Guidelines for the Industry-Academic Transition

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Abstract

Recently, practicing professionals with several years of industry experience have joined the academic ranks. This experienced, but new faculty member faces many of the same challenges as the recent Ph.D. hire plus one additional issue: his colleagues assume that he knows what he is doing and how to teach. This may or may not be a valid assumption. Further, some universities offer little faculty mentoring and the new professor must "sink or swim" his way to success. To avoid frustration, guidelines are presented to help the new hire avoid "trial-and-error" mistakes and they fall into three general categories: peer networking, teaching skills, and time management. Of these, teaching skills require the greatest attention. The new professor is encouraged to incorporate active learning exercises into his lecture and to integrate cooperative learning project in the course syllabus. Finally, attending a teaching workshop such as the NETI sponsored by ASEE is a great way to acquire an introduction to effective teaching techniques.

Introduction

Much has been written about a student's transition from the school setting to industry,[1] a doctoral candidate's transition to a faculty position,[2] and how our universities and industry can cooperate for the good of both organizations.[3] But recently, some practicing professionals with significant experience have crossed over the line and left industry for academic faculty roles.[4-5] The purpose of this paper is to provide guidelines for the professional to quickly and seamlessly assimilate into this new role. Others interested in this description include department heads or deans as they will gain invaluable insight to the challenges facing their new hire.

We assume that the practicing professional has been employed in industry for 15 – 20 years, obtained a Ph.D. some time ago, and is working in the private sector (not Government). Further, we assume that the professional has been successful and is leaving industry on his own accord. We will focus on the teaching transition and only lightly touch on research and service responsibilities.

The next section contain an overview of the differences between industry and academe. This will provide the reader with the background to appreciate the following section which identifies some of the challenges faced by the experienced, new faculty member. Lastly, we present some suggestions for the new hire and explain the rationale for these guidelines.

Industry-Academic Differences

Before we review the differences between the industry and academic environments, lets consider what the Ph.D. in industry has been doing. Many have been involved in technology or advanced development, and some with revenue product design. The first area contains a far greater research component and the latter a significant application component. But the big question for most academics is: why would a successful professional want to leave industry? Generally, the successful Ph.D. looks at the tradeoff between 1) salary, and 2) research flexibility and/or less stress. Since they are not at the beginning of their careers, they may have invested wisely and do not feel that salary is as important as it once was. Further, improved flexibility and/or less stress may now be very important. But each individual's situation is unique and a decision can be made for a wide range of reasons. The point here is that the experienced new faculty may be looking more for intrinsic rewards then extrinsic (remuneration) rewards.

Table 1 contains a synopsis of the primary differences between industry and academia across a large number of attributes. The higher the attribute in the table, roughly the greater the difference. So, mission is at the top. In industry, it is very clear why you are there and that is to make money for the company. At a university, you are there to educate students and to advance the state-of-the art or current state-of-knowledge. This is a major paradigm shift because mission has such a pervasive impact on how, why, and what you do every day.

There is no doubt about it, you make far less money in academia then in industry. Moreover, in industry there are many more job classifications (a dozen or so) and opportunities for promotion abound versus the two faculty promotions: to Associate, and to (*Full*) Professor. Salaries are very competitive both within the company and among similar companies. In industry, you often receive annual stock options and if you are working for a high-growth company, they each can eventually be worth several times your base salary. Or they can also be worth nothing. When you add in bonuses, the total compensation in industry contains several factors and this is not by accident. The theory is that when times are good your compensation increases and when times are bad it decreases. This way, a company does not have to lay off employees in bad times and rehire-retrain them when times rebound. Academic salaries are on the other side and often table- or formula-driven. Some department heads adjust salary increases to reflect merit but many just use a percentage based on their new budget.

Your performance metric in industry is focused on results (technologies transitioned, products shipped, etc.) and measures what you accomplished and how you contributed to the company's mission. At the very senior management levels, the metric is simply based on profit-and-loss: did your division make money or not? At the university, you are measured on numbers. Specifically, the number of papers published, number of research contracts and the dollar amount awarded, and the numbers generated from your student evaluations. One could argue that the university

numbers are easy to quantify but then, again, not all papers and contracts are of the same quality. How do you take that into account?

Table 1. Primary differences between industry and academia.

