



TO: OFFICE OF SCIENCE AND TECHNOLOGY POLICY
NATIONAL ECONOMIC COUNCIL

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Ref: Comment on ‘Commercialization of University Research’
per Federal Register: March 25, 2010 (Volume 75, Number 57), pps. 14476-14478

Part I: With Respect to University Research, Promising Practices and Successful Models

Universities across the United States are engines for science and technology development and innovation within the nation. There are many programs and models for translation of University research to new business and commercialization, however, there is a continual need to improve these systems and mechanisms. Two primary missions of large research Universities are education and research. This can be extended to include the translation of the research output and incorporated into the educational component. These extensions are not in conflict with the basic mission, but rather complimentary.

The University of Massachusetts Amherst (UMass) has been actively developing the competencies and systems to effectively translate science and technology to the public sector. This is in alignment with our mission as a land-grant institution. The following are basic comments on the topic areas with programs and practices established at UMass noting some of the successful or developing practices along with some of the challenges and barriers encountered.

UMass has been developing programs that engage students in both the science and technology disciplines with those in our business school. The University offers courses in entrepreneurial activities and provides additional support and counseling through various entrepreneurial associations. Training the next generation of business and scientific leaders is key to moving research outcomes from the University to innovations relevant to the commercial enterprise. Integrating the various disciplines during their education and training will foster more effective translation to new business. The University regularly conducts business plan competitions and the “Innovation Challenge” to encourage students to collaborate cross-discipline as they

move new ideas and concepts to sound business plans and models. These programs work very well and are endorsed by our campus and industrial partners.

In addition to entrepreneurial training and education of our students, UMass is very actively engaged with industry. We view our interactions with industry as win-win collaborations. There are many facets to our industrial partnerships, with some of the more obvious being industrial sponsored research at the University and a supply of well-educated, future employees. UMass has several centers and institutes that focus on University interactions. One of the most notable is the Center for UMass/Industry Research on Polymers (CUMIRP). This Center is a graduated, National Science Foundation (NSF) – Industry/University Cooperative Research Center (IUCRC) that was founded in 1980 to foster academic – industrial research collaborations. CUMIRP is the oldest NSF-established IUCRC in the nation and will celebrate its 30th anniversary in 2010. The center continues to flourish and serves as a model for other academic-industrial centers in the U.S. UMass also has an active IUCRC in its Engineering School in the area of computer aided engineering design (e-Design Center) that collaborates with several other Universities in addition to its industrial partners.

UMass has more recently been awarded a NSF Partnerships for Innovation (PFI) grant (August 2009). The objective of this grant is work with local area Small and Mid-sized Enterprises (SMEs) and translate science and technology from UMass to these local area companies to create new business and new jobs. New job growth in the U.S. over the last decade has mainly come from small and mid-sized companies, with the larger corporations showing a decline in their overall employment. Large research Universities mainly collaborate with large corporations that are set up with R&D personnel and the funding to conduct research. The goal of this PFI program is to work with regional SMEs to identify science and technology at the University, efficiently and effectively translate the technology to grow their business, enable new market opportunities and create new jobs. This is one segment of our research and economic engine that has not been effective to date. In addition to having an impact on our local (western Massachusetts) economy, we are trying to understand the dynamics of these partnerships to find the models and practices that work.

The above two programs (CUMIRP and PFI) are only two examples of many at UMass working with our industrial partners. Through these relationships, we have identified many of the hurdles and challenges to be addressed and overcome as noted below.

Intellectual Property (IP): Universities have always been significant generators of intellectual property. With the Bayh-Dole Act, most have developed very active intellectual property efforts engaged in identifying internal IP, marketing the property and licensing the IP. However, there have been extreme growing pains since universities entered the world of ‘IP as a business’.

In terms of licensing to Industry, there still appears to be a discrepancy between the value a potential licensee is willing to pay and the value established by the university along with a disconnect in the timelines. With the exception of medical schools associated with a university, much of the research in science and technology is in the early, fundamental stage and will need years of continued research and significant development and market research to bring to commercialization. The ‘value’ of the IP is very difficult to determine in the early research phase, yet universities want to put a set value and have industry sign a license agreement very early on, well before the industrial licensee has determined the true costs of development and commercialization.

It is even more difficult if the research institution is a public university and, in addition to state laws governing the use of research facilities, is subject to the Internal Revenue Service regulations governing the use of publicly funded facilities (specifically, Revenue Procedure 97-14). This has been a very problematic regulation for public research universities when working with private industry since it does not allow for any ‘pre-negotiations’ or clear definition of the IP provisions accompanying a sponsored research program. All

discussions regarding the IP must be deferred until the IP is created and then offered on the same terms as would be granted to any other business. This is a strong deterrent to any company when considering a proposal research relationship.

