IIQP NEWSLETTER

Fall 2002

Institute for Improvement in Quality and Productivity

University of Waterloo

Inside...

Evolving Quality Improvement Strategies

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

To better understand where business has been, where it is and where it is likely going from a quality improvement strategy it is useful to refer to David Garvin's "Four Major Quality Eras" which have been adapted in Figure 1. In Era 1- "Inspection", quality was seen as a problem that could be best solved through detection. The quality role in this initial era fell solely on the inspection department where the product was gauged, measured, graded and sorted into good and bad categories. Problems generated at any point in the process were not detected until the very end of the process. This method was not only very costly but also ineffective in detected unacceptable product, which then led to the "Statistical Quality Control" era.

Unfortunately during this second era quality was still viewed as a problem to be solved. The method used was to control the product and to prevent it from being shipped to customers. Inspections were added at the various steps of the process - incoming, in-process and final inspection. The emphasis was on product uniformity and the reduction of inspections by the introduction of statistical techniques. Quality professionals were involved in problem solving and the application of the statistical methods for inspection. The quality responsibility was also transferred to the manufacturing and engineering departments, however the focus and approach was to "control in" quality. The approach was reactive and considered "non-value added" as it focused on the product after it was produced and did not impact the product's quality. If poor quality was produced the best this approach could offer was to detect it and prevent it from being shipped to the customer. Increased inspection resulted in increased nonconformances being detected, however

Figure 1 - Four Major Quality Eras

Era 1	Era 2	Era 3	Era 4
Inspection	Statistical Quality Control	Quality Assurance	Strategic Quality Management
Inspect in – Quality	Control in – Quality	Build in – Quality	Manage in – Quality

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Evolving Quality Improvement Strategies

(continued from page 1)

it did not address preventing the defect in the first place. This unsatisfactory situation led to the third era - "Quality Assurance".

The Quality Assurance era was very revolutionary in that the emphasis shifted from trying to detect poor quality to an emphasis of *not producing* poor quality. This shifted the focus from the *product* being produced onto the *processes* that were used to produce the products as it was determined that the only way to prevent poor quality was to control the processes used. This phase emphasized the coordination of all functions throughout the complete supply chain from design to ultimate customer and the contribution of all areas, particularly design through the use of sophisticated tools such as Design of Experiments and Failure Modes and Effects Analysis, to prevent quality failures. Quality improvement programs were used to address quality. The role of the quality professional changed to one of consultant in quality planning, quality measurement and program design. The quality responsibility was now shared by all functions - engineering, manufacturing, materials and quality with the focus to "build in" quality.

In Era 4 - "Strategic Quality Management" the primary focus was the strategic impact on the organization with emphasis on the market and customer needs. The methods employed were strategic planning, goal setting and the mobilization of the complete organization. The quality professional's role was goal setting, education and training, and quality improvement consultant. In this era top management were now included in the quality process and expected to provide strong leadership. Until now management had been able to delegate the quality responsibility. The orientation of this era was to "manage in" quality.

ISO 9000 and Total Quality Management (TQM)

ISO 9000 Quality Management System was issued as an International Standard in 1987. The bulk of the initial registrations were in the UK. ISO 9000's adoption in North America was very much slower. Japan's Deming Prize led to the development of the Malcolm Baldrige National Quality Award (MBNQA) in the USA in 1987. Canada followed the USA by developing its own award, the Canada Awards for Excellence - Quality (CAE - Quality) in 1988. These national quality awards became in fact Total Quality Management models.

