

# Is Graduate School Next?

## Making Informed Decisions About Graduate School

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Graduate school is a very important part of the education of some engineers. Since earning a PhD in engineering typically requires an additional five years, whether to go to graduate school, what degrees to earn, which graduate school to attend and what research project to work on are all important decisions. Two earlier CEE articles<sup>[1,2]</sup> focus on the process graduating seniors will follow in applying to and accepting offers to go to graduate school full-time. This article takes a broader view and in addition to the application process considers the options available to graduating seniors, the different types of graduate programs including part-time programs, and selection of a research project once one starts a graduate program. Examples of an organized process for making decisions are presented for several decisions along the path.

An education in chemical engineering is broad enough and rigorous enough to prepare graduates for many different careers and many different advanced degree programs. As part of the *Chemical Engineering Education (CEE) Guide to Graduate Schools*, this article focuses on graduate schools in engineering.

### OPTIONS AVAILABLE AFTER GRADUATION

Why go to graduate school:

- You have good grades in college courses (a 3.0 on a 4.0 scale is the minimum overall grade point average to be considered for admission to most graduate schools, and higher grades increase the probability of being accepted), you kind of like school, you understand what is expected, graduate school is generally free for engineers if they do research, the type of job you want requires more training, your significant other is going, you did research as an undergraduate and you enjoyed it, you want to dive deeper into studying a subject, your parents want you to go or at least are not against you going to graduate school, student loans do not come due when one stays in school, an academic career is enticing to you (and a PhD is essentially required to become a professor), or you do not feel ready

for (or able to secure) a job in industry.

Why go to work:

- You want to work for a few years before going to graduate school, you are really tired of school, you have never really enjoyed school and the idea of more school is not pleasant, you studied to become an engineer and now is the time to start, you need the money to pay off student loans, your significant other is starting a job, your parents think it is time for you to get a job, you worked in industry during the summer and really enjoyed it, you have been offered a cool consulting job, you do not think you would enjoy the theoretical graduate courses, or your grades are not good enough for graduate school.

Why do something totally different:

- You are really dedicated to helping others and have always wanted to join the Peace Corps or Engineers Without Borders or a number of other Non-Governmental Organizations (NGOs) doing good work around the world, or you always wanted to do extended travelling, or live in a commune, or do something else exciting, and you have no entanglements or obligations that prevent you from trying something different. Graduate school/work can wait.

If you are still reading, I will assume you have at least some interest in graduate school.

**Professor Phil Wankat** from Purdue University was on the editorial staff of CEE from 1992 through 2019 and was the editor from 2014 through 2019. After retirement, he is focusing on designing and building small boats and fishing. The northern pike in the photo was caught and released in Quetico Provincial Park, Ontario, Canada in July 2018.



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## DIFFERENT TYPES OF ENGINEERING GRADUATE PROGRAMS

### *Master of Science (MS) or Master of Engineering (ME) Degree Programs*

There are a large variety of MS and a modest number of ME degree programs. Although there is considerable overlap between the two types of programs, ME programs tend to be more focused on industry and solving realistic problems than MS programs.

#### *Thesis versus non-thesis*

- A non-thesis program, available only for master's degrees, is mainly based on coursework although an extended project may also be undertaken. In many ways a non-thesis program will feel like a continuation of undergraduate school. In engineering typical requirements are 30 to 36 semester credit hours. Assuming that all courses are passed, the time to degree is typically one academic or one calendar year.
- Non-thesis MS programs are often part-time and can be completed whilst one is working full-time. If one takes one course a semester for two semesters a year, a 30 credit hour program will take five years to complete. If you do not have significant other obligations such as a family, this time can be shortened by taking two courses some semesters or adding a course during summer. The time can be extended if there are semesters when you will be too busy because of increased family or work obligations or will be unable to take courses because of poor health, increased travel, deployment of your naval reserve unit and so forth. The delivery of courses may be a traditional lecture taught at night or the course may be delivered on your computer. Many engineering employers offer partial or full reimbursement of the costs of part-time MS programs. Based on the assumption that work helps engineers mature, part-time programs that cater to practicing engineers often have less stringent admission requirements than full-time programs; thus, if your undergraduate grades were weak (below 3.0), a part-time program may be your only option.
- Thesis MS programs are very different degree programs than non-thesis programs and may require grades significantly higher than the 3.0 minimum average grade point. Thesis programs require a combination of coursework and writing a thesis based on research. Typical requirements are again 30 to 36 credit hours, although a portion of the credit hours are based on doing research and writing a thesis instead of coursework. Students unfamiliar with graduate programs may misunderstand the time requirements. Twelve or fifteen credits of coursework can be completed in a semester. Completion of the research portion of the degree has no set time frame and can stretch from one to several years. Although there is no set time for finishing, most students complete thesis MS programs in 1½ to 3 years.
- A third type of MS program is the professional master's degree program which includes a project or internship with a company in addition to coursework. These programs may

