

**ENBIS Workshop:
Statistical Consulting and
Change Management
Section 6
Practical hints; do's and don'ts
Newcastle, United Kingdom
September 17, 2005**

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6.1

Introduction

- The section is a collection of miscellaneous hints, do's and don'ts
- Most is based on what we have learned "the hard way"
- Higdon's Law:
 - Good judgment comes from bad experience
 - Corollary: Experience comes from bad judgment

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6.2

Do I know Enough to be a Statistical Consultant?

- Statistical consulting always involve some other subject matter area, typically rather complicated technology
- Question: How much do you need to know about the subject to be able to be an effective consultant?
- Answer:
 - You are asked to join the team because of your statistical knowledge and general problem solving skills, not because you know a great deal about any other subject.
 - With that said you should always try to learn as much as you possibly can about the subject matter both before and during the consulting engagement

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How Do I Quickly Learn About X?

- My Trick:



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Other Resources: Handbooks

- A few examples we use:
 - Juran, J. M. and Godfrey (2000), *Juran's Quality Handbook*, Fifth Edition, New York: McGraw-Hill.
 - Handbook of Chemical Engineering
 - Doyle, L. E., Keyser, C. A., Leach, J. L., Schrader, G. F. and Singer, M. B. (1985) *Manufacturing Processes and Materials for Engineers*, Third Edition, Englewood Cliffs, NJ: Prentice Hall.
 - Maynard, H. B. ed. (1970), *Handbook of Business Administration*, New York: McGraw-Hill.
 - Riggs, J. L. (1976), *Production Systems, Planning, Analysis and Control*, Second Edition, New York: John Wiley and Sons.

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6.5



Pragmatism

- Really useful solutions are typically simple. Indeed they are useful because they are simple!
- Clients don't want to hear about how difficult it is to solve a problem. They don't want to hear about violated assumptions. They want a quick solution!
- A good solution is seldom "optimal" in any narrow sense but satisfactory in a number of ways
- The key to success is to cut out the complexity and develop a simple and useful solution.
- Sometimes you need to shoot from the hip:
 - Example SPC for autocorrelated data. Multiply the sigma estimate by 2
- H. Hofmann: "The ability to simplify means to eliminate the unnecessary so the necessary can speak."
- A. Einstein: "Everything should be made as simple as possible, but not simpler."

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6.6



Solicitation and Marketing

- Don't do media advertising and fancy brochures; not effective
- Clients typically find consultants through indirect channels, word-of-mouth recommendations from friends and colleagues, meeting the consultant at business meetings or conventions, hearing the consultant speak, reading articles by or about the consultant, books written by the consultant, news items
- Teach short courses, pre-conference workshops and give talks pro-bono for a variety of trade and professional organizations including non-statistical societies
- Write books and articles

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6.7



Solicitation and Marketing

- Cultivate relationships
- Network, get together, express interest in getting acquainted, conduct conversations, establish contracts, exchange business cards, etc.
- Work on referrals
- Develop a brand; develop a good reputation
- Use a broker
- Write proposals
- Do good honest work! Nothing succeeds like success. (Many consultants do such poor jobs that you will quickly develop a reputation if you are doing good solid work)

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6.8



Novice Consultant's Mistakes

- Unnecessary overheads and expenses
- Fancy offices, cars and other paraphernalia
- Expensive marketing efforts and brochures
- Failure to do sales work until business is slow
- Incorporating

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6.9

Engagement Maintenance

- Long term relations are the best:
 - You learn more,
 - Get exposed to better problems and
 - Can make more significant contributions to the clients operations (short term engagements are mostly training)
 - Requires less selling
- Rule number 1: Be effective! Aim for saving the client 5-10 x your fee.
- Rule number 2: Do what you promised to do (and don't promise what you cannot or will not do).

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Engagement Maintenance

- You must always listen carefully to client feedback, try to understand what they need, work with them to make sure they are satisfied customers
 - Example: The one trick pony: The client needed and requested a talk on management of experimentation but the consultant gave a lecture on consulting.
- Keep the client team on your side, involved and get buy-in
- Make the client shine!
 - ...it is not about you!
 - If your client looks good in the eye's of the superiors, you will have repeat work
- Identify new client needs while you work on the current assignment and let the client know that you have additional expertise that can help with XYZ

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Arrogance

- Arrogance is “Problem Number 1” of consulting
- Don't ever be condescending and patronizing to your client
- Statistics is difficult -- many people have “stat anxiety”
- Avoid “disdainful punitiveness”
- There are always tactful ways to bring the bad news
- Clients hire consultant to get help, not to be insulted
 - Example: “Didn't you learn in Stat 101 that you cannot do that?”
- Help the client explore how critical mistakes were made
- Words like “trivial”, “obviously”, and “easy” should be banned

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Solve the Clients Problem

- The purpose of consulting is not to show how smart you are!
- The purpose is not to find the most sophisticated way to solve a problem or to provide an “elegant” demonstration of a particular technique
- Consulting is not necessarily a statistical research project.
- Technique Driven Problem Solving: Don’t act like the expert wanting to solve all problems with your favorite technique
- Problem Driven Problem Solving: The purpose is to solve the client’s problem
- Solve the clients problem quickly and with concern for the cost and urgency
- Be prompt with your services
 - Example: Circuit board manufacturer

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Never Forget Who is Your Client?

