Knowledge Transfer and Economic Development: The Role of the Engaged University in the Twenty-First Century

Mark Crowell
University of North Carolina
Chapel Hill, NC

I will provide an overview of technology-transfer trends and what is working well and what could and should work better. I will discuss some of the shifts in the economy that translate into a new role for universities in terms of economic development and engagement. "Engagement" is a wonderful term, used increasingly to define the role of land-grant colleges in the twenty-first century, which I will amplify. And I will make some suggestions on how an engaged university should interpret its role analogous to that of land-grants in the nineteenth century. Our role is very much the same today, taking knowledge and translating it into ways that benefit society, improve quality of life and improve well-being and wealth creation for the regions in which we operate. And finally, I want to talk briefly about what my professional group has done to extend this conversation into the area of engagement and public benefit.

In the academic setting, technology transfer is a global business.

AUTM

I've just spent a year as president of the Association of University Technology Managers, an international organization with about 3,500 members, 12% of whom are from outside of North America and 10% are from Canada. The non-North American group is growing at 2½ times the rate of the US group. Clearly, in the academic setting, technology transfer is a global business, like many other aspects covered at this conference.

Bayh-Dole

Technology transfer as we know it in universities started in 1980 with the passage of the Bayh-Dole Act, which was the foundation upon which most of us launched our first activities in the tech-transfer arena. As a result of Bayh-Dole, universities can own intellectual property. Prior to it, we could not. In the past 15 years in particular, technology-licensing offices or technology-transfer offices—TLOs or TTOs—have begun to flourish, and not only at large research universities. They are increasingly present also at regional universities, at relatively small universities, at historically minority universities and in other countries throughout the world. Furthermore, they are dealing not only with patentable inventions but also with innovation and knowledge. It is important to realize that, in addition to transferring patents to industry, research discoveries and innovations made by our faculty and graduate students are being made available for the common good.

TTO Explosion

In the past 5 to 8 years, many countries have adopted similar policy infrastructures for technology transfer, both in large industrialized countries and emerging countries. In 2005 I made about fifteen trips around the world, including with Dr. "Vijay" Vijayaraghavan to India, where we helped launch an Indian Society of Technology Managers.

The growth in emphasis of technology transfer, by every measure that we have, has exploded during this period of time. Clearly, it's an activity that is being embraced. On many of our campuses, particularly younger faculty actually interview TTOs when they are looking at jobs, because they expect this asset to be available to help in their research and translational activities. There has been a large increase in the number of licenses granted and many universities are using their intellectual property to leverage research funding from industry. Such knowledge transfer impinges on industrial development nationally, regionally and locally.

Recent years have seen a rapid increase in number of start-up companies resulting from university research. Interestingly, 75% of them locate near the university. Data show that their ability to sustain themselves is affected by the distance from the lab where the science was done; the closer they locate to the university, the higher the chance of success. Again, this speaks to economic development potential.

Impact on Research

How is this phenomenon affecting how research is done at universities and how research agendas are set? Some studies are examining impact of technology transfer in terms of the research environment, academic issues, and graduate students' progress toward their degrees. We don't have to rely on inferences, suppositions or anecdotes to address these issues. Scholarly research has been done by anthropologists, sociologists and economists. Jerry and Marie Thursby at Emory University and Georgia Tech, Atlanta, tracked a number of laboratories that have increased the numbers of their inventions, in an effort to determine whether the portion of research the PIs are involved with that is classified as "basic" changes over time: as they disclose more inventions that are involved in licens-

ing or start-ups do their research programs and students shift more to applied kinds of research activity? The study was rigorous, and the results, published in Science (Thursby and Thursby, 2003), indicated no increase in the portion of research that was labeled "applied" over a period of time in which the level of patenting activity increased ten-fold in the laboratories under study—in short, good science is still being done for the sake of good science.

Emphasis on Revenue?

But all is not rosy. One of the speakers commented that much of what we've done so far has been focused on driving up revenue. On the other hand, if that is true, then technology transfer has been spectacularly unsuccessful. Comparison of the average university research budget with royalties indicates a 2% return on investment. However, I would argue that this is irrelevant. As an illustration: we just licensed a course for teaching conversational Spanish to healthcare workers in the State of North Carolina, a web-administered course for addressing a tremendously under-served population in terms of their healthcare. We licensed this program to Yale University Press, who are now selling it all over the country. We will make a couple of hundred dollars a year, which will not show on the revenue meter. On the other hand, this is a highly successful technology-transfer story and a good example of why we need to expand the conversation and talk about a lot more than money.

