STAGES OF CONSULTING

General

How to ensure the point of contact in the early stages of the consulting session is the real client we are working with? How to ask for clarification or for a contact with other stakeholders without being offensive?

During the second stage of consulting, if I'm dealing with an intermediary, what are some appropriate ways to request a meeting with the real client?

> *The best way to get to the "real client" if your point of contact is not the real contact, is to establish a good working relationship with your point of contact person. It's then likely that your point of contact will offer to bring in the "real client", or at least provide project criteria from the "real client", as needed during the project. If that doesn't happen, then you can raise the possibility in "problem-solving" and "planning" conversations with your point of contact. Since you will have established a good working relationship, there will be a graceful way to bring this up that does not offend.*
>
> *Note: Sometimes the "real client" is rather abstract or unspecified. For example you may be consulting on a project that leads to a report that will be read and acted on by unspecified policymakers—perhaps not even members of the organization of your point of contact. In that case of course you can't "get to" the real client, but if you have a good working relationship with your point of contact you can still work with the point of contact to find things that the abstract/unspecified client will actually be interested in.*

It was stated that disappointment is often one of the consequences of failing to spell out the details of a consulting relationship. Isn't the relationship supposed to be agreed in advance at the beginning of the project on paper or so? If that's the case, are there still problems regarding violation?

> *Too much, or too little, planning and rule-making at the beginning of a project can lead to disappointment. Too much, and you run the risk of over-promising before you really know what you're dealing with. Too little, and everyone is free to make up their own expectations and someone will end up feeling disappointed, or worse. It is important to plan out the project and set up the consulting relationship at the outset. This provides a framework for moving forward. But be careful not to overspecify (e.g. "I will do this project using Smedley's variation of support vector machines", or "Please only talk to my teammate Joe about writing") because you can paint yourself into a corner, i.e., make it impossible to adapt to inevitable changes in the project.*
>
> *Keep your plans and your relationship specific enough that they are useful, but flexible enough that you can accommodate realistic and healty changes as you move through the project. And **most important**, keep a good working relationship with easy and obvious lines of communication in both directions between you and the client: that will facilitate both sticking to the plan, and changing it when it is healthy to do so.*

Establishing Rapport

I learned from the article about the most common stages of the consulting process for statistical consulting project and that some stages of the process differ from strategy consulting process. I am

curious about the first stage of the process. It says in the reading that the first stage of the process is establishing rapport. In my experience, the project was always initialized by preparing a proposal report / presentation for our potential client. Is this step not required or usually not required in statistical project?

> *Rapport is a part of building trust between human beings so that they can work productively together, accommodate challenges, negotiate healthy changes of plans, etc. A project proposal is just an outline in words and figures of a set of goals, contexts and plans for achieving those goals. The proposal is an important starting point and an important guiding document throughout a consulting project but it does not substitute for establishing professional, human rapport with your client.*

Identifying the Research Problem

> *There were no questions specifically about this, but I wanted to emphasize a passage from the Kirk article here:*
>
> *Clients often have a very specific idea of what their research problem is (i.e. what they want), but they may not be able to express the problem in clean statistical terms, or even in any terms outside of the specific context and technical language of their own work. Part of your job is to figure out what they want, without changing it into something more familiar or easier for you.*
>
> *This often involves translating back and forth between language that is natural for you as a statistician and data scientist, and language that is natural for the client in their own field. To be successful you must listen carefully while the client is talking, listen carefully while you are talking, and frequently summarize back to the client what you have heard them say, to ensure that your conception of the research problem is the same as the client's conception of the research problem.*

Setting Goals

What are the differences between identifying research questions and setting goals?

Is project timeline something to bring up in the setting goals stage?

> *The research question is the overall aim of the project: what should be the content of your final report or product for the client. Often the research question will be somewhat complex, and in order to make progress it will be necessary to break it down into smaller goals or subgoals which, if all accomplished, result in the an answer to the research question. Goals and subgoals can be pieces of the final report or product, and/or they can be mileposts along the way as the project progresses. They can include anything from "We will interview person Z to find out what data exists for subgoal W", to "We will perform EDA on data set X", to "We will read papers and other literature on subject Y to better understand the client's context and constraints for answering the overall research question", and of course many other things.*
>
> *Setting out a project timeline in the goals state is a good idea: it helps to indicate when each goal or subgoal is going to be accomplished. Plans and timelines often change as a project progresses, so it is a good idea to point out (gracefully of course!) that the timeline is a current*

best-guess, and you will be flexible about changes if you or the client later discovers that changes are needed.

What can we ask to clarify clients' expectation for us?

One of the most useful tools for doing this is to summarize back to the client what you think their expectations are. If you are right, they will nod their head approvingly. If you are wrong, they won't hesitate to set you on the right track.

During the stage of setting goals, should we clearly tell clients what specific statistical tools to use in order to answer the question? Or can we stop at suggesting a general description of actions such as: exploratory data analysis?

I am in favor of some amount of flexibility in initial planning statements. If you want to specify a particular statistical tool, emphasize that it is your current best guess, and of course if another tool turns out to be more appropriate, that is what you will use. Otherwise I am inclined to stick to more general descriptions, until you are more familiar with the research questions, the client, and the data.

<u>*Agreeing on a Division of Responsibility*</u>

What are some strategies that help the consultant when discussing the division of responsibility?

What should the consultants do when they find they are assuming roles that are out of their responsibility?