There have been several ‘working groups’ that have attempted to draft a national model for a sponsored research and IP agreement template as a recommended starting point for discussions. Unfortunately, none have been generally accepted. The Council for Chemical Research (CCR) and the Government-University-Industry Research Roundtable (GUIRR) group, among others, have attempted to produce an acceptable model but with only minor success. In addition to the lack of an industry-sponsored research template for U.S. Universities, research is now competitive on a global scale, and any research / IP agreement must be cognizant of the global academic research market. UMass has recently reviewed and revised its procedures and practices for industrial sponsored research programs to be more ‘user-friendly’ and effective. These recent modifications have been well received as an improvement by industrial partners, but are still confined by state law and the IRS procedures.

Much University research has traditionally been early stage, basic and fundamental in nature. This is one of the prime functions and must continue, since most companies have drastically reduced their fundamental research efforts. However, Universities should be encouraged to develop their science and technology further along through early development stages. Typically there are fewer publications and less educational merit associated with applied research, that can be very specific and potentially tied to IP, thus of less interest to many university faculty.

There are numerous areas that the Federal Government can address and assist to facilitate universities working more closely with industry and effectively translating science and technology to the general public. A few examples are noted below:

- IRS regulations for public institutions: these procedures should be reviewed and revised for publicly funded institutions to work with private industry without jeopardizing their tax status. Companies willing to invest in research should be provided incentives and allowed to better define the cost of moving the science and technology forward. Currently, in addition to paying for the research cost, they must also negotiate a license (after the IP is identified) at a fair market value that any other company would pay. This provides little incentive to sponsor research. Without industrial collaborators to move science and technology along, there is very little technology that will make it to the public sector.
- Federally supported programs: Federal programs intended to foster academic-industrial relations need to have increased funding levels and longer durations for success. The two programs mentioned above (NSF – IUCRC and PFI programs) have been successful at initiating programs, but lack a sufficient level of funding and/or sufficient program duration to fully establish a sustainable academic-industry program. Due to decreasing funding levels or too short of an incubation period, many promising centers fail before becoming a self-sustaining entity.

NSF-IUCRC’s are funded at \$ 70,000/year for the lead institution / \$ 50,000/year for a participant institution. This level is reduced over the course of the center.

NSF-PFI programs have a 2-year, \$ 600,000 finite period.

Federal programs should be allowed to identify promising programs and determine the support needed to ensure success.

- University should be encouraged to expand their basic and fundamental research into applied research to reduce the ‘valley of death’ between the end of University research and the beginnings of industrial development. This type of applied research should be considered in university accomplishments and rankings. Universities should provide incentives to faculty and ‘credit’ be given for these activities.
- SBIR and STTR programs need to be simplified for easier access by small companies. There are many small companies that survive on SBIR/STTR funding, but these companies have been designed to exist on this type of funding, and are set up to continually process proposals. The majority of small companies in the U.S. do not have the resources or lack the capabilities to successfully compete for these research awards. At UMass, we are currently trying to address this gap – between awareness of the funding and actually being able to submit a successful proposal.
- Universities should be encouraged to partner with economic development and other regional agencies to develop best practices for technology translation. This is a good example of an ‘innovative ecosystem’. The current UMass NSF-PFI program brings together: UMass, 2 local community colleges, the regional employment board, the local economic development council, local chapter of precision manufacturing companies (~ 60 companies) and ties into several other area technology networks and support systems. In the past decade, government agencies have encouraged universities to work cross-discipline within their programs, to engage with other research institutions and government research entities and to collaborate with industrial partners, but have not emphasized the need to work with all the entities necessary to build a successful ‘technology commercialization bridge’.
- Universities should be encouraged to identify or develop the resources needed to move research beyond their campus. This would include resources capable of assisting with start-up and spin-out technologies, such as investment funding, professional management capabilities, and facilities to move the technology to the next level. Additionally, and perhaps more importantly, Federal incentives should be established to encourage industry to develop ‘Pilot Labs’ that would be located at or near university partners to bridge the basic the basic and fundamental research conducted with the university labs and do the necessary pilot-development before moving to corporate R&D facilities. This proximity to where the science and technology was developed can be crucial in getting the technology far enough along to warrant serious business and technical development. It may also reduce the corporate “NIH (not invented here) syndrome” that can sometimes retard external development efforts.