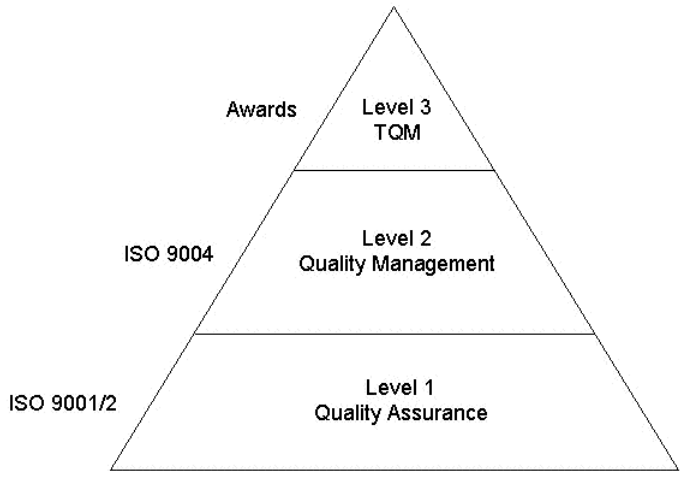
Many organizations saw ISO 9000 and TQM as competing programs. However they were very different in their strategy and approaches. ISO 9000 focused on 20 very specific requirements emphasizing documented procedures to demonstrate compliance to the standard. TQM was very much broader in its focus and was really based on a set of quality management principles. While the Deming Prize, the Malcolm Baldridge and Canada's Quality award were slightly different the principles were mainly the same.

The ISO Task Committee, TC176, addressed the philosophy and strategy behind the development of the ISO series of standards in their document ISO/TC 176/SC 2/N336. Figure 2 has been adopted from this document. They developed a three level Customer Needs Hierarchy of Quality Assurance, Quality Management and TQM. Level 1 is the ISO 9001, Quality Management Requirements, for Level 2 use the ISO 9004, Quality Management Guidelines and Level 3 implement the TQM principles using either Malcolm Baldrige or other National Quality model.

Level 1 - Quality Assurance's goal was to put in place an effective system to produce products conforming to customer requirements. Controlling product quality and eliminating customer failures and recalls prevents customer dissatisfaction. This is very much Era 1 and 2 in Garvin's Evolution of Quality.

Level 2 - Quality Management addresses cost, efficiency and effectiveness in meeting customer needs. Here the focus is on

Figure 2 - Customer Needs Hierarchy



Reference: ISO/TC 176/SC 2/N336

customer satisfaction by improving the complaint process, reducing cycle time and waste reduction. This process, prevention focus moved into Era 3.

Level 3 - TQM equates to Era 4 in Garvin's model. Strategic Quality Management and TQM both focus on total customer satisfaction. This is achieved through employee involvement, long range and strategic focus and customer driven designs.

Strategy Unsuccessful
The implementation strategy has not been successful for a number of significant reasons:

Communication
The ISO task committees did not communicate the implementation strategy to a very wide audience. Most organizations are completely unaware of the “Customer Needs Hierarchy" that the committee proposed. Even the guideline standard, ISO 9004, received very little attention. Registration is based on the implementation of ISO 9001 or 9002 requirements; therefore ISO 9004 was "not needed". Consultants and trainers, in most cases, did not promote the use of the guideline standard. As stated earlier TQM was seen as a competing strategy and not as a necessary step in meeting customer needs.

Compatibility
ISO 9001 and ISO 9004 were not compatible. The language in the requirements standard was totally different from the guideline standard. It was very difficult to incorporate the ISO 9004 guidelines into the organization's quality management system.

Registration vs. Improvement Focus
Likely the most significant barrier has been the focus of quality systems on registration rather than using the quality system to drive improvement in organizations. This registration focus has driven senior management in organizations to minimize cost, minimize effort and delegate their quality responsibility. Organizations using their quality system with an improvement focus maximize value, reduce waste and improve product/service quality through the senior management team's involvement.

Quality Improvement: Linking Principles, Strategy and Tools
Most quality improvement efforts, including TQM, have been unsuccessful. One has to ask the question - why? Total Quality Management for the most part is really a set of principles. Successful quality improvement efforts require having a set of principles that drive a strategy and then use the appropriate tools for implementation.

For example, a current successful quality improvement program is Six Sigma. The strategy is reducing variation, using a disciplined approach and a good measurement system. This is not a new concept or strategy however what makes Six Sigma successful is also the principles that drive the strategy. Six Sigma principles include: Senior Management Driven, Major Projects, Weeks of Training and Dedicated Resources.