At an organizational level, you are responsible for

- *Setting up a regular meeting schedule that works for the client, and setting up lines of communication for between meetings that work with the client's preferences (email? slack? cell phone texts? Etc.) and other obligations.*
    - *Establishing a format for meetings that works for the client. Does the client want a progress report at every meeting? Or just to hear about specific problems or successes? Does the client want to drive the agenda, or does the client prefer that you drive the meeting agenda? Etc. And of course followup with a written summary of the meeting.*
- *(Specific to 726) doing the same for your faculty mentor.*
    - *Establishing a format for meetings that works for your faculty mentor. Generally speaking I recommend starting with a progress report since the last time you met with the mentor, then discussing any new problems (statistical or interpersonal), methodologies, new initiatives, etc., and ending with steps to be taken before the next meeting. And of course followup with a written summary of the meeting.*

For the project itself, generally speaking

- *You are responsible for*
    - *Learning the subject area, contexts, and constraints of the client and the research problem, and learning about the problem*

    - *Learning anything new about statistics and data science methodologies that you need for the project*
    - *Offering advice, analysis (quantitative and/or qualitative), and a final work product, that is meaningful to the client*
- *The client is responsible for*
    - *Aiming you toward any non-statistical information you need for the project*
    - *Providing you with a research question and possibly high-level goals, as well as any updates on the question and high-level goals as the project progresses*
    - *Proving you with feedback (at a very high level – not specific technical feedback) about your work as it progresses*
    - *Providing you with data (unless one of the goals of the project is for you to find, or find out about, data)*

Although specific division of responsibility will change from project to project, and even over time within the same project, the above is a useful place to start & then modify as needed for your particular project.

If you have developed good professional rapport with the client, these sorts of negotiations tend to go well.

Here are a couple of things to watch out for:

Be wary of taking on responsibilities that "just need to be done, and the client isn't doing it." If you feel this may be happening, have a conversation with the client and with your faculty mentor.

You should never commit to a responsibility that feels like it is outside the scope of what you can do with the amount of time and expertise you yourself have, without first discussing it with your faculty mentor, and ultimately with your client.

<u>*Reviewing what has occured / summing up*</u>

How to properly present the results of a statistician's research to clients?

This is obviously a very general question!

Intermediate progress reports, etc., are probably best presented with slides, unless the client or your faculty mentor or instructor want something more.

Essentially all of the projects will end with a work product that at least includes a paper, as well as perhaps other things such as one or more computer programs, etc. The default format for your final papers will be IDMRAD, although again the specific format will depend on client preferences.

As we learned last semester when we did IDMRAD papers, your final paper will need to be readable by people with varying levels of expertise. Readers (clients) who are not statistically sophisticated should be able to clearly see what you have done and what the results are, even by only skimming the paper and skipping all of the technical statistical stuff. More quantitatively sophisticated readers (your faculty mentors) should be able to take a deep dive into your technical work, because you have created a well documented and complete technical appendix,

with detailed and specific references from each part of the main paper to the specific part of the technical appendix that is relevant.

With the exception of progress reports for your faculty mentors, never write a report that say "first I did this, then I did this, …". Focus on the meaningful story for the client, not the meaningful story for you.

NEGOTIATING WITH THE CLIENT

From the authorship example given, it seems that it was only after the publication did the consultant know that he/she was not part of the authorship. Is this something that I should make clarification before the finalization stage of the project?

What is the best type of document to use to prevent receiving credit without approval? What situations typically ask for it, and are there any warning cues from your prior experience that we should especially look out for to avoid unwanted citations/appraisal?

Is there anything that can be done in the situation in which was described in the data blesser example (given credit when did not express so)? Does this happen a lot in consulting?

The problem of not getting credit when you deserve it, and the problem of getting credit that you would rather not have, are both much more of an issue in academic consulting than they are for a statistical consultant who works in a firm. For the purposes of 726, I recommend not raising these issues yourself, but if they come up naturally, have a full and frank discussion with your faculty mentor, who has been through this sort of things many times in the past.

Among the things that should be discussed in the policy statements, would there be some aspect of cost attached to any of our projects this semester?

In 726, client billing is all behind the scenes and you do not have to worry about it. Estimating the value of your time, and estimating the amount of time it takes to do something, is difficult. I have a few heuristics that I use for myself, but frankly I still don't know if I have it exactly right. One of the nice features of 726 is that at least you'll learn how long it takes to do things, which will help you in future consulting projects.

My last question from the reading is about the interpersonal skillsets required for the stat-consultant. In negotiating for desired consulting role, the core explained in the reading is to successfully capture client's needs and approach the potential issue in a way that could satisfy client's needs. Is it also possible to suggest a potential issue and persuade our clients into having those needs to negotiate for a desired role?

I don't understand the meaning of "When there is disparity between the client and consultant in power or prestige and the difference favors the client, the consultant should try to negotiate on the basis of principle." Specifically, what is "the basis of principle"?

Both of these questions presume some level of friction between you and the client. Obviously we do not want friction, and the best way to avoid it is (1) establish strong professional rapport and two-way trust with the client; and (2) establish easy-to-use lines of communication that agree

with the client's style, to help stay "on the same page" as the client. Note that trust is earned by making clear commitments, following through on commitments, helping in ways that were unforeseen at the beginning of the project, etc.

The principles being referred to in the second question are things like fairness, accommodating the challenges that others face, giving credit where credit is due, etc., and more generally the golden rule, "do unto others as you would have them do unto you." If you find yourself in a situation where you need to invoke such principles, please have a frank conversation with your faculty mentor before invoking them with your client.

