

# 24 The Entrepreneurial University

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This chapter will discuss the increase in university/industry collaboration from the viewpoint of a large, private, research-oriented university. Universities need this collaboration, especially since federal and state funding are both decreasing as a source of money to support the operation of the university.

Technology transfer is about more than licensing. There are many sources of technology transfer. Perhaps the most important one is the body that actually embodies the science and technology that we have discovered and are teaching: the graduating student. The two types of technology transfer addressed here are industrial research collaborations and technology licensing.

## Industrial Research Collaborations

The survey by the Association of University Technology Managers (AUTM), which admittedly is not as complete a study of university funding as you can get from the National Science Foundation, shows \$13.7 billion in 1998 federal funding and \$1.97 billion in industrial funding. The total funding was \$21 billion because of all the state funding. Industry now contributes ten percent of the research university's funding. This survey however did not include research hospitals and universities that are not research-oriented.

To put this into perspective, my university, the Massachusetts Institute of Technology, went from about seven percent in industrial fund-

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ing in the early 1980s to now over 22 percent. We show a large influx of industrial funding, currently over \$80 million a year. We see a lot of increase at other places too. The numbers from 1996–98, which include the United States, Canada, and others, show a compounded 10 or 12 percent increase in industrial funding per year. We are seeing quite a trend.

My university currently has about \$80 million a year from industry, which is a little over 20 percent of our campus research. From the viewpoint of universities and industries learning to work together, it looks like a good thing. But there is a problem. The problem is manifested in a psychological dynamic. The more we work together, the more apparent the differences become; the more we need each other, the more frustrated we get with each other.

A big difference between the two sides has come from the reason industry funding is growing. Twenty years ago, industry funding of universities was quasi-philanthropic. It was done for all sorts of vague reasons. Industrial funding kept the corporate name around the university and helped establish relationships with professors. Industry could afford the funding and liked the benefits. But after the downsizing of the 1980s, and many industries shutting down their basic research labs in the early 1990s, industry woke up and realized they were profitable, but they had nothing in the pipeline. They did not have their central research labs anymore, and they were not going to rebuild them. In addition, technology was moving so fast that even in those industries that had not shut down their central research labs (like pharmaceuticals) knew they could not do it all themselves. So they went to the universities now, not philanthropically, but as a business deal. They needed new technology, and the universities were a source of that technology. University research could help fill industry's new-product pipeline. Industry gave more money to the universities, acknowledged a greater need of the universities, and also expressed that they would demand more of the universities. It was not just philanthropy anymore.

Now industry comes to a university and says, we're paying for it, we own it, and we ought to get to tell you what to do. Issues come up such as ownership of intellectual property, direction of research, ownership of data, and control of publication. The university sees its reason for being as education and dissemination of knowledge. Research is a mechanism for education and for discovering the knowledge they want to disseminate. Industrial sponsorship of research is seen as part of this mech-

anism rather than an objective. Both sides get positive benefits: The universities educate students who will go out to work for industry and industrial investments improve the transfer of discoveries to the public.

But the company comes back and says again that they are paying. The university replies that the company is paying for only a small part of the research. Industry is embarking on a temporary voyage on a river of knowledge and research that the university has built up. Industry is tapping in to this river for only a limited amount of time. The relationship between the university and the company is temporary. The university values the relationship, but the university is thinking about the long term.

Given these two very different perspectives, how do we learn to work together? We are all participating in a transition period of two cultures that have occasionally only visited with each other and now have to live together. You start with two very fundamental differences in who you are. The university has primarily societal responsibility and open-ended goals, and industry has clear, straightforward, capitalistic, profit and loss goals, which are driven by specific objectives and an eye to shareholder value. The university is used to doing unpredictable research: You go where the most interesting question is, not where you are most likely to come to the end most quickly. The university expects no promises with a long-term orientation.

I came to the university from industry and one of the things that surprised me the most is that faculty are frequently working on things that take 10 to 15 years to come to fruition, even the ones working in rapidly changing fields. But, generally, industry is oriented toward the shorter term. It cannot wait that long. Companies will be broke, merged, or gone by then.

Perhaps the biggest cultural difference is the hierarchical orientation of the university and the teamwork orientation of industry. In industry, you are not in it for an individual, you are in it for the corporate outcome. In universities, faculty members practice individualism, with a view toward academic freedom and the honors and rewards systems that reward individuals, not teams.

Industry gets frustrated because they are used to contracts that talk about task statements and performance to tasks, confidentiality, restriction of publication, ownership of intellectual property, and negotiation of indirect cost rates. (I find the latter ridiculous since we ask the same rate that the government asks. The government does not pay full costs; but, with this rate, we are already subsidizing the company.)

You can balance publications and confidentiality. However, the university thinks it must publish because that is part of its reason for being. A second factor in preserving the universities' independence is that academic status depends on fame, not fortune. Fortune follows fame. And publication brings fame.

Other issues are more subtle. Confidentiality limits discussions within the university itself, with other students and other faculty members. And, of course, if a discovery cannot be built on, it is not available for further discovery. The universities have told industry that they cannot do confidential work for industry, but they can use intellectual property to give a company a proprietary position. The university will publish what it discovers, but it will file patents on it or copyrights on the code. The university can allow a company a competitive position through the licenses of the patents.