We need to expand the conversation and talk about a lot more than money.

I am concerned that the model for tech transfer that has evolved resulted from early focus on pharmaceuticals and biotechnology and in pharma and biotech exclusive licensing is the rule of the day. They will not invest in drug development if they don't have an exclusive license. As a result, we have probably patented things that we should not; we were probably not as skilled as we are today in ensuring that, when we license a technology to a large pharmaceutical company, we reserve an academic or not-for-profit license to share with other academic laboratories. There are horror stories of important discoveries, *e.g.* research tools, becoming "locked up" and unavailable for use. We are developing new approaches to be more careful and better stewards of our intellectual property, so that as we seek new partnerships for licensing a property we do it in a way that helps to position our partner favorably in the marketplace, but also takes into account that these research tools are in large part paid for with tax dollars and should be available to other scientists who need them.

On a related issue, many of our technologies potentially have application and could impart great benefit to populations in less-developed countries. While maintaining our focus on traditional commercialization pathways in developed countries in our licensing

practices, we have often failed to preserve avenues of knowledge transfer where it is needed most. However, many universities in AUTM are addressing that issue by partnering with all kinds of organizations and foundations and working very hard to develop new approaches, new standard license agreements that tend to reserve rights to do both types of licensing and technology transfer.

Land-Grant Role

As university technology-transfer offices have increased in numbers since 1980 with pressure to form start-ups, offer licenses and generate research dollars, technology-transfer offices have evolved to be all things to all people. I tell my staff that no matter what we do, a counterforce always seems to be at work to suggest that something could have been done faster, better, cheaper, generating more money, *etc*. The fact is, we have many different competing aims and priorities for our intellectual property assets; it's our job to be as successful as possible in meeting priorities across the spectrum. However, another component is being added to the tech transfer office. We are being asked to become experts in economic development, forcing us to broaden our horizons even further to help reposition land-grant universities in this field of engagement to continue to articulate a compelling role in the new century.

We are being asked to become experts in economic development,

---

What's driving this? The economy is shifting and our research programs and disciplines and academic boundaries are shifting similarly. From these new alignments, it does appear that the world really is flat. In a speech in September 2005, I heard the prime minister of Singapore end a speech by saying, "Remember: innovate or die." Perhaps a little startling, but it speaks to the fact that the winners in this new economy—particularly in our society where competition is strong and where we can no longer compete on price—will be those who do great work, who produce great technology. The thing that we have always done well and that we have to continue to do well, is innovate, innovate, innovate. We must feed the research beast and stay ahead of the game, continuing to translate discoveries through technology transfer to help drive economic development.

Mary Walshok, an extension person at UC San Diego, is one of my favorite writers on this subject. In her book, *Knowledge Without Boundaries* (San Francisco: Jossey-Bass, 1995), she was one of the first to talk about the universities' role in the knowledge economy. As economic power shifted from possession of territories or natural resources into generators or possessors of knowledge, she stepped up even in the mid-90s to address where universities, particularly land-grants, are going to be asked to function. Whether we want it or not, we are involved in economic development. It's time not only to acknowledge that, but to step up and embrace it.

Knowledge transfer, technology transfer, should be at the epicenter of an engaged university's activities in this new economy.

The Engaged University

In my opinion, knowledge transfer, technology transfer, should be at the epicenter of an engaged university's activities in this new economy and this new century. The Kellogg Commission defined engagement as the interface for connecting people and communities to supplies of knowledge and research residing in the university for connecting the university with real community problems. By seeing engagement in these terms, and thinking about the assets and resources we have to make this happen it becomes clear how these activities converge and why I argue that knowledge transfer should be at the epicenter.

First of all, we must partner effectively and make sure that our training and our research programs are aligned to the extent appropriate and possible with clusters of industry excellence in our state and our region. And we must be sure that we are smoothing the interface between those two to ensure good communication, back and forth, and that our own planning for our research and training programs is informed by what they say their needs are and not by what we think their needs are.