With respect to roles, I think most teams will find that their role is a blend of helper, collaborator, and teacher. It is difficult to learn enough about a new subject, within one semester, to be a true collaborator, but many projects will afford you the opportunity to try out some aspects of collaboration with your client. If not, in your particular project, that is OK; all of these roles are honorable and necessary for the project's success. Over time (measured in years) some people find they like being helpers more than collaborators; others find they prefer collaborator or teacher roles. This is your semester to try things out. I would recommend against getting your heart set on just one role; instead, use this semester as a chance to practice whatever roles are offered to you by your project.

CONSULTANT'S RELATIONSHIP WITH CLIENT

Working with the client

The author mentioned that interpersonal skills are as important as statistical skills but sometimes the school give little attention to it. Are there any other strategies that could help improve such skills besides the examples the author talked about ?

Grace and magnanimity are two of the most important general interpersonal skills. These will help you establish strong professional rapport with the client and keep lines of communication with them open.

Reliability (following through on commitments) will help establish you as trustworthy, which will help if you ever need to report on an unexpected or undesirable result of your work, or if you need to negotiate a difficult point with the client, etc.

In the syllabus I mention the idea of upholding the inherent worth and dignity of every person. This is important. It's obviously important that you treat your clients and your other teammates in this way. But it's also important that you treat yourselves in this way. For example

- *It is easier to be dignified when you are doing everything right. But it is equally important to carry yourself in a dignified manner when you make a mistake, admit your mistake to others, and work to learn from it, correct it, and/or do better next time.*
- *A part of your inherent worth is your time and effort. Although helping the client is a central part of every project, you may find you need to draw some boundaries around your own time, so that you do not become exhausted and burned out and unable to help*

the client or do any of the other things that you need to do to be a successful MSP student and a happy person.

The reading says "Clients have multiple interests; develop a climate for agreement by first focusing on shared interests and then turn to interests that are opposed". When would the client's interest be opposed to the consultant's?

Generally, the client's interests are not the same as yours. Your goal is to graduate from the MSP program, get a position somewhere, and move on with your life. Your client's goal is to make their situation, right where they are, better. Later in your career, you will still find that your interests and those of your client are not the same.

Shared interests often involve a bit of reframing. The client wants to make their situation better, but that can only happen by helping you to succeed: your success was not initially a goal of the client, but now it is. You want to graduate, but that can only happen by making a positive contribution in your consulting project with that client; the client's happiness was not initially your goal in the MSP program, but now it is. Those reframed, common goals can be broken down into more specific shared interests that are the basis of positive, healthy agreements.

The article mentions that the introduction of new materials can often be interpreted as rejection. Before introducing these materials, should we first clarify the reasons we introduce them then?

I think that introducing an alternate approach is much more graceful than simply saying "Dear client, your approach is worthless."

If you are worried about how to introduce an alternate approach or other new information or materials, try doing it in the context of brainstorming with the client, or reporting to the client brainstorming that you did in a team meeting.

When confronting a question to which we are not sure about the answer, how to appropriately tell the client that we need more time to figure out the solution while not affecting clients' confidence in our statistical expertise?

This is 100% OK, and will usually be viewed by the client as a sign of your intellectual strength, not weakness. The only thing I would add is that it is important to then follow through on your commitment by doing research, consulting with your faculty mentor, etc., to figure out the solution, or at least take positive steps toward that, in the time you've requested.

When negotiating with clients, what should we do if we find that it is very difficult to reach an agreement?

Is the client always right? In the reading, we see some negotiation tactics but what is the line between leaving things as is and speaking up and initiating change?

The client's high-level goals are always right, unless they raise moral or legal issues. With regard to specific consulting roles, specific statistical/data-science methodologies, etc., I suggest treating the client's wishes as worthwhile and worthy of trying to do, but not necessarily set in stone. You will find that some of the client's wishes really are set in stone, and others are more open to negotiation, evidence-based decision, etc.

For example if the client wants to do method X and you think there's a better reason to do method Y, try both methods (perhaps on some smaller, representative test data sets, if it would be too time consuming to do on the full data), giving both your best effort at making them work. The results will give you and the client strong empirical evidence for making a decision between the methods.

If you are unsure how to proceed in any situation like this, consult with your faculty mentor.

What if my client does not want to spell out the details when I am trying to set up an agreement?

Talk to Jamie or me (or both).

What should we do when the client is busy and is not able to be actively involved?

Talk to Jamie or me (or both).

Mistakes

What if a consultant makes a mistake that they lead the project to another direction? How will they pay for the mistake?

How do you reconciliate a project that you have realized may have been done incorrectly but towards the end of the timeline of the project?

How to proceed if we realize our initial assumptions/client expectation was wrong in the middle of a complex project?

If there's not enough time to re-do our work after the failure, can we just tell the truth? What else can we do to make up for it?

You definitely will make mistakes in the project. The real issue is when you discover them, and what to do about them.

*If you have established **good rapport**, **regular meetings**, and **good lines of communication** between meetings **with your client** and **with your faculty mentor**, mistakes that could lead the project in the wrong direction, or expectations that were wrong or unrealistic, will be discovered early, and/or when they are still small; they will generally be easier to correct without making the project seem worthless.*

If a project-changing mistake isn't discovered until nearly the end of the project, consider writing a report about why you decided on that approach, and why it was the wrong approach (with lots of empirical and logical evidence and reasoning, from your whole semester of experience!). It won't solve the research problem that was posed in your project, but it very well might help a future consultant not make a similar mistake, and that too is a contribution!

What kinds of mistakes can lead to a legitimate statistical malpractice suit in statistical consulting?

I am not aware of any law suits involving "statistical malpractice" being brought against a professional statistician. The phrase "statistical malpractice" is just a colorful way of referring to mistakes and shortcuts that we all would rather avoid.