Generally the universities are not compromising on the ownership of patent rights for a number of complicated reasons. First, technology transfer outside of industry-sponsored research has become an important way in which the university delivers technology to the public. This research is part of the 80 percent of university research that is federally funded. Under the Bayh-Dole Act researchers are entitled to a share of the royalties. Universities, however, cannot discriminate between those researchers working on a federal grant and those working on an industry grant.

Universities also have to make sure that the technology is used, not suppressed. A university will not grant an exclusive license, even to a sponsor, without an assurance of diligence to develop.

The road to hell is mapped with small exceptions. A single concession becomes precedent faster than you can blink. On things like intellectual property ownership, you have to be remarkably consistent, which is what a lot of people learned on the slippery slope of negotiating overheads.

One big question when discussing industry/university collaborations is: Will what you expect to be done get done? One of the funniest phrases in a contract is one that says, "The professor shall." I always say that I am going to sign only if you let me add, "if he damned well pleases," because faculty are not really employees even if legally they may be. The university can make it happen only if the interpersonal, the psychological contract between the university and the principal investigator works. The principal investigator must want to do the project.

On the company side, somebody must be there who really cares and is participating in the dialogue and keeping it on track. My usual

advice to companies is that if they are not getting along with the principal investigator when they are negotiating the agreement, walk away. Not getting on with the administrators is acceptable, because we can compromise. But the company must work well with the principal investigator.

Another important consideration is the issue of indirect cost. We charge industry the same indirect cost as the government overhead rate, which does not cover the full costs. From the perspective of a non-state university, the only sources of making up the difference are tuition and philanthropy. Neither the students nor the philanthropists would appreciate knowing they are subsidizing a private company.

When you explain this to industry they understand it. Provided that you are not negotiating and giving some companies a break on overhead costs and others not. If you explain that it is a clear business issue that this is the way it has to be because we don't have any other money, most companies will understand. (If improperly expressed mathematically, our overhead rates sound high, but they are actually about 40 percent lower than the lowest fully loaded cost in industry.)

So what has happened? In spite of holding the line on indirect costs, we say that we can make it work through interpersonal relationships at the beginning of the programs. We can be actively involved as champions on the side of the company. This way, the company gets more out of the work. The university owns the intellectual property, but we can work out options to exclusive licenses.

In summary, industrial projects must include the following criteria: investor-initiated research only, no confidential research, all projects available for full student participation, freedom of publication and no confidentiality within the university, standard indirect cost rates, university ownership of intellectual property, project-by-project funding rather than departmental funding, and an emphasis on development of technology. At this point we are managing about 200 new industrial projects a year. We have tripled our fraction of industrial research.

## Technology Licensing

The AUTM survey shows that universities are granting over 4,000 new licenses a year. From 1997 to 1998, the number of licenses increased ten percent, and 364 new start-up companies started in fiscal year 1998. The amount of royalties may be \$700 million a year. But if

you divide that by the research budgets of the universities from which it comes, it averages less than two percent. University licenses are not going to replace the declining research budget. License revenue is simply not a major source of revenue, except for the blockbuster inventions.

The proper way to make money in university technology licensing is to get lucky. If anyone will tell me the algorithm for doing so, I would appreciate it greatly. History will show that probably only a couple of dozen inventions in the last 20 years, over the entire spectrum of American universities, are bringing in more than \$5 million a year. That number is smaller today because some of the licenses have expired.

The classic is the Cohen-Boyer-Stanford-UCSF gene-splicing patent. You could not do genetic engineering without that patent. It was widely and exclusively licensed, bringing in about \$300 million, which sounds like a lot of money. But it is \$300 million over 10 to 15 years, or \$20 million a year split between two universities. The \$10 million a year to Stanford University is not even two percent of a \$600-million-a-year research budget. Even if you get lucky, it is not going to make a major impact on the research budget, or on the budget of the university. So why do we do it?

The most important reason is to disseminate technology by getting industry to invest in university inventions and discoveries. I spoke with a group of medical students recently who said that even if you are doing your research for the most philanthropic and idealistic reasons, the only way you are ever going to get any of your results into the patient is by the intervention of industry. There are no medical findings (unless perhaps some from psychiatry) that hit the patient without investment by industry.

University start-ups are the new frontier. They are causing a lot of angst, but also a lot of interest because you can get investment with real commitment to the technology with the potential of the universities taking an equity share instead of royalties. They make a little bit of money, and perhaps worry a great deal about conflict of interest.

What works for us right now is that we have drawn a Chinese wall between the start-up company and the university. We do not take a seat on the board, we do not let the company sponsor research in the faculty member's lab, we do not promise future research coming out of the lab, and we do not do any confidential work. With this, we have started about 230 companies since 1987. We have had almost three dozen go public. We have not made a lot of money, but we have made some. You

can make it work if you keep in mind the basic mission of the university, and that money is a route to that mission, not its reason for being.

We have to be creative in making agreements with industry. We are working with hundreds of companies. The better funded universities have an obligation to hold the line on these old varieties because the universities with less funding find it hard. We have to balance that queasy feeling of unease against cold, hard cash on an example or an exception-by-exception basis. You have got to hold the line theoretically.

A new battleground is coming. It is not the battleground between the individual and the institution in the entrepreneurial universe of institutions and companies. It is between the individual and the institution in the entrepreneurial university. It will come about particularly as we get out of simple inventions and things like courseware, multimedia, and the kind of technology that can be done at home on your laptop rather than in the lab.