be of interest to engineers who have worked in industry for a few years and want to broaden their horizons. Typical programs have a set time frame and last for one to 1½ calendar years.

- There are also engineering management MS programs and combined MS/MBA programs. These programs prefer that the students have some job experience before starting the program. Companies will often choose the engineers that they send to these programs based on their perceived management potential.

#### *PhD Degree Programs*

Unlike MS and ME programs which have considerable variety, doctorate programs (aka PhD programs where PhD is an abbreviation for Doctor of Philosophy) are all quite similar in that they all focus on research and writing a thesis.

- Some coursework is typically required and you will be expected to earn decent grades, but research is more important.
- There is no set time frame for completing the program, although many programs expect approximately five years to earn the degree.
- Most engineering graduate students in PhD programs have their tuition and a stipend paid by the sponsor of their research as long as they are making satisfactory progress.
- Graduate students work closely with one or more research advisers. To a certain extent, graduate students select their adviser(s) and research project (more on this aspect later).
- The vast majority of doctoral programs are full-time.
- Students may earn a thesis MS on their way to earning a PhD although many schools allow or encourage students to bypass the MS and work directly on a PhD. These schools may award a non-thesis MS to students in the PhD program based on completion of coursework.

**The CEE Guide to Graduate Programs presents information on a number of research-oriented, mainly full-time programs including both MS thesis programs and PhD programs.**

## THE APPLICATION PROCESS AND CHOOSING PROGRAMS TO APPLY TO

This section provides advice, but does not explain the entire application process. A detailed schedule for the application process is presented by Swindlehurst and Bullard.<sup>[1]</sup> If you find the application process confusing, look up this article (available open access on the web) or talk to a professor or academic adviser who is familiar with the process at your school or at the one you are applying to.

- Apply early. Some schools close admissions for the fall semester before Christmas, and many prestigious fellowships (the graduate school equivalent of merit-based scholarships) require application during the summer before your senior year.

- Apply to more than one program. Common advice is to apply to one or two “stretch” programs (programs that have very high admission requirements), apply to three or four programs that you believe are likely to admit you and that have research that appeals to you, and apply to one or perhaps two “safe” programs that you are almost guaranteed admission to.
  - If your grade point average hovers around 3.0 and there are no safe schools that you want to attend, consider attending a non-thesis MS program with the intention of earning high grades before applying to PhD programs.
- Be open to schools that are less highly ranked, particularly if there are advisers and research that are very appealing to you. There is little or no difference in the quality of schools that are within five or ten places in the rankings. Since the graduate student experience is quite dependent upon the student’s fit with the adviser and the research group, one may have an exceptional experience at a lesser known program or a mediocre (or worse) experience at a highly rated school. However, avoid weak graduate programs signaled by insufficient support for students and for faculty, very few graduate students and very few graduates, few courses to choose from and insufficient research equipment.
- Limit the number of programs you apply to. You must satisfactorily complete your current undergraduate program to attend graduate school, and applying to too many schools may cause grade difficulties and unnecessary stress. As a rule of thumb, apply to between four to eight schools.
- If you know the research areas you are interested in, talk to professors at your undergraduate school to find schools that are doing interesting research in these areas. In addition, look in this guide for programs with a focus on research in areas of interest to you. If you are convinced that there is an area of research that you must work on, if possible choose schools that have several professors working in this area. If there is only one professor doing research that you find interesting, what would you do if that professor has no money available, chooses other students, or leaves the school?
- If you are open to several future research areas, talk to professors for their suggestions of good graduate schools and look through this guide to find programs that offer research in a large number of areas.
- If the pool of potential schools you’ve identified is too large, include other factors that may be important to you such as location, cost of living, or distance from family to reduce the number of schools.
- Common wisdom for students who plan on an academic career is that it is best to earn a PhD at a different school than your undergraduate school. Programs, educational philosophies, and general atmospheres can differ markedly between schools. These differences are less important for students who plan on an industrial career or a career in other areas such as consulting, government, and NGOs. There may be special circumstances that make staying at your undergraduate school important, such as needing to help care for a relative who lives close to the school or a significant other