2000 Edition of ISO 9001
The new ISO 9001:2000 standard includes eight quality management principles: Customer Focused Organization, Leadership, Involvement of People, Process Approach, Systems Approach to Management, Continual Improvement, Factual Approach to Decision Making and Mutually Beneficial Supplier Relationships.

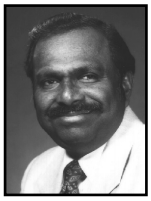
The strategy of the revised standard include: Increased Base Requirements, Alignment of 9001 and 9004 Documents, Internal Audit Training includes TQM Principles and Required Awareness of 9004.

Likely one of the most significant changes is the move from a 20-element structure to a structure consisting of 4 parts based on a process model. The 4 sections are: Management Responsibility, Resource Management, Product Realization and Measuring, Analysis and Improvement. Management Responsibility includes: Policy, Objectives, Planning, Quality Management System and Management Review. The Resource Management section includes: Human Resources, Information and Facilities. Product Realization includes: Customer Satisfaction, Design, Purchasing and Production. The final section Measuring, Analysis and Improvement includes: Audit, Process Control and Continual Improvement. The 20 elements from the second edition have not been eliminated but rather incorporated into this new process structure.

Conclusion
Organizations are slowly adopting more preventive strategies and moving away from earlier inspection focused approaches. Many are also recognizing that to be successful with their quality improvement efforts they have to first have a set of principles to drive a strategy then use the appropriate tools to implement. The 2000 Edition of ISO 9001 is a good example and if implemented correctly will provide many additional benefits for its earlier version. ◆

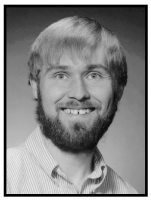
Upcoming Courses

Meet some of our Course Instructors ....



Bovas Abraham
Director, IIQP

G. Dennis Beecroft
Managing Director, IIQP



Hugh Chipman
Consultant, IIQP

Chris Fader
Economics, UW

Jock MacKay
Consultant, IIQP

Stefan Steiner
Consultant, IIQP

Gary Waller
Associate Provost, Academic and Student Affairs, UW

Cost of Quality for Continuous Improvement

TWO DAY COURSE

Course Description

Cost of Quality (COQ) is an excellent continuous improvement (CI) management tool. COQ can be used effectively to identify, 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

- 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 and ISO 9000

Target Audience

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

Course Dates

November 14-15, 2002
February 5-6, 2003

Cost

$790 (+GST)

Cost Includes: tuition, course notes, handouts, lunches, coffee and refreshments.

Managing for the Future

TWO DAY COURSE

Course Description

We are in an era of organizational transformation, when new forms of enterprise are emerging, and old forms are changing radically. It is essential that high potential leaders understand these changes and be able to take effective action in the organizations of today and tomorrow. As a result of the growing recognition of the difficulty to shift to the new organizational forms, and the challenges encountered in taking action in the new work context, an introduction to some of the required individual skills and organizational features are developed in this course

You Will Learn

- Key Features of Emerging Organization Models
- The Major Drivers Behind Development of New Models
- Assessment of Organizational Change from Traditional Models to New Models
- Individual Skills and Organizational Features Required by the New Model
- Power and Conflict in Traditional and In New Organizations

Who Should Attend

- Human Resources Personnel
- Training Professionals
- Management Leaders
- Quality Professionals

Course Dates

November 26-27, 2002
February 25-26, 2003

Cost

$790 (+GST)

Cost Includes: tuition, course notes, handouts, lunch, coffee and refreshments.