There are codes of ethics for science generally, that are related to statistical analysis and reporting. One version is briefly summarized here:

https://webarchive.nationalarchives.gov.uk/20070603172611/http://www.dti.gov.uk/science/science-and-society/public_engagement/code/page28030.html

You have also encountered some related issues in your CITI professional ethics training.

Changing goals – data problems

What should the consultant do if the final deliverables change for unexpected reasons as the project goes on? For example, in the middle of the project, the consultant finds out that it's not appropriate to use one data entry that is offered by the client.

How should we communicate with our client if the data fail to address the questions of interest?

If the consultant and a client set up a goal at the first, and the consultant finds out that the goal cannot be reached due to the data in the middle of the project, how does the consultant do?

How to euphemistically tell clients that the direction of their idea may be unrealizable?

These are things the client needs to know, and it would be intellectually dishonest not to inform the client about them. Euphemism is not a good tool here. Rather, graceful and honest communication, based on the good professional rapport and two-way trust that you have already developed with the client, is the best approach.

When I have to tell a client or collaborator something like this, I try to do more than simply say the hoped-for result can't be obtained with the current data, tools or time limitations (or whatever else seems to be in the way). I always try to suggest an alternative: a different question that the client may be interested that can be answered with the data, tools and time available, or perhaps suggestions for further data collection so a future statistician could help answer the questions the client is interested in, etc.

Sometimes this can lead to a report on the limitations of the current approach and – more importantly – feasible suggestions for the future that will benefit the client. When it can happen, this is a great way to snatch victory from the jaws of defeat!

Changing goals – client problems

What if the client's expectations change drastically during the end of the project when the final report is due?

If the client changes his or her expectation during the middle of the project, how should the consultant negotiate with the client?

If we find in the middle that we are unable to meet all of the client's expectations, how can we communicate that to the client?

*If you have established **good rapport**, **regular meetings**, and **good lines of communication** between meetings **with your client** and **with your faculty mentor**, you will be aware of changing client expectations long before it is too late to discuss them, change the direction of the project, etc. In fact, you will probably find that it is natural to discuss these changes with your client as they occur.*

In any case, you should discuss these changes openly and respectfully with the client, with an eye toward working together to decide whether the new expectations can be met in the time allotted, with the data and tools available. If they can, great! If not, consider alternatives like a more limited set of expectations, or writing a report that describes what would be needed to meet the new set of expectations. You should definitely have a frank discussion about all this with your faculty mentor before charging ahead with the client, however.

Disappointing the client

How do you deal with a situation in which you discover a finding or relationship that the client doesn't agree with? For example, after our analysis I go to our client and say "we found a strong positive relationship between these two factors?", but the client says "no that is not possible that does not align with what we observed in the past".

What should I do when the result is not what the client expected?

How to work with stakeholders that may be negatively affected by the analysis result?

***In all of your work**, whether the results are ones your client expected and agrees with or ones that the client didn't expect or doesn't agree with, the most important thing you can do is **have a clear record of the assumptions and logic that went into your analysis, and a clear record of the empirical, data-based evidence that led to your conclusions.** The assumptions and logic include not only statistical modeling assumptions, but also assumptions and knowledge about the context (the client's field) for the problem and the data, assumptions about how the data arose, what missing data mean, etc., etc. The empirical, data-based evidence includes a high-level summary that your client can understand "at a glance" and also a detailed "technical appendix" record that your faculty mentor can dig into.*

It is easy to forget to record all of your assumptions, logic, data analysis and other evidence when the client agrees with your results – "why worry? It is what the client expected!" – but if you do forget, then neither you nor the client will have the justifications you'll need if someone else pushes back on your results.

It is perhaps more obvious how important all this is, if you arrive at results that your client does not expect or agree with; now it is the client who is pushing back on you.

If you have all of this in place, and you have developed good professional rapport with your client, then you can have a calm, graceful discussion with the client – you might find yourself discussing ways to interpret the results that are helpful to the client in the long run even though they are disappointing in the short run, or perhaps you will be discussing alternate data, alternate assumptions, or alternate statistical methodology that might lead to results more in

line with the client's thinking, etc. And if the outcome negatively affects some stakeholder, let the client take the lead in how they would like to distribute the results of your work.

This is ultimately all very helpful to your client, and really can be an example of successful consulting (if there were no surprises, why would the client need you?). Keep your faculty mentor in the loop on all this; they can be very helpful as you try to find a way to steer through these discussions.

CONSULTANT'S ROLES

General

What type of role would you like us to assume in the capstone projects? Should we assume we will be mainly working as collaborators? Have you seen examples of the other 4 roles being taken on in previous years that this course was implemented?

How should a consultant determine his or her role in a project if he or she can choose? Are there any suggestions?

I think most teams will find that their role is a blend of helper, collaborator, and teacher. It is difficult to learn enough about a new subject, within one semester, to be a true collaborator, but many projects will afford you the opportunity to try out some aspects of collaboration with your client. If not, in your particular project, that is OK; all of the roles – helper, leader, data-blesser, collaborator and teacher – are honorable and potentially necessary for the project's success. Over time (measured in years) some people find they like being helpers more than collaborators; others find they prefer collaborator or teacher roles. This is your semester to try things out. I would recommend against getting your heart set on just one role; instead, use this semester as a chance to practice whatever roles are offered to you by your project.

Once we identify our role in a project, how do we ensure we do not overstep our bounds?

*I know I sound like a broken record, but if you have established **good rapport**, **regular meetings**, and **good lines of communication** between meetings **with your client** and **with your faculty mentor**, this will take care of itself: you will know how far the client wants you to go, and you will get useful feedback from the client and your faculty mentor.*

What are some techniques to negotiate more favorable terms without insulting the client?