who will be attending your undergraduate school. A number of students decide to do graduate work at their undergraduate institution, and this decision does not appear to adversely affect their careers.

- Many students will use a “seat of the pants” or “blue sky” or “intuition” approach in making decisions. In other words, they probably do not use a logical decision method because they have never been taught how to use one.

## KEPNER-TREGOE (K-T) DECISION ANALYSIS EXAMPLE FOR CHOOSING SCHOOLS TO APPLY TO

Although there are a number of well-known decision methods that can be applied to questions such as which graduate school to attend, my favorite is the Kepner-Tregoe (K-T) decision analysis method.<sup>[3]</sup> This method combines a weighted table of items that one wants with a table of must haves. Fortunately, the method makes sense, is easy to learn, and is relatively easy to apply to real situations, including graduate school selection and selection of research advisers.

- In order to apply K-T decision analysis to any complicated decision, we must first decide what we must have. “Must have” means that if the item is not satisfied (a No Go decision), we will not select that choice despite all its other fine qualities. For this example, the student, Katie, has decided that all schools she applies to must have an active research program in catalysis.
- Second, we need to determine factors that are important but not critically important (Wants). In this example Katie decides that a highly ranked program, a good track record placing graduates in academic positions, a quality catalyst research program, and location in a large city are Wants. For each Want factor we need to determine a weighting factor.
- The order of importance of items can be determined by comparing an item’s importance versus other items one at a time. Katie initially determines the following relative importance of items:
  - The school’s track record placing graduates in academic positions is more important than the quality of the catalyst research program,
  - The quality of the catalyst research program and location in a large city appear to be equally important, and
  - The quality of the catalyst research program is more important than the school’s rank.
  - Logically, the school’s track record placing graduates in academic positions should be more important to Katie than location in a large city or the school’s rank, and location in a large city should be more important than the school’s rank. Katie examines these pairs and agrees.
- Set preliminary weight functions between 1-10 (with 10 being the highest weight) for each of the Wants in the order of importance. Katie selects:

- o Weight of school's track record placing graduates in academic positions = 9
- o Weight of school's location = weight of quality of school's catalyst program = 4
- o Weight of school's rank = 2
- Develop two matrices (Go-No Go and Wants) for the schools one will compare. This step requires that a score from 0-10 be assigned to each of the Wants for each school using data gleaned from the *CEE Guide to Graduate Programs*, from departmental web sites, and from discussions with professors at your undergraduate school. The "score" is the product of the weight and the rating, summing to a total score for each institution. Katie develops two matrices to compare each of the fifteen schools using the Must Haves and the Wants. A sample portion of the matrices is shown in Table 1 for four schools:
  - o Note that active catalyst research program is used for the GO – NO GO analysis, and the quality of the catalyst research program is given a weight in the Wants analysis. Since the private research university is a NO GO, it is not ranked.
  - o The K-T decision matrix is a tool. Since the weights are important but are subjective, we need to determine if the results make sense to us. Katie looks at the resulting matrix and realizes that she may have given academic placement too high a weight and the quality of the catalyst research program too low a weight. She re-sets the weights and determines the matrix shown in Table 2.
  - o Katie looks at Table 2 and decides this table makes more sense than Table 1.
- In one sense changing the weights before visiting is relatively unimportant if Katie visits both the Tech Institute and the Large State University. However, if sufficient thought is given to the items in the K-T table, the same K-T table, with the addition of an item for the relative value of the offer and probably a NO GO for admission with no support, may be used for deciding which schools to visit and which school's offer to accept. However, after visits many of the ratings will change because the data used to determine the ratings will be much more refined.
- Once you have decided which schools to apply to, there are a number of steps to complete the applications.
  - o Answer all of the demographic and education questions.
  - o Arrange to have your current institution send an official transcript.
  - o Ask three or four professors if they are willing to be references for you. If they agree list their names and e-mail ad-

resses on the application. Most graduate schools will ask the professors to log into a secure web address and provide their reference letters electronically.