Design of Experiments

TWO DAY COURSE

Course Description

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

Design of Experiments (DOE) is one of the continuous improvement tools in Six Sigma and ISO 9001:2000. This two day course will teach you how 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 simultaneously
- Fractional Factorial Designs - efficient ways to look at many factors
- Taguchi's Robust Designs to Reduce Variation
- Implementation - Planning and Executing Experiments

Course Dates

November 7-8, 2002
March 6-7, 2003

Cost

$790 (+GST)

Cost Includes: tuition, course notes, handouts, lunches, coffee and refreshments.

Effective Problem Solving

TWO DAY COURSE

Course Description

Effective Problem Solving involves a disciplined methodology and the use of appropriate tools. This workshop teaches a 5-step problem solving model - Define Problem, Containment, Determine Root Cause, Implement Solution and Verification of Solution, and tools to be used at the various steps within the problem solving process.

You Will Learn

- How to Correctly Define the Problem
- Understand Work as a Process
- Identify Different Types of Problems
- Define Processes Using Process Maps
- Learn the 5-Step Problem Solving Model
- Practice the Use of Problem Solving Tools

Who Should Attend

- Quality Managers and Professionals
- Quality Improvement Team Members

Course Dates

November 21-22, 2002
February 19-20, 2003

Cost

$790 (+GST)

Cost Includes: tuition, course notes, handouts, lunches, coffee and refreshments.

Training Effectiveness

ONE DAY COURSE

Course Description

Training Effectiveness is a requirement for ISO 9001 Quality System Requirements under Element Training. This introductory workshop is based on the Kirkpatrick Model.

You Will Learn

- Options and Recommendations for Developing Evaluations
- Procedures for Measuring Effectiveness
- Roadblocks to Effective Evaluation
- How to Evaluate at the Four Levels (Reaction, Learning, Behaviour and Results) and Pros and Cons of Different Approaches

Who Should Attend

- Human Resources Personnel
- Training Professionals
- Management Leaders
- Quality Professionals

Course Dates

October 31, 2002
March 20, 2002

Cost

$395 (+GST)

Cost Includes: tuition, course notes, handouts, lunch, coffee and refreshments.

Knowledge Management

ONE DAY COURSE

Course Description

Firms today are experiencing acute competitive pressures for a variety of reasons. Successful firms are employing better organizational design and improved management techniques in order to improve performance. It is these firms that recognize that the creation, retention and application of knowledge are now key competitive success factors. This growing awareness of the value of specialized knowledge and the awareness of knowledge as a distinct factor of production has led to a new field of study and practice - knowledge management. This one-day course will introduce the fundamentals of knowledge management.

You Will Learn

Defining Knowledge Management

- Information vs. Knowledge
- Key Concepts

Explicit and Implicit Organizational Knowledge

- Problems of Knowledge Codification and Coordination
- Mapping and Modeling Knowledge
- Capturing Tacit Knowledge
- Knowledge Transfer

Technologies for Knowledge Management

Practicing Knowledge Management

- Case Studies of KM (Successes and Failures)

Course Date

November 1, 2002
April 4, 2002

Cost

$395 (+GST)

Cost Includes: tuition, course notes, handouts, lunch, coffee and refreshments.

Statistical Process Control

ONLINE COURSE

Course Description

This new course is equivalent to a 2 day (14 hours) short course on Statistical Process Control (SPC). This online course is developed for people involved in process control and improvement activities. It will provide an understanding of the basic concepts of Variation, Stability, Capability, etc.

Course Contents

- Understanding Variation
- Charts for X-Bar and R
- Charts for Individuals
- Sampling for Charts
- Process Capability
- Charts for Attribute Data

For More Details Visit:

www.iiqp.uwaterloo.ca/SPC

Registration Information

Use the online form to register. Once the form and payment is received a user name and password is issued via e-mail.

Course Available Until

April 30, 2003

Cost

$195 (+GST)

Statistical Engineering

TWO DAY COURSE

Course Description

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 compliment 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

Course Date

January 15-16, 2003
April 10-11, 2003

Cost

$790 (+GST)

Cost Includes: tuition, course notes, handouts, lunches, coffee and refreshments.