- You may think you consult with for a company, but the person who retained you is your client!
- It is your job to make whoever hired you look good
- It is not about you! As a consultant you are in the “hero-making,” not “hero-being,” business!
- Always give your client credit and assume an inconspicuous role
- If you are effective, your client will be successful. If you fail or are not effective, the person that hired you will end up with “eggs on his/her face”
- Consulting is a person-to-person business
- Be sure you know who really hired you
 - Example: Mr. C or Mr. S?

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6.14



Who Makes Decisions?

- **A Fundamental Principle:** Consultants do *not* make decisions!
- Consultants provide input to making decisions, but in the end the client/manager makes the decision
- The manager ultimately is responsible for the decision, not the consultant
- The consultant can help determine what conclusions can be drawn from a set of data and with what confidence, but should then back off
- If the evidence is weak, the consultant is responsible for pointing this out, preferably with analysis to back up the claim

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Statistical Consulting Rules

- Avoid answering any statistical questions until the subject matter background is understood
 - Example: “Should I run an ANOVA on this data set?”
 - Example: “Don’t you agree that a t value of 7.2 is very good?”
- It is legitimate to help endorse a client's own solution, but you must first understand the problem, grasp the objective of the study, scrutinize the data, understand how the data was collected and carefully examine how the client developed the solution
- It is OK to say “I don’t know.”
- You should know your limitations and you should make them known to your client (C. Daniel, 1969)

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What is a Statistical Problem?

- Deming's definition: "I'm a statistician, I helped solve the problem, ergo it is a statistical problem."
- Deming's shoe story
- Some times it takes someone, an outsider, non-expert, a person not bound by "conventional wisdom" to identify and solve a problem
- "Experts" tend to think in conventional ways
- Beware of the "expert" that says it cannot be done!
- To come up with a new way or a new solution may often require someone coming in naively asking "why not!"

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An Observation

- You typically cannot do good consulting in your own immediate neighborhood
- If you do, you end up doing low-level work for a low fee, on an hourly basis, gain little respect for what you do and end up with complaints about your bill
- A definition of a consultant: "Someone who flies in from at least 500 miles away"

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Solo or Going Big?

- Going big or going it alone?
 - There are many advantages by being a sole consultant – small overheads, no financial commitments to others
 - However, it is hard to do marketing while you are working on a contract so you end up with going from feast to famine
 - There are also limits to how large jobs a sole consultant can take on
- On the other hand you need to get quite large before you make as much money as a multi consultant company as you did as a sole consultant
- Going big you end up doing nothing but selling
- You will have problems with quality control
- Compromise: Use subcontractors; act as a broker

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Why Consult?

- Why should you consult?
 - If you are an academic:
 - » Consulting teaches you what is really important for the practice of statistics
 - » You get much better “war stories” to tell in class and better examples; you become a better teacher of statistics
 - » Rich source for research ideas
 - If you are an internal or external industrial statistician:
 - » Consulting is very rewarding, will make you a much better statistician, and a more successful professional
 - » The best way to learn!
 - » Your clients teach you so much about statistical as well as non-statistical issues
 - In any case, consulting is great fun!

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The Importance of Practice in the Development of Statistics

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The article shows how application and consideration of the scientific context in which statistics is used can initiate important advances such as least squares, ratio estimators, correlation, contingency tables, studentization, experimental design, the analysis of variance, randomization, fractional replication, variance component analysis, bioassay, limits for a ratio, quality control, sampling inspection, nonparametric tests, transformation theory, ARIMA time series models, sequential tests, cumulative sum charts, data analysis plotting techniques, and a resolution of the Bayes-frequentist controversy. It appears that advances of this kind are frequently made because practical context reveals a novel formulation that eliminates an unnecessarily limiting framework.

KEY WORDS: Practice; Theory; Least squares; Ratio estimators; Correlation; Contingency tables; Studentization; Experimental design; Analysis of variance; Randomization; Fractional replication; Variance component analysis; Bioassay;

Technometrics (1984)

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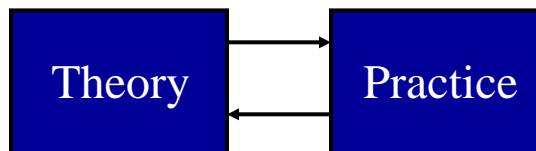


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Statistical Theory and Practice

- A primary stimulus for innovations in statistical theory comes from challenging applications
- Historically, major and minor statistical theory developments have occurred in direct response to the demand for solutions to important practical problems
- It is a two-way street:
 - Challenging problems stimulate the development of new procedures, methods and theory
 - New theory and methods stimulate new applications



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Conclusion

- The human side of consulting is much harder than the technical
- This workshop was not intended to teach you “everything you ever wanted to know about consulting”
- The purpose was to stimulate thoughts and discussions about effective consulting skills
- Consulting can only be learned by “doing consulting”
- We hope this workshop was thought-provoking

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