- o If essays are required as part of the application, write a first draft, let it sit for a couple of days, edit it, let it sit for a couple of days, edit again, and ask someone else to read the essay and comment. The purpose of the sitting time is to put some distance between your thoughts and what was actually typed. Then, when you read the essay, you are more likely to see what is actually written instead of what you think should be written.
- o Finish the application and let it sit for a few days. Then proofread the entire application carefully. Check that all questions have been answered.
- o Follow the instructions for sending the application to the graduate school.

Wait, probably for several months, to hear from schools. The waiting period is a good time to focus on your current school work.

## OFFERS

When you receive an acceptance letter, celebrate! Once you have your second acceptance letter, you will automatically start to compare schools. Slow down. The decision deadline for schools in the United States is April 15. Think about the comparison of schools and modify your K-T decision matrix while you wait for additional schools to respond.

- Most engineering graduate students doing thesis research receive tuition rebate (the school does not charge them tuition) and financial support, which is the money required

**TABLE 1**  
**Sample K-T decision matrices for selecting graduate schools to apply to. Round 1.**

MUST HAVE		Tech Institute		Large State Univ.		Private Research Univ.		Safe School	
Active catalyst research program		<b>GO</b>		<b>GO</b>		<b>NO GO</b>		<b>GO</b>	
WANTS		Tech Institute		Large State Univ.		Private Research University		Safe School	
items	weight	rating	score	rating	score	<b>NO GO</b>		rating	score
Academic placement	9	9	81	5	45			3	27
Quality catalyst research	4	2	8	9	36			3	12
Big city	4	3	12	1	4			10	40
Rank	2	8	16	8	16			2	4
<b>Total</b>				<b>117</b>				<b>83</b>	

**TABLE 2**  
**Sample K-T decision Wants matrix for selecting graduate schools to apply to. Round 2.**

WANTS		Tech Institute		Large State Univ.		Private Research Univ.		Safe School	
items	weight	rating	score	rating	score	<b>NO GO</b>		rating	score
Quality catalyst research	9	2	18	9	81			3	27
Academic placement	7	9	63	5	35			3	21
Big city	4	3	12	1	4			10	40
Rank	2	8	16	8	16			2	4
<b>Total</b>				<b>109</b>				<b>92</b>	

for normal living expenses. Although money should not be your primary objective for going to graduate school, it is an important consideration. Since cost of living can be very different and since some schools add tuition money to the offer but then require you to pay the tuition up front, offers are somewhat difficult to compare. Once you have the cost of apartments or other housing, you can compare offers based on the standard of living at each university.

- An offer that requires a student to pay tuition without providing support is a significantly lower level offer. If all of your offers require you to pay, you should analyze the situation to determine why. Is there a mistake in your records? Or have you aimed too high in all of your applications? Talk to a professor at your undergraduate school for advice.
- Some schools may say no. If you met the admissions requirements but weren't admitted, what does this mean? The written admission requirements for PhD programs are the minimum requirements and meeting these requirements does not guarantee admission. PhD research is resource intensive and requires sufficient space, equipment, professors, and money to match the number of students. If you were not admitted, the school has decided that other applicants are a better fit for its program.

## VISITS

If you live in the United States many schools that admitted you will invite you to visit at their expense.

