experiment. You will also gain the experience in deciding if experimentation is a good approach to your particular problem(s).

You will learn:

- What is an experiment?
- Experiments vs. other data based approaches
- Complete factorial experiments - looking at several factors simultaneoulsy
- Fractional factorial designs - efficient ways to look at many factors
- Taguchi's robust designs to reduce variation
- Implementation - planning and executing experiments

Course Dates

May 31 - June 1, 2001

November 8 - 9, 2001

Cost
Only $695 +GST

Cost includes: Tuition, course notes, handouts, lunches, coffee and refreshments

STATISTICAL ENGINEERING

THIRD EDITION
ISO 9001:2000

AN UPDATING OVERVIEW

TWO DAY SEMINAR

Statistical Engineering is a combination of statistical strategies and tools carefully selected to efficiently solve chronic problems in high volume manufacturing. Statistical Engineering attempts to exploit observational data from your existing process to "home in" on the root cause of problems.

This two day course covers the guiding strategies and tools you need to effectively apply this exciting methodology to improve quality and reduce costs. This course is a requirement for our new Statistical Engineering certification program, and is also a good complement to the design of experiments two day course.

You Will Learn:

- Guiding principles of Statistical Engineering
- Structured problem solving strategy - diagnostic and remedial journeys
- Progressive search and families of variation
- Clue Generation Methods - using observational data to efficiently guide improvement efforts

ONE DAY SEMINAR

This course is designed for organizations who are already registerd to ISO 9000 and need to know more information on the updated edition.

The Third Edition ISO 9001:2000 has made several changes creating a more user-friendly standard. It has simplified its language, reduced the required documentation, and made several changes based on customers and users' feedback. This edition will be easier to implement, use and upgrade from the previous editions.

In this updating course, find out about the changes and how it impacts your organization and your registration status.

You Will Learn:

- Background on 2000 edition
- Overview of changes
- Impact on current quality system
- Transition guidance
- Review of critical changes
- How to implement changes
- Changes to auditing

Course Dates

September 20 - 21, 2001

This course is also available in-house.

Contact the IIQP for rates.

Course Dates

June 6, 2001

September 25, 2001

November 13, 2001

Cost
Only $695 +GST

Cost includes: Tuition, course notes, handouts, lunches, coffee and refreshments

Cost
Only $350 +GST

Cost includes: Tuition, course notes, handouts, lunch, coffee and refreshments

How Do I Register?

You may register by returning the form below or contacting the institute at the following address:

Institute for Improvement in Quality and Productivity
University of Waterloo
Waterloo, Ontario, Canada
N2L 3G1

Tel: (519) 888-4593
Fax: (519) 746-5524
E-mail: iiqp@math.uwaterloo.ca

More Information:

◆All IIQP courses can be tailored to suit specific needs or applications and presented within your company. Such courses are often deleloped by modifying or combining exisitng courses, depending on the request.

◆Instructors are University of Waterloo faculty and IIQP staff who are professionals with extensive industrial training and consulting experience.

◆Please add GST to all course fees (GST #: R119 2606 85)

Cancellation Policy:

Refund of fees will be made only if notice of cancellation is received at least 10 working days prior to the beginning of the program. Substitution of participants from the same organization is permitted.

Registration Form
I want to register for the following IIQP course(s):

❑ Cost of Quality (June 19 - 20, 01)   ❑ Cost of Quality (Oct. 16 - 17, 01)

❑ Design of Experiments (May 31 - June 1, 01)   ❑ Design of Experiments (Nov. 8 - 9, 01)

❑ Statistical Engineering (Sept. 20 - 21, 01)   ❑ ISO 9001:2000 Updating Overview (June 6, 01)

❑ ISO 9001:2000 Updating Overview (Sept. 25, 01) ❑ ISO 9001:2000 Updating Overview (Nov. 13, 01)

Statistical Process Control (please visit www.iiqp.uwaterloo.ca/SPC/main.htm for registration details)

Name: _____ Position/Company: _____

Address: _____ City: _____ Mail Code: _____

Tel: _____ Fax: _____ E-mail: _____

❑ My cheque / money order is enclosed.   ❑ Please bill me.