Third Edition

ISO 9001:2000

An Updating Overview

ONE DAY COURSE

Course Description

This course is designed for organizations who are already registered 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 customer and user 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

November 12, 2002
March 18, 2003

Cost

$395 (+GST)

Cost Includes: tuition, course notes, handouts, lunch, coffee and refreshments.

Forecasting in Quality / Productivity Improvement

TWO DAY COURSE

Course Description

Forecasting plays a central role in business decision making: decisions about investments, resource allocations, schedules and inventory levels. This course gives an overview of useful quantitative forecasting tools and it also covers regression/time series models that incorporate into the forecasts any additional information such as sales promotions and price reductions. Computer software implementing these procedures are demonstrated, and participants have the opportunity to practice their new skills with their own data sets.

Course Contents

- Sales forecasting and inventory control
- Quantitative and qualitative forecast approaches
- Exponential smoothing forecast procedures
- Autoregressive models for forecasting
- Forecast models for incorporating the effects of promotions
- Forecast evaluation and forecast tracking
- Case studies
- Discussion of computer software
- Hands-on computer lab to practice new skills

Target Audience

- People in marketing, operations management, logistics and inventory control, etc.
- Brand managers.

Course Date

March 27-28, 2003

Cost

$790 (+GST)

Cost Includes: tuition, course notes, handouts, lunches, coffee and refreshments.

How Do I Register?

REGISTRATION INFO

You may register online or contact the Institute at the address below.

Institute for Improvement in Quality and Productivity
200 University Ave. W.
University of Waterloo
Waterloo, Ontario N2L 3G1
Tel. (519) 888-4593
Fax. (519) 746-5524
E-Mail. iiqp@math.uwaterloo.ca
Web. www.iiqp.uwaterloo.ca/Courses

More Information

- All IIQP courses can be tailored to suit specific needs or applications and presented within your company. Such courses are often developed by modifying or combining existing courses, depending on the request.
- Instructors are University of Waterloo faculty and IIQP staff who are professionals with extensive industrial training and consulting experience.
- Refund of fees will be made only if notice of cancellation is received at least 10 working days prior to the start of the course. Substitution of participants from the same organization is permitted.
- Please add GST to all course fees (GST#: R119 2606 85)

Name: _____

Position/Company: _____

Address: _____

City: _____

Postal Code: Zip: _____

Tel: _____

Fax: _____

E-Mail: _____

Please Specifiy Course(s) and Date(s):

_____

_____

☐ Bill Later ☐ Cheque / Money Order Enclosed

Innovation

Bovas Abraham

Innovation is a form of change. Innovation is something nobody has thought of before. Peter Drucker defines Innovation as "change that creates a new dimension of performance'. Innovation is all about new ideas, new products, new processes, new services and new customers. Business organizations, government departments, community groups etc are talking about innovation. The federal government of Canada claims that it is investing very heavily into Innovation. In particular Industry Canada is organizing these 'Innovation Summits' across the country to get feedback from Canadians regarding their priorities for Innovation. They also have published two booklets (1.Knowledge Matters, 2. Achieving Excellence) which sets some targets for Canada to achieve by 2010.

The following excerpt is taken from one of the booklets:

The Government of Canada proposes the following goals, targets and federal priorities to help more firms develop, adopt and market leading-edge innovations.

Goals

- Vastly increase public and private investments in knowledge infrastructure to improve Canada's R&D performance.
- Ensure that a growing number of firms benefit from the commercial application of knowledge.

Targets

- By 2010, rank among the top five countries in the world in terms of R&D performance.
- By 2010, rank among world leaders in the share of private sector sales from new innovations.
- By 2010, raise venture capital investments per capita to prevailling U.S. levels.

Several articles and books also have appeared recently discussing Innovation (for example, (1) the monograph HBR on Innovation, Harvard Business School Press, (2) Leading for Innovation by F. Hesselbein, M. Goldsmith, I. Sommerville, published by Jossey-Bass). Some of the ideas in this article are taken from the articles in these books.