- It is tempting to visit every school that offers to pay for your visit. However, visits consume time and energy, and you probably still have homework, exams and senior design projects that may be pressing. Limiting the number of schools that you are serious about is important. If you visit more than three or four schools, it will be difficult to remember which school offered what and even more difficult to remember which other students, who may become your peers, you met at a school.
- Before the visit or at the very least on the airplane going to the school, learn as much as you can about the school. Look up what research professors are currently involved in. Check if there are special opportunities at the school that excite you, such as a joint program with the business school or a program to prepare students for future academic careers, and ask about them. You may find that the department really does not want you to become involved in anything other than your courses and your research.
- Visits are particularly useful for determining your personal fit to the university, to the department, and with professors whose research interests you. Fit is important, but it is highly personal. Thus, you need to talk to a number of current and potential graduate students and professors to get a feel for the university, the town and the faculty. Of course, since everyone connected to the school will be on their best behavior, they may have a tendency to filter their comments. Once some rapport has been developed, it should become possible to determine the information you

need. Talking to alumni of your undergraduate institution who are currently or previously enrolled may make it easier to get honest feedback. In addition, talk to professors from your current institution that are alumni of your potential graduate school.

- There are a few key questions that you should try to find the answers for. The first group of questions may be covered in presentations or can be asked after the presentations.
  - Are students admitted directly into the PhD program, or are there exams and other requirements that must be passed before students are considered PhD students? If admission is not directly into the PhD program, what % of new students are eventually admitted into the PhD program?
  - What are the median and the average times to degree for students admitted into the PhD program? For example, suppose there are 30 new students and 25 are admitted into the PhD program. Then the date that the 13th student of the 25 receives a PhD gives the median time to the degree. The median time to the degree is a better indicator than the average time to the degree since the average time can be skewed by a few students who take many years to finish.
  - How long are students supported? And what happens if the major professor loses research support?
  - How are graduate students matched with advisers? This very important question is discussed in detail later.
  - What other duties are required, such as being a teaching assistant, and for how many terms? Most schools require graduate students to put in some time as a teaching assistant, but the amount of time required varies.
  - What type of positions are graduates of the program getting? For example, if you want to become an academic but almost all of the graduates go into industry, the program may not be a good fit for you.
  - Is the faculty member that you want to work for going to be accepting students this year?
- The remaining questions are probably best answered by listening and integrating comments from a number of people:
  - Are the graduate students generally happy? Since there will always be a few disgruntled students, cast a fairly wide net.
  - Are most of the faculty generally happy, and which professors are disgruntled or burned out? Some well-known professors at the school may no longer be doing research or taking new students.
  - How do students describe their work-life balance? Do students do things together outside of school?
  - Are research advisers generally available to meet with students?
  - Is the stipend sufficient to live on with a student lifestyle?

## WHICH OFFER SHOULD YOU ACCEPT?

Compare the schools that accept you based on the research programs available. Since the PhD is a research degree, research that is interesting to you must be available. The research projects open for new graduate students can fluctuate considerably from year to year. Most schools expect new graduate students to work on funded research projects.

- Are there funded projects open to new graduate students that interest you? Do you believe you could work with the professors conducting this research? How likely are you to be able to work with the professor(s) you want to work with?
- Before making a decision, include other important factors such as the general reputation of the school, the location, the amount of support being offered, the average time for degree, and your parents' or significant other's wishes.
- If you had the opportunity to visit the school, what was your subjective feeling of "fitting in"? Five years is a long time to spend at a school where you feel like an outsider.
- If you have gained rapport with the graduate students of the faculty member that you want to work for, call the students and chat. Most graduate students will be honest about their experiences.
- As mentioned earlier, you can modify the K-T decision matrix to include the value of the offer and to factor in whether you would want to work for the professors involved in the research you are interested in. In Katie's case the ranking of a school for the quality of the catalyst research would plummet if she found the professors involved with that research to be distasteful.

Although the date that students are expected to tell schools if they will accept their offer is April 15th, schools appreciate knowing earlier. If you accept, the school will be pleased. If you do not accept, the school may be able to make an offer to another student.

## GATHERING DATA TO CHOOSE A RESEARCH PROJECT AND RESEARCH ADVISER(S)

After you have selected the graduate school to attend, the most important decision is what research project and which research adviser to work for. Selection procedures vary from university to university.