I am not sure what you mean by "favorable terms" here. In your career after 726, the main issues will be time, money and interest: Do you have time to do the work? Is the fee OK? Are you interested in the project or what you could learn from it?

In 726, time and fee are negotiated "behind the scenes": all the clients know you have only a semester, and the fee, which is $0 for some projects and more for other projects, has already been determined, and should be irrelevant to the effort you put into the project. You have to find a way to make yourself interested in the projects, but hopefully all of the projects are inherently interesting!

The two most favorable outcomes you can achieve ins 726 are (a) a client who thinks the project was a success (whether the original goals were achieved or not); and (b) a new set of people who know you (your instructors, your faculty mentors, your clients) who will agree to be references for you in future job and academic applications. If you can achieve these without burning yourself out or neglecting your other professional, academic and personal responsibilities, you have definitely done well!

How common is it to switch and transfer between consulting roles? Do you assume a consulting role based on the intentions of the client or your intuition of approaching the problem at hand?

Does a consultant always stay in one role, or in a mixture of roles?

It is quite common for a consultant's role to change over the course of a project or relationship with a client. You will find this to be even more the case in your career after 726. For example, you may start as a <u>teacher</u> (the client comes to you asking how to do procedure X with their data) or <u>data blesser</u> (client wants to know if the data will tell them the answer they want), then become a <u>helper</u> (you offer to do procedure X and other analyses for the client), then a <u>collaborator</u> (as you and the client get to know each other you begin to work together on the client's questions), and over the course of many years you may eventually also take on a <u>leader</u> role (defining, or helping to define, the important questions in the client's field).

As I said before, in 726 I expect most teams to occupy some combination of helper, teacher and collaborator. Your clients will probably first think of you as helpers. You will probably find opportunities to be a teacher or partial collaborator from time to time throughout the semester, again if you act thoughtfully and with grace.

Within your teams, to the extent possible, you should also try to let each person try different roles or responsibilities over the course of the semester. For example one member of your team may be a great Python or R programmer. Definitely use that person's skills for some things, but also let someone else who wants to learn those skills do some of that work (and of course support that person by providing feedback, encouragement, etc.). Similarly there may be a good communicator, but let someone who needs to work on their communication skills also do some report writing, oral presentation, etc. You are students in a university class and you should take the opportunity to practice some things that you are less comfortable with.

<u>Helper Role</u>

Regarding the helper role of the consulting roles, how would we gauge the extent of help that we should provide?

If your project focuses on data analysis (as most but not all of the projects do) you will be the primary data analysts. This is a natural helper role and you should do the best, most extensive job with it that you have the time and experience to do.

If your project focuses on developing a software tool for the client, same story: do the best job your time and experience will allow.

If your project involves uncovering and cataloging data sources, and documenting gaps in the data to be filled in in the future, then that is what you need to do the best that you can, within the time and experience that you have.

Bottom line is: the helper role is doing the technical things that make it possible to answer the larger questions that the client has. Except for the limits of your time and experience, be the best helper you can be.

Leader Role

If a consultant finds themselves in a leader role, how can they try to escape it and become a collaborator instead? Assuming that the client is unaware of the different roles in a consulting relationship.

What should we do when we are in the leader roles? How can we encourage our clients to become more involved?

As there are many pitfalls of taking the leader role by consultants, should we always try to convince the client to take the leader role?

The leader role is probably not going to be a big issue in 726 projects. If it becomes an issue, please have a frank conversation with Jamie, me, and/or your faculty mentor. Generally the projects in 726 are not designed to be so open-ended that you need to be a leader in the client's field of work. On the other hand if the client asks you to determine what the best methodology to apply to their problem/data is, that is not a question that puts you I the role of leader, but rather it puts you in the role of helper or collaborator, using your expertise in statistics and data science to help the client with their problem/research question.

In your career after 726, I'd advise simply not taking on projects that require you to be in a leader role until you've had some experience in the client's area of work as a collaborator. Once you know an area well, being a leader can be very satisfying. If you try to be the leader before you know the area, you run the risk of encouraging your client to produce results that are trivial or irrelevant for their field. That will negatively affect both your reputation and your client's reputation.

Data Blesser Role

The author talked about five different roles that consultants are expected to assume. It seems that data-blesser role is the least favorite one. I was wondering if there are more ways to help avoid the unpleasant situation mentioned in the article and what if the strongly worded policy statement method would affect the relationship between the clients and the consultants?

The data-blesser seems to be inevitable at some point, even though there might be some policy written ahead, the consultant's still loses creditability. What should we do if it really happens?

Is a strong worded policy statement requiring written approval of all credit lines (to solve the problem of being in a data blesser role) feasible in all consulting projects? Is it okay to ask of the same from a client?

Kirk is more negative about the data-blesser role than I think he should be. It can be a very useful and honorable function for a consultant to help the client determine whether the data and

tools available can actually answer the questions the client wants, or even whether the data and tools will give the answer the client wants. You can save the client a lot of time and heartache in this way.

In a sense, every project involves some amount of data-blessing, because even if you are a helper or consultant, you have to determine whether it is worthwhile to apply the available tools to the available data.

The data blesser role can be very straightforward if the data generation process is clear and the statistical techniques are familiar.

It can also be much more challenging, if there is lots of data, lots of missing values, data in many locations, or if the data management and/or generation process is not clear, or if the methods of analysis are not clear or not familiar.

I have some trouble understanding the data-blesser role – should I understand it as such that consultants / statisticians should be aware of the whole data as well as all kinds of tests being run on the data, as opposed to skipping over the data-managing processes?