Technology-transfer offices need to develop. They need to be at the forefront of this activity as these plans are laid to ensure that the research programs connect with business and industry needs. Particularly, we must focus on clusters of excellence within the economy, and try to connect them strategically and carefully with those appropriate sectors in our states and our regions. We need to focus on developing a portal to lower the barriers and reduce the "black-box" factor. We hear often from our industry friends that they love to work with the university, they know we are doing great research, but they are unable to determine what we are doing and they find it all very mysterious. We've got to somehow remove the mystery and remove the black box and make it easy and transparent for them to see what's going on, to know how to partner, to know how to navigate these strange structures called universities.

It is incumbent on universities to remember the global part of "global economy" and "globalization." We cannot do it in isolation and, in fact, I would argue that by focusing on global partnerships and our knowledge-transfer and economic-development activities, we are also helping the companies and partners in our regions and states and beyond to cope better with the effects of globalization. An economic historian at UNC has written a wonderful paper, *Driving Down Highway 52*, in which he talks about leaving the ivory tower and the lovely surrounding of Chapel Hill and riding through one of the most economically depressed parts of the state, seeing textile mills and manufacturing plants shuttered. He figures that if he stopped and talked about how wonderful the global economy is with those people they would probably run him out of town. As we seek to pursue the engagement initiatives that I talked about, we have an obligation to do so

also in a global sense and to use that knowledge and those partnerships and that synergy to leverage additional information and assistance to help such companies cope better, to get access to innovation, to retool what they are doing, to understand markets and look beyond the landscapes in which they have traditionally operated.

Partnership is fundamentally important with whoever is working in this space, in state and federal agencies, not-for profit organizations, and educational institutions. Partnering is the key because there is too much to be done and too many resources are required for any university to be effective alone.

A Better World

AUTM is beginning to address this conversation and to position the profession of tech transfer to be more credible and to have more of a voice and more of an impact in this discussion; it's what we call our *Better World Project*. For 20 years, AUTM has published an annual survey that counts all the things we shouldn't count: licenses and patents and revenue, what everyone always wants to know, but which don't speak to public impact. The *Better World Project* is an attempt by AUTM to do just that. The *Better World Report* is a series of twenty-five in-depth stories of university innovation that has been translated into products that have been the bases for starting companies, that somehow changed an economic circumstance, a human-health circumstance, an environmental circumstance, with significant impact regardless of financial implications. A companion piece, *Reports from the Field*, contains a hundred shorter versions in vignette form. The objective is to educate our members and also to educate other interested parties who don't quite understand why universities are involved in this. The stories are contained in a searchable database and more will be added over the next few years from the United States, Canada and around the world. We are sending these reports to all members of Congress and to most of the agencies in Washington that lobby for research dollars and technology-transfer dollars. We are stepping up to this conversation in a major way to try to have a more positive impact on how the conversation about the universities' role in knowledge transfer and economic development is going, and what impact it should have and what should we be looking at in the future.

Reference

Thursby JG Thursby MC (2003) Intellectual property: University licensing and the Bayh-Dole Act. Science 301 1052

MARK CROWELL is associate vice chancellor for economic development and technology transfer at the University of North Carolina at Chapel Hill. Prior to joining UNC in 2000, he held similar positions at North Carolina State and Duke Universities. He has extensive experience in technology transfer, new-company development, seed capital formation, economic development, and research park development and marketing.

Dr. Crowell's beyond-campus duties in the Research Triangle Park area of North Carolina include serving on the boards of directors of the North Carolina Biotechnology Center, of the Research Triangle Regional Partnership, and of the Council for Entrepreneurial Development. He is an appointed member of the Orange County (NC) Economic Development Commission, and he recently co-chaired the *Entrepreneurial Companies* working group in conjunction with a North Carolina Governor's Office initiative to develop a *Statewide Strategic Plan for Biotechnology* in North Carolina.

Crowell has extensive national and international speaking, consulting, and management experience in organizations and initiatives related to technology transfer and innovation-based economic development, including the American Academy for the Advancement of Science and the National Academy of Sciences. He is the 2005–2006 president of the Association of University Technology Managers, and is faculty advisor to the Carolina Student Biotechnology Network.