Recent IIQP Presentations

Institute for Improvement in Quality and Productivity Overview
Confederation of Indian Industy and
Cochin University
Cochin, India   *January 2001*
G. D. Beecroft

Managing Multiple Models
8th International Workshop on Artificial
Intelligence and Statistics
Fort Lauderdale, Florida, USA   *January 2001*
H. Chipman

IIQP and Canadian Industry
Confederation of Indian Industry and
Cochin University
Cochin, India   *January 2001*
B. Abraham

Classification and Regression Trees
Predicting Health and Health Services:
Data, Methods & Models
Toronto, Ontario, Canada   *January 2001*
H. Chipman

Analysis of Event History Data
University College
London, UK   *February 2001*
J. Lawless

Statistical Tools for Quality and Productivity Improvement and Competitive Success
Institute of Technology of Buenos Aires
Buenos Aires, Argentina   *March 2001*
B. Abraham (jointly with V.N. Nair)

Design and Analysis of Industrial Experiments
Institute of Technology of Buenos Aires
Buenos Aires, Argentina   *March 2001*
B. Abraham (jointly with V.N. Nair)

Using Quality Costs to Support ISO 9001:2000
8th Annual ISO 9000 Conference,
American Society for Quality
Reno, Nevada, USA   *March 2001*
G.D. Beecroft

An Academic Consultant's View of Statistical Process Control
Canadian Operations Research Society
Toronto Mini Paper Night
Toronto, Ontario, Canada   *March 2001*
S. Steiner

Threshold-Based Interventions to Optimize Performance in Preemptive Priority Queues
Department of Computing and Software
McMaster University   *March 2001*
S. Drekic

Survival Analysis and Likelihood
University College
London, UK   *January 2001*
University of Surrey
Guildford, UK   *February 2001*
University of Reading
Reading, UK   *March 2001*
J. Lawless

Analysis of Data from Studies with Multiphase Designs
Medical Research Council Biostatistics Unit
Cambridge, UK   *January 2001*
University College
London, UK   *February 2001*
Imperial College
London, UK   *March 2001*
J. Lawless

IIQP Research Reports
2001

RR-01-01
Interpretable Dimension Reduction
H.A. Chipman and H. Gu

RR-02-02
Differencing a Time Series and Modifications to the Variogram
B. Abraham and N. Balakrishna

These and all other Reserach Reports and/or abstracts since 1988 are available free of charge. Visit our website for a complete listing of all research reports.

www.iiqp.uwaterloo.ca/rrs.html

electronic
C O M M U N I C A T I O N

Would you like to view your newsletter and receive announcements online?

Please let us know by responding to:
iiqp@math.uwaterloo.ca

The IIQP Newsletter is now available in PDF (Portable Document Format).

Visit
www.iiqp.uwaterloo.ca/newsletter.html

Thank You To Our Corporate Sponsors

The Institute gratefully acknowledges the contributions of the following
Corporate Members:

Their continued support throughout the year has been invaluable.

Their support contributes to the success of this newsletter. Thank you!

General Motors of Canada, Metal Koting, Nortel Networks, Research in Motion and Wescast Industries

A Free IIQP Networking Half-day Seminar...

Lean Strategies

Come and hear how major organizations are addressing this important area.

Date: May 29, 2001

Time: 8:30 - 11:30 am

Location: Davis Centre, Room 1302

University of Waterloo

Register early!
Limited enrolment to 100 registrants!

Participating Organizations

Toyota Motor Company

-Lean Manufacturing

General Motors of Canada

-Lean Engineering

To Register: Contact the IIQP by faxing this page back to **519-746-5524** or calling **519-888-4593**.

IIQP NEWSLETTER
University of Waterloo
200 University Ave. W.
Waterloo, ON N2L 3G1 Canada