This is a good insight. As a consultant, you want to be as aware as possible of the whole process by which the data was collected or assembled, what the shape and size of the data are, missing values, possible sources of biases in data collection, etc. These are things that are part of the data blesser role whether or not you are explicitly cast in that role. Some of them you can find out from the client directly; others you will have to find out from your own research on the project, from interviewing other stakeholders, from developing answers yourself, etc.

<u>*Collaborator Role*</u>

When consultant takes the role of collaborator, would it be more tricky with responsibility division?

*Here's that broken record again: if you have established **good rapport**, **regular meetings**, and **good lines of communication** between meetings **with your client** and **with your faculty mentor**, then division of responsibility can be discussed in an honest and trusting way, and adjustments to the division of responsibility can be negotiated over the course of the project if needed.*

If you feel that the division of responsibility is not balanced right, not fair, etc., and you feel you cannot work it out yourself, it is time to have a frank conversation with me, Jamie, and/or your faculty mentor about how to proceed. We are here to help you with such things!

<u>*Teacher Role*</u>

Does being a good consultant mean taking a role of teacher, or taking a role that combines helper, leader, data-blesser, collaborator, and teacher?

How can a statistical consultant delve into the role of teacher when they are dealing with a client who has much more prestige than they do?

More details about strategies to appropriately teach clients.

One of my favorite sayings, which irritates my wife without end, is "We are all teachers, all the time, whether we realize it or not." Ultimately, the teacher role is part of every consulting role.

Every time you interact with your client, in person, in email, in a presentation, or in any other way, you are teaching them something about what statisticians and data scientists consider is important, how we look at data and research questions in other fields, which procedures and methodologies we prefer, how we communicate, etc. We are also teaching the same things about members of the Carnegie Mellon academic community.

More specifically, when you communicate a plan of analysis to your client, or you communicate results to your client, you will need to teach the client the assumptions you are making, the data and variables you are using (and not using) and why, and a general understanding of the methodologies that you applied to obtain your results. Some clients will already know some of these things; others will not. In my experience, if the "teaching" is brief and doesn't get in the way of the story you are trying to tell about the data, then both kinds of clients will appreciate it: the more knowledgeable clients will know and be familiar with exactly where you're coming from, and the less knowledgeable clients will learn something. And you can always stop and answer any more detailed questions that may arise.

CLIENT'S KNOWLEDGE

What's the tradeoff between using a method/procedure within the client's statistical sophistication and solving the problem?

How do you deal with clients that are fairly prolific researchers but are comfortable with outmoded or inappropriate research strategies?

The article mentions that as a general principle consultants should use the simplest statistical procedures with which the client is familiar. But in some situations, an unfamiliar solution may be the only approach, but that will make conveying the results tougher, how should this be balanced?

The article talks about finding the middle ground between working at the client's level of expertise and using more appropriate but perhaps more advanced analysis. In a consulting project, should statistical consultants aim for the client's satisfaction or the most appropriate statistical analysis?

A great deal of academic/theoretical statistics is about finding the best or most optimal procedure for drawing an inference from data. This is an important goal but it is not usually the most important goal for consulting statisticians.

In my own consulting, I usually try to use the most elementary procedure that is powerful enough to accommodate the data and answer my client's or collaborator's question. I do this for two reasons: explainability and reproducibility. A more elementary procedure is one that I will better be able to explain (teach!) to the client, and it is one that the client will be better able to explain to their colleagues, superiors, etc. The more elementary procedure is also likely to be easier to reproduce by someone checking my work (e.g. a client's colleague or another statistical consultant), and easier to apply to another similar data set to answer the similar question(s).

Of course, we do not want to use a procedure that is elementary but fails to account for some aspect of the data or the questions the client wants to ask. For example, in some situations, a pair of boxplots is sufficient to compare two experimental conditions; other situations would

require a two-sample t-test. And we would not use a two-sample t-test to compare the two conditions, if there are other variables that need to be controlled for in a more complete regression analysis. When the data and/or the questions require a more sophisticated procedure, or when elementary procedures are not powerful enough to obtain a result, then it my be necessary to take a more sophisticated approach.

Whether you are using a more elementary approach or a more sophisticated one, you may find you need to teach the client generally how your procedure works. This will not be like a classroom lecture where you begin at the beginning and cover every detail. Rather, you should try to explain, in the context of the client's question and the client's data, how your procedure helps to answer the question. If the client asks for more detail, be prepared to provide it, or offer to go find out and report back to the client later.

In section 4.4, working with clients having varied statistical backgrounds, the author mentioned beyond giving the clients the simplest solution that they are being pushed to the "statistical wheelchair", a consultant can "make the client walk", or to give them more domain knowledge, if the client shows a willingness to acquire new knowledge. However, what if the new knowledge beyond their level of expertise? If we take tutoring a freshman with willingness to learn phd level of statistics as an example, do we take all the efforts to teach them everything they need to know (all the immediate classes) before they reach the phd level?

The language that Kirk adopts here is not very helpful, in that it does not honor the potential for clients to learn if they are motivated and if you are willing to be a good teacher.

I cannot think of a statistical procedure that cannot be explained in general terms that could be understood by any motivated person with a bachelor's degree. Of course, as a good teacher, you will omit many technical details that get in the way of the "main ideas" of the procedure. If the client asks for those details, you as a good teacher should be prepared to provide some of them, or offer to bring them to the next meeting or so after you have refamiliarized yourself with them. (Even in our applied linear models class last semester, we covered many details, but there are many more details concerning efficient computation on one hand, and existence and uniqueness of conditional probabilities and the like on the other hand, that I omitted, because they would get in the way of the main story of what applied linear models are all about!)