Attribute	Industry	Academia
Mission	Make money	Educate students, advance knowledge
Salary	Competitive, stock options, bonuses	Table or formula-driven
Performance Metric	Results	Numbers: papers, contracts, student evaluations
Job Security	None	Tenure
Stress	High	Low and medium
Priority	Schedule, budget, features	Teaching or research
Accountability	Significant	Committee-oriented
Processes	Rigid, documented	Few, "tribal knowledge"
Colleagues	Work in teams	Minimal and difficult cooperation
Development	Seniors mentor juniors, quick feedback	Sink or swim, trial-and-error
Resources	Significant	Limited
Culture	Dynamic, aggressive, leading edge	Stoic, intellectual
Focus	Product	Teaching or research
Autonomy	Strict reporting structure	Independence
Legal Restrictions	Confidential, proprietary, patents	Public

In industry you do not have job security. When times are bad, you can be laid off regardless of your years of service. In practice, it is not as bad as it sounds because in a large company there are numerous opportunities within different departments, divisions, and sites (locations). Further, if you are smart, you will learn how to become and stay an invaluable asset to the company and avoid lay offs. The tenure system is an important part of the university environment and indicates recognition to the faculty member and a long-term commitment by the school. There is no counterpart to tenure in industry.

As mentioned earlier, stress can be a factor in leaving industry for academe. In industry, stress is high because you are under constant pressure to meet your schedule and deliver products on time that meet or exceed expectations. Some product teams will work, at times, literally around-the-clock to meet a key milestone. Basically, there are no excuses for missing your schedule. In the

academic setting, the impact or penalty of not completing something is less severe. So the stress level is either low or medium but not high. This is a major attraction to some in industry.

Your top priority in industry is meeting your schedule. Senior managers talk about holding budgets and features, but schedule is usually top priority. It is not unusual to spend more money or drop a feature or two to meet schedule. The reason for this is that you must maintain the company's revenue stream and every product is part of it. For the faculty member, either teaching or research is top priority depending on the type of university. Some say they give equal priority to the two but that is very difficult to do. It is important for schools to be clear about priorities so faculty can focus on what is important.

In industry, everyone has a role in shipping a product on time. Hence, you are accountable for your part and bad things will happen if you miss your schedule. It is true that each professor is accountable for their classes but there is not a tight dependence from one to the other. As long as you hold class and receive good teaching evaluations, everything is fine. But in the academic environment, everything is done by committee. If the committee doesn't get something done, it's the committee's fault and not the individual members of the committee. Thus, there is a bit less accountability in academics then industry.

When you work on large projects and have a manufacturing charter, processes are critical to success and a key component is good documentation. Another basic factor is change control. For success, you must have a way to determine the need and impact of any change. Conversely, the university does not have such a need for process. Sure universities have a process to register students and a process for tenure, but it is not the same thing. Instead, word of mouth and other "tribal knowledge" will suffice for the university to operate fairly well. The only exception to this is when someone is new. Unfortunately, it takes a while for a newcomer to integrate and learn the ropes.

In industry you work in teams, all kinds of teams, and team sizes of several hundred are not unusual. If you can not function well in a team setting, then industry is not for you. The reason for teams is many products are so complicated that no one individual or small group can possibly do it all. The university setting is very different in that most of the projects are small and work is done by individuals or a small committee. It seems that most faculty prefer it this way and show no real interest in working in teams. Perhaps this is because of how they are evaluated and team work does not impact their "numbers."

When you work in teams, meet regularly, have lunch together in the cafeteria, and reside in the cubicle next to your manager, you typically interact several times each day. Thus, senior personnel (managers, engineers, etc.) by default mentor their juniors and provide instant feedback on performance. This greatly impacts development and the smart professional will carefully select their manager/mentor. In academia, development is very different. It varies widely but many schools practice the "sink or swim" approach to development. In the faculty members annual review, there are comments, good or bad, about the numbers, but little concrete suggestions for improvement. New faculty end up doing considerable "trial and error" and frustration may set in.

Generally, resources (facilities, budgets, equipment, infrastructure, etc.) in industry are superior to most universities. Without leading edge resources, you can not design leading edge products. Universities suffer from strange funding practices and, hence, place a high priority on research contracts (salaries, equipment, overhead, etc.) and soliciting donations. This is not always the case. While in industry, the author visited a Tier I university and observed stockpiles of donations sitting in the hallways collecting dust. But this example is not the norm.

The culture of any company is unique but in industry it can be characterized as very dynamic, fast paced, and simply exciting. The old saying "the only constant at this company is change" is very true. This is a requirement for any company involved in high technology. The university culture is not as fast paced, things do not change as quickly, and may be dull compared to industry. However, the academic culture is very intellectual and one can strike up an interesting and/or esoteric conversations with anyone at any time. This is stimulating to the mind and is appropriate given the mission of the university.