Part II: With Respect to POCCs

The Proof of Concept Center is a good basic model to encourage innovation and can be built upon. The essential basis is the belief and commitment from all partners involved that the POCC is needed and viable. There needs to be strong support from the University, regional and state agencies and industrial partners. The POCC should be affiliated with or under a Research Institute or equivalent, such that it can adapted to the needs of the POCC without being directly tied to a university or federal administrative bureaucracy. The initial funding and duration should be sufficient to establish a solid foundation for the center, a minimum of a 5 year commitment would be needed, with options for additional support if justifiable.

In establishing a POCC, the University or Institute should be able to demonstrate a positive track record in attempting to move science and technology forward to commercialization. The POCC should build upon successful programs in existence with a plan to coordinate and elevate those programs to the next level.

Programs such as ERC's, IUCRC's, PFI and similar programs should be looked at as potential 'feeders' to the POCCs.

The NSF PFI program at UMass is a good example of an initiated program that is taking hold in the local arena. The federal funds provided by the NSF have been leveraged by state funds, University funds and direct and in-kind support from local area small and mid-size companies. There are dozens of people involved in this program from all sectors that are committing time and resources to ensure this program is successful and sustainable. The program has already established six projects between UMass and SMEs with technology transfer as one of the main outcomes. There are several other project teams in formation but lack the necessary seed funds to initiate the collaborations. The overall objective is to translate science and technology from the University to local SMEs to create new business opportunities, new markets and create new jobs. A POCC would be a logical extension to move the research project forward during the more applied research stage through successful translation to the private sector.

Existing POCCs should be encouraged to share their findings with each other and potential POCC candidates, however, any new POCCs should be directed to adapt best practices to their environment, tailor to their strengths and be strongly encouraged to try new and different endeavors. POCCs should be designed such that they are: adaptive, flexible, responsive, enabling, facilitating with a culture that lends itself to innovation and progress.

The POCC, in addition to providing a venue for technology translation, must also address the supporting issues that often come with technology translation. In the case of University spin-out technology, must address the supporting resources (mentioned previously) needed to position the start-up for success. The POCC should also provide or link to resources that can address issues such as: qualified workforce, additional training needs, assistance with funding vehicles (private or government grant programs), access to university resources for on-going technical support, business methods and practices, legal and financial services and other similar needs. As an example, in the greater UMass area, there are local legal firms willing to consult with a new start up venture pro bono or at very little cost. For the engaged science and technology areas and for the 'customers', the POCC should be a 'one-stop shopping' center that can assist and enable successful innovation.

The POCC should also have access to or plans for appropriate facilities from research labs to early manufacturing. This may exist within the university campus and extend to private facilities. But the POCC must have these identified and accessible.

Proposals for a POCC should clearly show the 'pathway' to success building upon their strengths and current programs. The program should encapsulate the priorities of the University, the local and state directions and address national needs. The initial participants and partners should be identified or outlined. However, the overall proposal, especially over time, should allow for flexibility and change. Often very detailed programs with concrete promised results often provide a barrier to 'course-correction' when needed. Metrics for success can be included in the framework, but these should be modified as needed or new metrics added as uncovered. Some example of metrics that can be monitored are: establishment of the POCC infrastructure, number of project initiated and advanced, proposals submitted / awarded through the center, tech-transfer successes, creation of new business and of jobs, etc... These metrics will be self-evident and should not be used as milestones, but rather monitored for progress. The POCC structure should be designed to provide flexible venues for translation of technology and be capable of capitalizing on the unexpected. Any proposal for a POCC should contain the elements of a good business plan.

In establishing the administrative structure of a POCC and for on-going operations, the center should draw upon all sectors for guidance. Any 'advisory board' should be comprised of the stakeholders in the center and

represent the sectors that will make the center successful. This board should be an “Advocacy Board” that not only provides advice and comment, but can be called upon and engaged when needed.

A successful POCC will become or be self-sustaining. The time to self-sufficiency will likely vary (likely 5 years or more), but the goal will be to create an enterprise that can support its own endeavors. There will certainly be metrics along the way that indicate the likeliness of success or identify deficiencies. There should be ‘checkpoints’ throughout the development stage that the POCC should meet or address. Formal reports to the federal sponsor should not be an ‘output’ of a POCC. Significant manpower effort goes into formal reports and may also direct activities that will generate report data that may not necessarily support the overall effort. ‘Successes’ during the POCC development phase should be shared among all POCCs as they occur. Reviews should occur with both the federal sponsor and the university, together if possible, and should not focus on the ‘program to date’ vs. ‘milestones’, but rather collectively look at where the POCC is and ensure that it is addressing the right issues at the right time to move forward. Those POCCs that demonstrate success and show increasing promise should be able to gain additional support. POCCs should be set up for and rewarded for ‘performance’.