The main idea is to explain at a high level what you are doing, and be helpful in digging deeper if the client is interested. You are not training the client to be a PhD statistician, just helping the client to understand the procedure at a level that the client is interested and curious about.

If the client has more knowledge in statistics than the consultant or has done relative research on this project, how should we do to cope with their work at the client's level?

How should consultants negotiate for his or her role for the project if the client side already has a team or a professional who are strong in statistical knowledge?

If you are working with several clients with different degrees of statistical knowledge, whose opinion should you weight more heavily in determining what the client wants?

If a client has more statistical knowledge than the consultant, is it better for the consultant to take the collaborator role than the lead role?

> *As I've mentioned above, I do not anticipate that your projects will require you to take a sustained leader role. If that does happen, please talk with your faculty mentor about how, and whether, to proceed as a project leader.*
>
> *Generally speaking, a client may know a lot about a specific procedure but will not know about the whole field of statistics and the way we look at data analysis problems. (There are exceptions, for example, if your client is themself a trained statistician; but in that case the client is likely to be your ally in the work.) If a client wants you to try a procedure that they are very familiar with, there's nothing wrong with that – go for it! But it is important that you understand why that procedure might (or might not) work, and not just implement it blindly. You may need to do your own research on this, rather than relying only on what the client can tell you. And in some situations, you may want to compare the client's procedure with some other procedure(s) that you think will work, and the comparison can be interesting for you and for the client. But you also have the advantage of knowing more about statistics as a whole than the client, and you can use that knowledge to help put the client's preferred procedure into the larger context of a complete data analysis that addresses the client's questions. In this way, you can do what the client wants, help the client solve their problem, and teach them something about the perspective and practice of statisticians.*
>
> *Of course, your faculty mentor can be a great source of advice in working through these issues with a client.*

When working with a client that has different statistical backgrounds, what should I do if the client keep asking questions about my work?

> *The best thing to do is to answer the questions, as a teacher might! If this is taking too much time from you (e.g. answering emails) or from project meetings, etc., then consider setting aside specific time(s), such as the last 15 minutes of a meeting with the client, to answer such questions.*

CONSULTANT'S KNOWLEDGE

What are the best steps for developing domain expertise in a subject as quick and efficient as possible?

How should statistical consultants deal with a statistical knowledge base that is increasing exponentially?

> *Don't try to learn everything for all possible future needs, all at once – that goes for statistics as well as the client's domain. Learn what you need for today, or for this week, every day and every week. Over months and years, you will develop all of the expertise you need, and you will find for example that although the number of statistical procedures and their variations are increasing exponentially there are relatively few key ideas that you need to have a general understanding of most or all of them.*

The article states that 5 or 6 statistical procedures can handle most research problems, but it doesn't mention what they are. What are they?

> *This will be a fun class exercise! Try it now. Based on your course work from the fall (and possibly from this spring), can you name three or more procedures that you would try to apply to most problems? I bet when we pool everyone's answers, we will find the 5 or 6 that work today (and it will be interesting to ask which ones are likely to be ones that Kirk was thinking of, way back in 1991!)*

INTERNAL TEAM DYNAMICS

How to decide the roles if two statisticians want the same role.

Are there ever scenarios where multiple consultants work on the same project? If multiple consultants work on the same project, how are the roles different than if only one consultant worked on the project?

Should we specifically assign each consultant role to individuals in the team during the discussion with clients? Or just generally discuss individual's responsibility for those aspects of the analysis?

> *I'm going to repeat an answer I gave above, because I think it is quite relevant here:*
>
> *Within your teams, to the extent possible, you should try to let each person try different roles or responsibilities over the course of the semester. For example one member of your team may be a great Python or R programmer. Definitely use that person's skills for some things, but also let someone else who wants to learn those skills do some of that work (and of course support that person by providing feedback, encouragement, etc.). Similarly there may be a good communicator, but let someone who needs to work on their communication skills also do some report writing, oral presentation, etc. You are students in a university class and you should take the opportunity to practice some things that you are less comfortable with.*
>
> *The problem of multiple statisticians or teams competing for the same role will not come up in 726. Later in your career, it is like any other competitive market issue: you can collaborate or compete with another statistician who wants the same role as you. While I tend to prefer collaboration, sometimes competition is the only avenue, and then of course you compete.*

CONSULTING CHALLENGES

<u>*Cleaning Up A Mess*</u>

More examples of cleaning up the mess to help statisticians to deal with.

The article has a section called "Cleaning Up the Mess," where the author basically only cites grievances against him. As a consultant, what should we do in a situation where we have to "clean up the mess"?

Messes like the ones Kirk describes usually occur because either the client hasn't thought through what they want to do, or there is a serious mismatch between what the client wants and what the data, tools and time can provide.

In your career after 726 you will be able to tell when the client hasn't though through what they want, and you can decide whether you want to work with that client or not. If you decide to work with the client, or you must work with the client because your boss demands it, then you will end up in some combination of collaborator and leader roles with the client. This takes patience with the client, as you help them formulate ideas, and patience with yourself, as you learn the client's domain and make, own, and fix many mistakes along the way.

In 726 the most likely problem (if it occurs at all) is that the data will be in some way mismatched to the questions the client wants to ask. As I mentioned above, if you have established ***good rapport****,* ***regular meetings****, and* ***good lines of communication*** *between meetings* ***with your client*** *and* ***with your faculty mentor****, when you discover that there is a mismatch like this, you can have an honest, respectful discussion about it with the client, and decide with the client where to go from here: get different data, change the research question, write a paper about how the original question could feasibly be answered with different data or different tools, etc. Don't forget to seek advice from your faculty mentor about this, as well.*

<u>*Developing Goals*</u>

Sometimes the client doesn't know what they want, how can a statistician help ensure that a product they provide turns out to be what the client wants?