In industry, you focus on a product. Sometimes, it is all consuming and you find yourself solving technical problems in the shower. As a faculty member, your focus is teaching or research and, again, you find yourself solving a technical problem at strange times in strange places. Both worlds can consume the individual. But in industry, the higher your position, the greater the level of commitment. Some senior managers do nothing besides their job and, sadly, it is their life.

Autonomy is somewhat absent in industry. You have a strict reporting structure and everyone has a manager. You do not have the flexibility to choose what you work on, who you work with, where you work, and, often, who you work for. But in the academic setting, you have far greater freedom for choice. In fact, your independence is very great and all motivation must come from within. In industry you have motivation from many sources and, sometimes, too many.

Lastly, as a practicing professional in industry, there are important legal restrictions you must adhere to. This is to maintain your competitive edge and to recoup the large investments of technology development and product design. To provide a data point, a semiconductor manufacturer may invest several billion dollars in a processing plant that produces a five dollar part. You must protect your intellectual property with confidentiality agreements and patents. At a university, patents are protected but most of the work remains in the public domain. It would not make sense to advance the state-of-the-art and not disseminate that knowledge to as wide an audience as possible.

From the above discussion, the two worlds of industry and academe are very different in many ways. When one crosses over from one side to the other, particularly after a fair number of years, it takes some time to become adjusted. It may take the experienced, new hire anywhere from 3 to 5 years to fully assimilate to the academic environment after working 15 – 20 years in industry.

Challenges

Lets start this section with a hypothetical scenario for the first year of an experienced, new faculty. The following example may appear a bit ridiculous but, again, it is not entirely unrealistic and does illustrate a couple of points.

After receiving and returning a signed contract, the department head assigns the faculty member a class to teach. He asks who taught it last time and discovers that the professor is either on sabbatical, just left the university, or can only provide sketchy and maybe inconsistent information because he is too busy or doesn't care. Next, the new hire asks the department head for historical information on the class and there is essentially nothing in existence but a course title and catalog description. So, this is the beginning point for the experienced, new faculty: not much to draw upon, and no one to help him.

He creates a set of objectives based on what he thinks is important to the students, orders a text book, takes a guess at how much material can be covered in a semester, puts together a schedule, then starts planning lectures. The average on the first exam is 46, the second exam 61, and the final exam 58. As a result, his student evaluations are very low. He reads through the evaluations and the students say his lectures are boring, his exams too hard, he does not care about them, and he is a lousy (*expletive deleted*) professor. At the end of the year, his department head delivers his annual review which, naturally, points out the low students evaluations and he is strongly encouraged to improve them. He asks his department head about suggestions for <u>how</u> to make some changes but receives nothing concrete. Right about then, the experienced, new faculty is asking himself if he made the right decision to leave industry and join the academic ranks. He is frustrated, feels all alone, and must "sink or swim" to succeed.

Some of the challenges pointed out in this scenario are not unique to the experienced, new faculty and are common with the recent Ph.D., new faculty. Basically, the new hire has not received any mentoring. He probably participated in a new faculty orientation prior to Fall Semester but that focused on university history, administrative procedures, an overview of tenure, who is who on campus, and legal concerns. It did not cover anything related to teaching skills.

This general subject has been discussed in the literature[6] and the new hire faces five distinct challenges:

- not enough time
- inadequate feedback and recognition
- unrealistic self-expectations
- lack of collegiality
- difficulty balancing work and life outside of work

But the experienced, new hire faces an additional challenge because his dean, department head, an colleagues assume that he <u>knows what he is doing and how to teach</u>. In some cases, this may be true but in many cases it is not true. Think about it, why should someone from industry know how to teach? It is not something they do every day. Moreover, the faculty member may be hesitant to seek help because he has been successful in industry and he doesn't want to look "stupid" to the senior, let alone junior, faculty.

Transition Guidelines

Earlier, we concluded that the experienced, new professor had not received any mentoring. Some universities offer excellent faculty development programs,[7-9] but some do not. They all focus on improving the numbers. But is true success measured by high numbers or by the significance of accomplishments? Here, significance[10] is difficult to measure but means that you have an important impact upon your students, university, and/or our research field. Significance is something to consider. In this section, we will focus on the more narrow numbers metric.

If a particular school offers an outstanding faculty development program, the opportunity for success will be present and more likely achieved. In what follows, we will assume that this is not the case and that little to no formal mentoring is in place. We will only focus on the student evaluation numbers. Research[11] shows that these evaluations provide a reliable, valid assessment of teaching effectiveness if the sample size is large enough and taken across multiple courses. Not everyone agrees with this perspective.