In this economically changing environment, innovation is crucial for productivity improvement. Without innovation we are stuck with old products, services and processes. Innovation does not happen in isolation. It results from intellectual creativity, careful management, and intense efforts.

Innovation begins with the identification of a need or an opportunity and followed by the creation of new methods, processes, products or services to satisfy that need. If leaders want people to be innovative they should find what is important to people and engage them in meaningful issues.

Management has to create an environment, a culture, and a system for creativity and innovation if they are serious about pursuing along this road.
The culture must encourage fast approvals, open communication, cooperation instead of combat across internal units, tolerance for uncertainty, and faith in people to try new things.

At the top management level a small number of big projects (in terms of investments in products, technology etc) may be initiated. At the middle management level, a larger set of promising experiments that are not yet proven may be tried. At the base level, many incremental innovations or continual improvements (improvement in speed, create a customer success etc) can be made.

Product or technological innovation has to go through a series of experiments so that the initial idea transforms to a prototype that can be tested, modified, and be shown to a customer for feedback. There has to a system for these experiments, tests etc. Some times 100's of experiments and tests are necessary making it a very time consuming and costly process. In today's economy we need a fast cycle time for feedback from experiments, and tests. High cost of experimentation has long put a damper on companies' attempts to create new products. However, new technologies are making it easier to conduct complex experiments cheaply and quickly. 1000's of simulation experiments can be done very fast now. For instance crash tests on cars used to be very time consuming and costly. Now we can do virtual crash tests many times at the fraction of a cost.

Sometimes ideas may fail. Leaders should have a healthy attitude towards failure. If one can detect failures earlier it would save money.

Companies trying to be more innovative face both managerial and technical challenges. Innovative companies are trying to create new markets by creating new products or services for which there are no competitors. For this a different mind -set is needed.

We can use old ideas as raw material for new ideas. Encourage good ideas from a variety of sources, keep these ideas alive, and turn promising concepts into real products and services. New ideas have commercial potential but there are uncertainties surrounding them. New products should have customer utility at an attractive price. Business leaders must change how they think about innovation and they must change how their company cultures reflected that thinking.

Partnerships between private enterprise and public interest that produces sustainable change for both sides need to be fostered. Some organizations are moving into corporate social innovation. Traditional companies viewed the social sector as a dumping ground for their obsolete equipment, tired executives and spare cash. The tide has changed and at least some companies are viewing community needs as opportunities to develop ideas and demonstrate business technologies, find and serve new markets; and solve longstanding business problems.

Innovation has lead to sociological change in the past and will continue to do the same in the future. Managing change is a challenge in itself.

If you are interested in learning more about Innovation you may participate in the International Conference on 'Quality and Innovation' (October 22-23, 2002) organized by the IIQP. For details of the conference, you may visit: www.iiqp.uwaterloo.ca/Events/qi.html. ◆

Recent Presentations

The Distribution of the Deficit at Ruin When Claims are Phase Type
University of Waterloo
Waterloo, ON, Canada January 2002 S. Drekic

Seven Habits of Highly Effective Industrial Problem Solvers
University of Amsterdam
Amsterdam, Netherlands January 2002 S. Steiner

Treed Generalized Linear Models
Department of Statistics, Stanford University
Stanford, CA, USA January 2002
Graduate School of Business, University of Chicago
Chicago, IL, USA February 2002 H. Chipman

Using Quality Costs to Support Your Quality Improvement Program
ASQ London Section
London, ON, Canada February 2002 G.D. Beecroft

Learning Treed Generalized Linear Models
Interface Meeting
Montreal, QC, Canada April 2002 H. Chipman

Understanding Variation
University of Waterloo
Waterloo, ON, Canada April 2002 S. Steiner

The Distribution of the Time to Ruin for Exponential Claim Amounts
University of Western Ontario
London, ON, Canada April 2002
CORS National Conference
Toronto, ON, Canada June 2002 S. Drekic