I'm going to repeat an answer I gave above:

Clients often have a very specific idea of what their research problem is (i.e. what they want), but they may not be able to express the problem in clean statistical terms, or even in any terms outside of the specific context and technical language of their own work. Part of your job is to figure out what they want, without changing it into something more familiar or easier for you.

This often involves translating back and forth between language that is natural for you as a statistician and data scientist, and language that is natural for the client in their own field. To be successful you must listen carefully while the client is talking, listen carefully while you are talking, and frequently summarize back to the client what you have heard them say, to ensure that your conception of the research problem is the same as the client's conception of the research problem.

<u>*Saying "No"*</u>

When must a consultant not collaborate with a client?

If there are potential ethical violations on the client's side, how should we respond?

In your career after 726, you should not have to work with any client where you feel the problem or the data is too ill-defined, unsolvable, or otherwise flawed to proceed, or perhaps you lack the time or the expertise to be helpful. Another thing that sometimes comes up is a severe

personality conflict with a potential client. I have walked away from situations with several of these difficulties myself in the past.

Of course sometimes you will be in a situation where your boss or your job description demands that you make the best of it, and then that is what you must do.

Ethical violations are a red flag, in 726 and in your career after Carnegie Mellon. In 726, if you think that there are ethical violations, please immediately talk with Jamie, me, and/or your faculty mentor, so that we can help you decide how to proceed.

Work-Life Balance

How to balance our live with the work? I've taken my internship as a consultant for about two weeks, and it's already made me exhausted.

You have to protect yourself, so that you do not burn yourself out, and so that you can meet your other professional, academic and personal obligations – those obligations include taking time off to recharge your batteries, maintaining friendships and other relationships with real people, etc.

Jamie has suggested that the consulting projects should take approximately 25% of your work time. There will be some variability from week to week, but this is a good target for your average commitment over time.

If you are having trouble keeping this commitment under control, or keeping your TA commitments under control, or otherwise maintaining a healthy work-life balance, please talk with Jamie or me about how to make it better.

CONSULTING IN ACADEMIA

I have a specific question for you and hope it is not rude: as a college professor, how do you select the consulting project you want to do? Will university step in and limit the time you spend on consultation (because it feels like a side job for me?)

Why does the academe grant the same amount of reward to both statistical consulting jobs and non-statistical jobs? To me the work differs a lot and the working intensity are also not comparable.

Are statistical consultants still often hired in academia these days? Or has a divide emerged between statistical faculty (in academia) and consultants (in the corporate sphere)?

In the last part, the author mentioned that sometimes statisticians failed to request joint authorship when it is clearly well deserved and also suggest consultants to be assertive about this aggressive and ongoing campaign. How would statistician seek academic integrity without hurting the clients feelings? What if the clients are reluctant to put joint authorship? When is a good time to bring this issue to the clients?

I personally choose projects that I am interested in. The amount of credit that consulting gets in tenure decisions varies greatly from one university to another. Generally speaking at Carnegie Mellon, the consulting relationships that get the most credit are ones in which I can assume at least a collaborator role, if not a co-leader role. These are usually supported by research grants

from organizations like the National Science Foundation, and they often lead to (or are motivated by) basic research in statistical theory and methodology that I am interested in. Thus, I get credit by (a) bringing money into the department and (b) generating new basic research, as well as (c) developing interdisciplinary collaborations. Many of my collaborators are in academia, but some are also in commercial and non-profit organizations. There is a formal limit on what percentage of my time I can devote to consulting, but because the boundaries between consulting, collaborative research and basic research are often fuzzy, the formal limit is not often applied.

CONSULTING IN INDUSTRY

How else are industry-experienced individuals evaluated, in the case that they are interested in working both in academia and in industry?

This paper mentions several examples about academia consulting. But in the business consulting situation, should we expect the same procedures?

What is the difference between statistical consulting in a university and statistical consulting in the industry?

I think Jamie answered this question well in class:

> *In industry the outcome of statistical work is often not external publications but rather internal research and development that drives strategic initiatives. Rather than co-authorship of papers, you build your internal brand in your organization based on the work that you do. Your work will drive differentiation for your organization: "What makes our company special?" … "This proprietary information drives our business." … Etc. These are very valuable things, and you can build a very nice career by contributing to them without a lot of (or any!) external publications. Unless your position is in an R&D department, it's going to be really clear from what your deliverables are and who your stakeholders are, how to contribute to these differentiating features of your company.*

I will also say that I have known a few people who have moved between industry and academia. If you are in industry and you want to leave the door open for a move to academia, you do need to have some external publications, and/or some sustained collaborations with academic researchers. Negotiating with your company for the time to do this is not always easy, but it is necessary if you want to keep this possibility alive. On the other hand, some academics who try to go to industry find it hard, at least at first, to work on "other peoples' problems" rather than their own. If they can adapt to this new norm, they may find that industry has interesting and complex problems that they simply didn't have access to in academia.

MSP CAREER PATHS

My goal in the aspect of the career path is to work at strategy consulting firm as a consultant with statistical knowledge and skillset. How is working at strategy consulting firm as data analyst different

from working at data consulting firm as data consultant? Will the processes and key things to do at each stage be different?

> *I think the best thing I can do here is refer you to Jamie's answer to the previous question, and also suggest that you talk with Jamie about it directly.*