Statistical Consulting in Industry; Experiences and a few examples

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Outline

- My Background
  - Academic
  - Work experience

- Westat Consulting Examples
  - BHP Mining and Blue Scope Steel
  - U.S. Environmental Protection Agency
  - Statistics Sweden

- Cal Poly Consulting

- Bringing consulting into STAT 465
  - Two example consulting projects
  - Some video
My Background

- **Academic**
  - Undergrad in Mathematics (started in Engineering)
  - Grad school in Statistics
    - Quality control
    - Experimental design
    - Statistical consulting

- **Work Experience**
  - Westat, Inc.
    - [http://www.westat.com/index.cfm](http://www.westat.com/index.cfm)
  - Cal Poly
Consulting for Westat

Types of Clients
- Industrial
  - Mining: coal, iron ore
  - Metals: steel, aluminum,
  - Refractories
  - Gases
- Service: Securities, Hotels, Hospitals
- Government
  - Census
  - Education
  - Environment
  - Energy
  - Health and Human Services
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Skill Sets

- **Technical/Statistical**
  - Quality Management/Six Sigma
  - Statistical Process Control
  - Experimental Design
  - Regression
  - Analysis of Variance
  - Reliability Theory
  - Sampling
  - Survey Research
  - Computing/data management
  - Basic science
  - Basic engineering
  - Basic business management
  - Technical and business writing
  - Research skills

- **Non-technical**
  - Intellectually curious
  - Project management skills
  - Collaborative/team work skills
  - Communication skills
  - Cooperative
  - Flexible
  - “Get things done” mentality

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Job responsibilities -- The Business End

- Write proposals and explain services
- Audit the current quality system/assess needs/set objectives
- Design a quality system
- Organize for quality within the organization
- Implement the quality plan
- Audit the continuing quality effort
- Monitor the cost of services and submit invoices
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Job responsibilities -- The Statistics End

- Study the major processes involved in the client's industry
- Develop industry and client specific training materials and courses
- Train senior management in methods for quality improvement
- Conduct a wide variety of courses in the qualitative and quantitative methods for quality improvement
- Provide project-specific statistical consultation and facilitation
- Train in-house trainers to carry on as quality advisors
- Provide on-going consultation in support of business objectives
Private Sector Consulting for Westat

BHP Billiton and Blue Scope Steel

- http://www.bhpbilliton.com/bb/ourBusinesses.jsp
Inductive heating of tube ends - SMS Elotherm, Remscheid, Germany

Source: SMS group
“QUESTIONS MANAGEMENT SHOULD ASK”

- What key process variables are you currently working on and how did you select them?
- Are you using process analysis methods such as:
  - A dynamic process flow chart?
  - Cause and effect diagrams?
  - Pareto analysis?
- What systems do you have in place to measure the stability of your key processes?
- Are personnel being empowered to assume greater responsibility?
- How does your performance compare with your customers' requirements and future needs?
- How do you know you are continuously improving?
- Do all your people participate in improvement activities?
- Are your process improvement activities formalized?
- Are you engaged in benchmarking?
- Do you monitor Key Performance Indicators (KPIs) in statistically valid ways?
Cal Poly Consulting

- The Consulting Service & Other consulting projects
- Consultants
  - Stat faculty
  - Stat undergrads
- Clients
  - College of ENG, AG, SM, BUS
  - Admin
  - Research Groups
  - Senior Projects, Masters Theses, General Research
- Mixture of unpaid and paid services
- Types of projects
  - Survey design and analysis
  - Experimental design and analysis
  - Observational studies
  - Data management

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Example STAT 465 Research Project: Gas Purification

- Original project was for a “real” client
- Role play client for STAT 465
- Project goals
  1. Design a study to determine which machine settings maximize the removal of methane from nitrogen gas
     - Response: Methane removed (ppb)
     - Predictors: Temperature, Flow rate, Time
  2. Analyze the data and report the findings
Gas Purification Initial Session
Graph Referenced in Follow-up Session

Interaction Plot for Methane

- Flow rate 15
- Flow rate 2000
- Flow rate 4000

Mean

Time

1 2
Example STAT 465 Research Project: Alligator Cracking

- External client: Caltrans

- Research Team
  - Eng. grad student
  - Eng. faculty advisor
  - STAT 465 students
  - Statistics faculty advisor

- Project Goal
  - Build a model that will predict the amount of alligator cracking
  - Predictor variables: age, traffic, asphalt and concrete thickness

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Alligator Cracking Initial Session Part 1

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Discussion
&
Questions