- At some schools, students are directly recruited by research advisers, so you know the adviser and the project you will work on before you apply to the program. Schools that use this procedure will usually explain the procedure in their offer letter.
- The majority of programs require new students to attend lectures given by professors on their research during the first term. After the series of lectures, students must visit a set number of professors to discuss research. Students

provide the department a ranked list of projects and advisers that they are interested in working on. The department then allocates students to different projects based on the student choices, the money available, and the preferences of professors for different students. Since schools need to assign students to a limited number of funded projects, there is no guarantee that you will get your first or second choice of project.

- Some programs delay assigning an adviser until after one or two terms. With more time to understand the various research programs, students hopefully will make more informed choices.

OK, you have listened to the lectures and talked to the required number of professors. What additional information do you need to make an informed choice?

- If the reputation of different professors is not clear, ask the professors at your undergraduate school to comment.
- Determine the sizes of different research groups by talking to the graduate administrative assistant or other graduate students. In large research groups (more than twenty students and post-docs), the professor will tend to act as a manager. Mentoring of new students will often be done by senior graduate students or post-docs, not the professor. On the positive side, funding is typically high and facilities are often excellent. In small research groups (five or less students), the professor often spends considerable time coaching the students, but there is less interaction with other students and there is usually less equipment. Intermediate sized groups are in-between the two extremes.
- Talk to current students working with the advisers you are interested in. Do this individually to avoid peer pressure effects. Also, the students may be more outgoing if you chat with them over a cup of coffee or a cup of tea or a beer. Try to obtain specifics about good and not so good aspects of working with their adviser. If an aspect that is important to you is not mentioned, ask.
- Staff members often know what occurs in the department better than most professors or students. If you get to know one or more staff members reasonably well and chat with them about choosing a research adviser, they may have some very good advice. However, to interpret it you will need to listen to what they say and what they do not say. For example, if they highly praise one professor but say nothing when you mention a different professor, their silence may mean they have a low opinion of the second professor.
- Gather information by walking around. You can get an idea of a professor's demeanor while talking to students and whether they are generally available in their offices by walking around and paying attention.
- Once you have whittled the list down to a reasonable number of professors, make an appointment to chat with them about their research again. Let them know that you are highly interested in their research, but do not promise that you will pick them as your first choice. The reason for

this injunction is many students change their mind at the last minute. Breaking your promise will probably irritate the professor.

## RANK ORDERING THE PROJECTS AND THE RESEARCH ADVISERS

You have gathered information about the professors and the projects, and you find several to be quite interesting. How do you rank order them?

I strongly suggest that you create a new K-T decision matrix for this decision. Many of the items on this list will be subjective and personal. Decide what aspects are most important to you.

- Do you want significant interactions with the professor? Is the ready availability of first-class equipment and funding to travel to conferences important? Would you be pleased if there was instant name recognition when you gave the name of your research adviser to other chemical engineers? Is there any aspect that you must have?
- Write down the aspects that are important to you and compare the importance of different items. Let the list sit overnight and try different weights for the items. Try testing the resulting K-T decision matrix for several professors.

## EXAMPLE OF APPLYING K-T APPROACH TO SELECTING A RESEARCH ADVISER

- Katie has narrowed down the choice of research adviser to Professors Brown, Chen, Jones and Smith. Katie cannot stand to be yelled at, so she decides to give any professor who yells at students a NO GO.
- Katie decides that the Wants on her list are: national reputation, available to graduate students, quality of research facilities, and her interest in the projects. After spending considerable time to determine ratings for each factor, she develops the K-T decision matrices shown in Table 3.
- This result is clear, Katie should chose to work with Prof. Brown. But wait a minute. Remember that the K-T decision analysis is a tool. Katie has second thoughts about that zero for being available to graduate students even though the other scores are high. So far, she has only heard Prof. Brown's lecture to the new graduate students, and all of her individual meetings have been with post-docs. One of Prof. Brown's students told Katie that he had only talked individually with Prof. Brown once in two years. And that discussion was arranged by offering Prof. Brown a ride to the airport. Katie decides to redo the Must-Have decision matrix as shown in Table 4.
- Now the choice is between Profs. Chen and Smith. Although some students will automatically go with Prof. Smith because