Overview of Statistical Engineering
Waikato University
Hamilton, New Zealand June 2002
University of Auckland
Auckland, New Zealand June 2002
Australian Statistical Conference
Canberra, ACT/NSW, Australia July 2002 S. Steiner

Flexible Modelling of High Throughput Screening Data
Spring Research Conference on Statistics in Industry and Technology
Ann Arbor, MI, USA May 2002 W. Welch

Some Prediction Problems in Reliability
Spring Research Conference on Statistics in Industry and Technology
Ann Arbor, MI, USA May 2002 J. Lawless

Mining Functional Process Data
Spring Research Conference on Statistics in Industry and Techology
Ann Arbor, MI, USA May 2002 H. Chipman

1-Day Workshop on Design and Analysis of Computer Experiments for Engineering
Annual Meeting, Statistical Society of Canada
Hamilton, ON, Canada May 2002 W. Welch

Hybrid Hierarchical Clustering With Applications to Micorarray Data
Statistical Society of Canada Annual Meeting
Hamilton, ON, Canada May 2002
Institute of Mathematical Statistics Annual Meeting
Banff, AB, Canada July 2002 H. Chipman

Use of Quality Costs to Link Quality and Strategic Business Planning
7th World Congress for TQM
Verona, Italy June 2002 G.D. Beecroft

A Preemptive Resume Queue with an Expiry Time for Retained Service
CORS National Conference
Toronto, ON, Canada June 2002 S. Drekic

Cumulative Processes Related to Event Histories
First Barcelona Workshop on Survival Analysis
Barcelona, Spain June 2002 J. Lawless

Optimal Designs for Model Selection
Valencia International Meetings on Bayesian Statistics
Playa de las Americas, Tenerife June 2002 H. Chipman

High Throughput Screening Data for Drug Discovery
University of British Columbia
Vancouver, BC, Canada July 2002 W. Welch

Why Statistical Process Control Often Fails
CSIRO
Melbourne, VIC, Australia July 2002 S. Steiner

Evolving Improvement Strategies in North America
Quality: Conference on International Experiences, Industrial Association for Region of Udine and University of Udine
Udine, Italy July 2002 G.D. Beecroft

Survival Analysis Based on Survey Data
International Conference on Advances in Survey Sampling
Ottawa, ON, Canada July 2002 J. Lawless

Dimension Reduction for Multivariate Prediction
University of Waterloo
Waterloo, ON, Canada July 2002 B. Abraham

Statistical Learning and Data Mining
Joint Statistical Meetings
New York City, NY, USA August 2002 H. Chipman

INSTITUTE FOR IMPROVEMENT IN QUALITY AND PRODUCTIVITY

INTERNATIONAL CONFERENCE ON QUALITY AND INNOVATION

Sponsored by the Institute for Improvement in Quality and Productivity - University of Waterloo and the Quality Management Division - American Society for Quality

Waterloo, Ontario, Canada

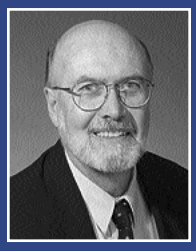
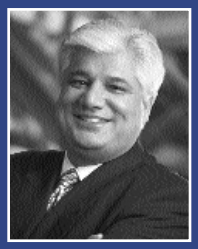
October 22-23, 2002 ◆ Waterloo Inn

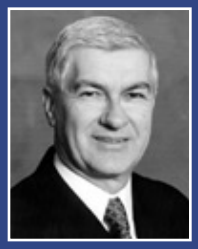
Quality and Innovation are key factors influencing strategic decisions in business, government and other organizations. In this rapidly changing economic environment, it is essential for organizations to respond effectively to changes in technology, environment and customer demand with efficient, high quality products and services. Innovation is all about new ideas, new products, new processes, new services and new customers.

The objective of this conference is to bring academic researchers, government and business leaders and professionals together to discuss and promote ideas in the areas of quality and innovation.

Keynote Speakers

Paul Guild, Mike Lazaridis, David Strangway and Ray Tanguay



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