In Table 2, we list a summary of recommendation for the experienced, new faculty member to improve their assimilation. It is also relevant to the new Ph.D. hire. The suggestions are grouped into three categories: peer networking, teaching skills, and time management. The list of suggestions are not in a specific order. These guidelines are really a set of common-sense ideas that can get one started in the right direction. It certainly is better than the default "trial-and-error" method.

Peer networking. This category refers to interacting with your colleagues. Will they be interested in helping you? Most will be honored to assist and some will not help at all. Start by finding a teaching mentor. Where can I find one? The author met a Professor of Nursing in the faculty lunch room, struck up a conversation, and she eventually became his "unofficial" teaching mentor. As the year progressed, the author was honored to recommend his mentor for the university's outstanding teacher award and she received the recognition at Spring Commencement. So, mentors are out there, you need to find them. When you are discussing teaching methods, it is not necessary that your mentor be in the same discipline. In some cases, it might be better if they are not.

Ask your dean, department head, and colleagues who the best teachers are and ask to sit in on a class either a few times, or for an entire Semester. Take note what techniques they use and try to adopt them to your classes. Perhaps visiting a class not in your discipline may prove fruitful. Similarly, invite the best teachers to observe your class. It might not be a bad idea to announce to the class why another faculty member is attending the lecture. You can be honest and talk about faculty development, or less clear and talk about curriculum development, ABET preparation, or about anything that sounds good.

It is important to set up a follow-on meeting or a set of meetings with the best teachers to discuss their techniques and observations about your style and methods. This could be done in a group setting or individually. Remember to be a good listener and open to constructive comments. If you feel comfortable about sharing your teaching evaluations with the best teachers, then you can provide them before your meetings. Many teachers view the evaluations as very private

information that only the dean or department head review. Give it some thought because the information in the evaluations is pretty good if you digest it. You should regularly summarize the data and use it for adjustments to your teaching methods.

Table 2. Guidelines for the experienced, new faculty.

Category	Suggestion	Rationale
Peer Networking	Find a teaching mentor	Learn from someone who knows how
	Visit successful teachers classes	Determine what works for them
	Invite successful teacher to your class	Be open for constructive comments
	Review student evaluations with peers	Look for both the good and bad
Teaching Skills	Lecture using active learning	Better match to learning styles
	Integrate cooperative projects	Students learn by doing
	Team teach a class before going solo	Observe and learn from others
	Conduct mid-semester course evaluation	Make mid-semester correction
	Review final exams for prerequisites	Find out what the students know
	More exams	Improves feedback process
	Relate war stories	Take advantage of experience
	Attend a teaching workshop: NETI	Hear it from the experts
Time Management	Create/protect open time	Manage your time carefully
	Tame email and phone calls	Both are a time sink
	Teach fewer courses more often	Each new class requires significant preparation
	Teach/develop courses in your area	Easier if you don't have to learn the material first
	Limit your service activities	Do what is expected, but no more
	Say "no" to good things	Be careful what you agree to do

Teaching Skills. This category includes specific instructional techniques. Probably the most important skill for the experienced, new professor is to include active learning exercises[12] in your lectures. This is so important that some schools now offer their engineering Ph.D. candidates an introduction.[13] Active learning is when the student does something other then listening during lecture. This helps maintain student attention span, focus, and retention of information. One rule of thumb is "no more then 15 minutes of lecture without an active exercise."

Active exercises vary widely but in-class problem solving and brainstorming are popular. Just split the class into groups of three and let them work on something for a minute or two. Ask the team, not an individual, to respond the rest of the class. For those who use presentation software like power point, put the question in the lecture notes but not the answer. You may wish to have a prepared answer in your power point file at the end but don't include it in the handouts.

Similarly, integrate cooperative projects[14] into your course. Here, students work in teams to solve a problem. You should be familiar with this as it is what you do in industry. We suggest the instructor pick the teams. If you have a large design project, break it into smaller chunks and provide the solution to each section after the assignment is due. This way, no team will stumble because their previous solution was late or did not work. Try to align the project to the text. For example, instead of designing a 32-bit CPU, modify it for 12-bits and a subset of the features. Students clearly learn by doing.

It may not be practical, but team teach a course with another instructor before you are on your own. This has many obvious benefits. Also, consider conducting an informal, mid-semester course evaluation. Make the questions a bit more open-ended and explain that you will use the data to make adjustment. Be sure to go over the results with the class and be sure to follow-though with some changes.

