An Institute for Improving Manufacturing Efficiency in Central New York

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To survive today, manufacturing organizations must implement

- Continuous product improvements
- Continuous personnel training
- Continuous process updates
- OR THEY WILL DISAPPEAR

Improvements Dilemma

- Given limited amount of capital
- I) Invest in short term improvements
  - Immediate survival of the company
  - That will immediately improve sales
- ii) Invest in long-term problem
  - Takes more time, effort and resources
  - There may not be a customer tomorrow
  - Without the company surviving today!

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Improvement Alternatives

- Do nothing: maintain status quo
- Use Independent Consultants
- Create internal QR&CI function
- Create Centers of Excellence:
  - Applied Institutes for QR&CI
  - Industry-Prof. Organizat.-Academe
  - For Joint/Cooperative work

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The Status Quo

- Small, medium size companies:
  - Continue without QR&CI functions
  - Approach QR&CI problems as “fires”
  - With resources within the organization
  - Occasional crisis brings in a Consultant
  - Long term solutions seldom developed
  - No established QR&CI permanent plan

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Our Proposed Solution

- Smaller, specialized, applied centers
- Supported entirely by grants/donors
- Two Main Components or Functions:
- I) Develop a “free” assessment function:
  - Service to small/medium size organizations
- II) Train practicing engineers in QR&CI
  - Enhances undergraduate education
  - Prepares H.S. students for engineering

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Relevant Precedent: the GI Bill

- Created After WWII, for Veterans
- Provided a Monetary Voucher
- Non-transferable; non negotiable
- Only Redeemable at a University
- Paid for college degree or training
- Of individual veterans who opted
- CREATED THE U.S. MIDDLE CLASS

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Similarly, QR&CI Institutes

- Created for Small/Mid-Size organizations
- Also Provides a Monetary Voucher
- Non-transferable; non negotiable
- Only Redeemable at QR&CI Institute
- Pays for assessment or training
- Of midsized organizations who apply
- FOSTERS INDUSTRY RECUPERATION

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The Assessment Component

- Provide free or affordable QR&CI assessment & services, to small & medium size organizations
- Supported with grants from local, state and federal institutions, with focus on increasing product and process quality and reliability
- Use college engineering students as interns, to provide hands-on experience and expertise
- Use local expertise (ASQ, consultants, faculty) as assessment directors and implementers.

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The Education Component

- QR&CI-CNY addresses a Key problem of the education of current and future engineers.
- Two Key NSF reports:
- *A Nation at Risk* (1982): http://www.ed.gov/pubs/NatAtRisk/index.html
- *Moving Forward to Improving Engineering Education* (2007) http://www.nsf.gov/pubs/2007/nsb07122/nsb07122.pdf

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Engineering Education “Situations”

- “Past” Situation (those in the field)
  - Practicing engineers obtain training in workshops/evening/short courses
- “Present” Situation (those in college)
  - Engineering students obtain hands-on experience via internships
- “Future” Situation (prospective students)
  - High School students and teachers exposed to engineering training

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Issue 1: What statistics

Do practicing engineers learn in college?

The Basics!

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Issue 2: What statistics

Do practicing engineers need, to perform in their work?

Specialized Methods

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Examples of Methods

- Certified Quality Engineer
  - statistical content of the exam (50%+)
  - http://www.asq.org/certification/quality-engineer/bok.html
- Certified Reliability Engineer
  - statistical content of the exam (40%+)
  - http://www.asq.org/certification/reliability-engineer/bok.html

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There is a gap between
college curriculum
and engineering needs
That needs to be Bridged:
After graduation,
on their own, via self-study,
with Mentoring.

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Methods Preferred

I) ***Readings: books and journals, as well as web tutorials, provide 38% of statistics knowledge. The use of web tutorials (10%) is increasing with time: older engineers prefer hard copy, whereas younger ones read web-based material.***

II) Short courses, exam preparations for the professional certifications, and Black Belt training, are also important methods of learning statistics (33%).