<b>MUST NOT HAVE</b>		Prof. Brown		Prof. Chen		Prof. Jones.		Prof. Smith	
Yells at students		<b>GO</b>		<b>GO</b>		<b>NO GO</b>		<b>GO</b>	
<b>WANTS</b>		Prof. Brown		Prof. Chen		Prof. Jones		Prof. Smith	
items	weight	rating	score	rating	score	<b>NO GO</b>		rating	score
National reputation	9	10	90	8	72			3	27
Interest in projects	7	9	63	5	35			8	56
Available to grad students	6	0	0	3	18			10	60
Quality of research facilities	4	8	32	8	32			4	16
<b>Total</b>		<b>185</b>		<b>157</b>				<b>159</b>	

the score is higher, I recommend treating the scores as tied and talking about the choice with someone you trust. At this point listening to your emotions may be helpful, and talking to someone else can help clarify how you feel.

- One major difference between professors that Katie has not included in her K-T decision matrices is the distinction between tenured and untenured professors. She decided that the items she included were more important because they are behavioral. Of course, there is a correlation between a professor's reputation and tenure if the professor has been at the school long enough to be tenured. Students may worry that untenured professors will be denied tenure and be forced to leave (see my personal experience later). However, professors leave for a variety of reasons, and at many schools tenured and untenured professors leave at about the same rates.

## WHAT CAN GO WRONG WITH THE ADVISER DECISION? PART 1.

The K-T matrix is a useful tool, but it is not infallible. There are two major causes for bad decisions when one uses the K-T decision matrix.

1. Bad data. The computer GIGO principle (garbage in, garbage out) also holds for decision methods. Professors may behave differently while recruiting graduate students than they do during the remainder of the year. You may have misinterpreted covert signals from staff or other graduate students or talked to a small, unrepresentative sample of students.
2. Not knowing yourself well enough or not being honest enough to create an accurate list of your Must Haves and Wants.

Revisit your list with a confidante who knows you well and can provide a reality check.

<b>MUST HAVE</b>	Prof. Brown	Prof. Chen	Prof. Jones.	Prof. Smith
Never yells at students	<b>GO</b>	<b>GO</b>	<b>NO GO</b>	<b>GO</b>
Available to grad students	<b>NO GO</b>	<b>GO</b>	<b>GO</b>	<b>GO</b>

## WHAT CAN GO WRONG WITH THE ADVISER DECISION? PART 2. PLANS B, C, D AND E

Since schools know that they often cannot accommodate every student's first or even second choice, they ask students to pick several professors in a rank order.

- The K-T decision matrix is very useful in listing several professors in rank order; however, after separating the first and second choices, there is a tendency to spend less time further down the list. We all expect to get our first or at worst second choice of adviser, so why spend time on names further down the list? If you are diligent, use of the K-T or other organized decision method will force you to spend sufficient time analyzing the professors further down the list instead of focusing on just numbers one and two.
- Most students are irritated if they do not get their first choice of research adviser, and they are particularly irritated or dismayed if they do not get their first and second choices. If you do not get your first choice, it is useful to consider the nature of the decision to choose a research adviser.

The choice of research adviser is not a decision that can be optimized. Optimization requires repeated calculations or trials so that results can be compared. You will hopefully pick only one research adviser in your graduate career. Even if you do pick a second time, it is not an equal trial with the first cycle because you will be an older and probably wiser student the second time. Since you cannot optimize, the goal is not finding the best possible research adviser. If you believe that finding the best possible research adviser is the goal, how will you know you succeeded? Instead the goal is to find a good research adviser for you, and there are probably a number of professors in the department who could satisfy this criterion.

What if you are assigned a research adviser, and later for

one reason or another, you have to select a new research adviser? Do not fret. During my graduate school experience, I had to select a second research adviser because my first research adviser was denied tenure. The second time around I was a year older, knew a lot more about the school and about the role of graduate students, and was wiser in my choice. Compared to students of equal ability who stayed with their original choice, I may have spent an extra month or at most two in graduate school because of the adviser change.

## CLOSURE

Exactly the same reasoning as was applied to not getting your first choice of research adviser can be applied to selecting a graduate program. The goal is to find a program that is a good fit, not necessarily the best possible fit, for you. You will know if the program was a good fit – you will never know if it was the best possible fit. Seen in this light, you can relax a bit and enjoy the hunt for a good school and a good research adviser.

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