One problem the experienced, new faculty encounters is that they do not really know the students. The tendency is to treat them as junior engineers. But students have not reached the intellectual or maturity level of junior engineers nor do they have the same motivation (salary, stock options, etc.). One way to find out what they know is to review the syllabii and final exams of prerequisite courses. Also, you can test the students early in the semester on previous material. When you first start teaching, consider giving your students more exams then normal. This will provide you and the students with additional feedback and opportunity for adjustment. Once you have a better feel for who your students are and what their backgrounds include, you can back off on the number of exams-per-semester. Remember to learn the names of your students and greet them by name in class and in the hallway.

Take advantage of your vast experience in industry by relating to your students specific project you worked on, problems you solved, and real design constraints. Be sure that it is aligned with the material and that you do not push or belittle your former company. Try to be impartial and make the example relevant to your lecture topic.

Finally, talk to your dean and department head about taking a teaching workshop. An excellent one attended by the author is the National Effective Teaching Institute[15] offered prior to the ASEE Annual Conference. The workshop is taught by a group of outstanding educators and includes an introduction to many of the key topics you will need to be successful. Wait until you have at least completed one year of teaching before you take the workshop. This way, you will have developed a style of your own (good or bad) and created a list of areas for improvement.

Time Management. This category is nothing new to a veteran from industry only the parameters have changed. Instead of one-on-ones, staff and department meetings, or crisis management activities, you will face endless requests from students, staff, colleagues, and the

administration. Start by blocking off a section of your daily calendar for open time. If possible, leave your office during this time. Try to work at home or the library or a conference room or anywhere besides your office. You will get more done if you are not disturbed.

We are constantly bombarded with email and phone calls. You must set some time to review these messages because they are a primary source of communication. For email, many client applications provide an Inbox manager. It will move messages to specific folders based on the author (say your dean, department head, etc.) or subject (say a course number) or almost any condition. The Inbox manager will allow you to know when an important message has arrived. To manage the phone, turn on your answering service and let it collect calls. Again, you need to review these on a regular basis and respond promptly. Overall, it takes some discipline to be effective.

Every time you teach a new class for the first time, it requires far more preparation time. To optimize this time, teach fewer classes and repeat them the following semester or year. At some point, you will "burn out" and probably need to change the classes you teach but until you get to that point continue to teach the same classes. Similarly, teach classes in a technical area you are familiar with and enjoy. Nothing is worse than teaching a class in an area you know little about and even care less about. Unfortunately, this does happen and it can be an acute problem at smaller schools and with smaller faculty groups.

We all must do our fair share of service work (committees, planning, mentoring, etc.) but when first starting out, limit yourself to what you absolutely have to do and nothing more. As time moves on, you will have ample opportunity to increase your service commitment and it will be expected. Finally, you must remember to say "no" to some requests. It might be something you are interested in and are well qualified for, but it may take time away from your teaching. Instead of responding immediately to a request, (e.g., review a paper, book, or research proposal), respond by saying that you will get back to them tomorrow. During the evening, think the request through carefully and only agree to do what supports your teaching.

In this section, we have reviewed guidelines for the experienced, new faculty member to improve their transition to the academic environment. Of the three categories, you will likely need to focus on teaching skills the most, time management the least, and peer networking to some extent.

Conclusions

A successful practicing professional may choose to accept a faculty position because of the tradeoff in salary for research flexibility and/or less stress. Because industry and academe are so different, it may take anywhere from 3 to 5 years to fully assimilate to the academic environment after working 15 to 20 years in industry.

When the experienced, new faculty hire crosses over from industry to academe, he faces many of the same challenges as a recent Ph.D. hire. These include not enough time, inadequate feedback and recognition, unrealistic self-expectations, lack of collegiality, and difficulty balancing work

and life outside of work. But the experienced, new faculty faces an additional challenge because his colleagues assume that he knows what he is doing and how to teach. This may or may not be a valid assumption.

What aggravates the problem is that some universities offer little mentoring to show the professor the ropes. This results in significant "trial and error" and, possibly, frustration as the experienced, new professor "sinks or swims" their way to success.

The list of guidelines for the experienced, new professor to follow include three categories: peer networking, teaching skills, and time management. Of these, teaching skills will require the greatest attention and two areas to key in on are active learning exercises in lectures and cooperative learning projects integrated into the course syllabus. Attending a teaching workshop such as the NETI sponsored by ASEE is a great way to get an introduction to many of the important skills required of effective teaching.

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Biography

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