III) Mentoring from more experienced colleagues and hands-on (learning by doing), also constitute frequent learning activities (22%).

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“Present” Situation

- QR&CI Institute will train college students
  - Currently little or no training, in classroom
- Provide Hands-on Experience on QR&CI
  - Through Work Internships in the Institute
- Contacts with Local Organizations
  - Hiring eased: both get to know each other
  - One of the most expensive/frustrating costs
  - Quality engineering workforce stays here!

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“Future” Situation

- High School students enticed
  - To follow science/engineering careers
  - Currently, levels unacceptably low!
- High School teachers better trained
  - Currently engineering knowledge is poor
  - As HS teachers do not know what we do
- Engineering is not just math and science
  - Nor solely for excelling math students!

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The Institute Operational Profile

- Specialized: QR&CI applications
- Specific functions: professional training
  - and QR&CI assessments for organizations
- Supported: by stakeholders and grants
- Interns: work by engineering students
- Target: small/medium size companies
- Develop workshops and short courses.
  - And a “nurturing” environment for QR&CI.

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More Specific Functions

- QR&CI Assessments and Audits include
  - Web-based materials and questionnaires
- Develop additional QR&CI web tutorials
- Training of QR&CI technicians/engineers
- Development of new QR&CI short courses
- Periodic meetings, talks and presentations
- Special activities for High School Teachers
- Support activities for H.S. science students.

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The Institute Networking Function

- With Other Industry-Academe Centers
  - Of different type, in the region
  - Of the same type, in the nation
  - To enlarge and refine their activities
  - To conduct synergistic activities
  - To exchange students and faculty
  - To teach synergistic QR&CI courses
  - And other mutually beneficial activities.

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Stake Holders/Benefits

- From Industry/Service Organizations
  - Increase competitiveness, profits, survival
- From Academe/University
  - Improve teaching and research
- From All Government Levels
  - Increase tax base and economic growth
- From the Public at Large
  - More Jobs, better services & quality of life.

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Possible Income Sources

- Federal Government grants
  - NSF: educational function (engineering)
  - Other agencies sponsoring job development
- State and Local Government grants
  - To help local industry remain competitive
  - Save local jobs; revert regional emigration
- Prof. Organization and Industry grants
  - Office space, phone, computers, interns.

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Institute Performance Measures

- Number of Assessments/Money saved
- Number of Interns/Placement rates
- Number of Tutorials/Reader Web Hits
- Number of Workshops/Number of students
- Number of Presentations/No. Attendees
- Number of Districts/Number HS Teachers
- Number of Schools/Number of Students

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The Institute Board of Advisors

- Integrated by Institute Stake Holders
  - Federal, State and Local Government
  - Assessment and education customers
  - Experts: academe and practitioners
  - Regional Professional Associations
  - Potential Institute Donors ($$$)
- Board helps define directions to pursue
  - Focusing on problem-solving activities
- Helps find new Customers and Services

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P.I. Professional Experience

- Ph.D. in Ind. Eng./Oper. Research
- Chartered Statistician Fellow, Royal Stat. Soc.
- Senior Member, American Society for Quality
- Member, American Statistical Association
- Thirty years experience as research statistician:
  - **Research Professor, Syracuse University**
  - **Illinois Inst. Of Tech. Research Inst./IITRI**
  - **Reliability Information Analysis Center/RIAC**
  - **Data and Anal. Center for Software/DACS**
  - **Adv. Mater. & Proc. Tech. IAC/AMPTIAC**

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Previous Project Presentations

- Mayor Roy Bernardi's letter (January 1998)
- Syracuse City Hall: Development Commission
- Rutgers University: Dept. Industrial Engineering
- ASQ Syracuse Section: Meeting Presentation
- NYS/CNY Economic Development Agency
- Senator DeFrancisco's Syracuse Office
- Syracuse Research Corporation
- TACNY Sweet Lecture Series
- Spring Research Conf. NIST/DC
- American Statistical Assoc. Annual Conference
- Manuf. Assoc. of CNY/MACNY (May 2012)

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