Enhancing Economic Development through Technology Transfer of Federal- and State-Funded R&D

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Federal- and state-funded research and development (R&D) organizations such as public universities and government laboratories have the potential to positively impact regional economic development in many ways. Some of these contributions emerge from these organizations' technology transfer programs:

- **Resources:** Publicly funded R&D organizations can serve as a valuable resource for local industry by providing expertise to help solve technical problems. For example, if they have invested significantly in unique facilities and equipment for their research, these R&D organizations can provide access to their capabilities to help local companies over technical hurdles.
- **Technologies:** Their innovations can be commercialized within the region, facilitating the formation of start-ups and/or the expansion of existing companies.
- **Collaborative R&D Opportunities:** Public-private collaborations can have a positive impact on economic development.

Because most publicly funded R&D organizations have a mandate for technology transfer, the above opportunities are not merely theoretical. They are, in fact, specific goals and metrics that are to be achieved by a formal Technology Transfer Office (TTO) within the R&D organization (universities, government labs, and not-for-profit research organizations).[1]

Given the potential economic impact of technology transfer activities, economic development agencies have a vested interest in the success of TTOs within neighboring university, government, and not-for-profit R&D labs. Therefore, these two groups—R&D organizations' TTOs and local economic development agencies—should work together as partners, leveraging each others' strengths to achieve their respective objectives more quickly.

For such a partnership to be successful, each party needs to bring something to the table that contributes to the other's objectives while fulfilling its own objectives. This paper offers specific ways that R&D organization TTOs and economic development agencies can contribute to a mutually beneficial partnership.

R&D Organization TTOs: Bringing it Home

To achieve technology transfer objectives while contributing to the local economy, R&D organization TTOs must establish successful licenses, collaborations, and other technology

[1] For more information about technology transfer metrics, see "How'd We Do?: Establishing Useful Technology Transfer Metrics" by Karen Hiser, Dr. Norman Pollack, and Laura A. Schoppe, available on the Publications page at http://www.fuentek.com.

transfer agreements where both parties benefit. Below are a few ways that TTOs can achieve this goal.

Streamline

A TTO's agreement approval process should be as streamlined as possible so that negotiations can be completed quickly to meet companies' market-driven schedules. Using standard language or agreement templates helps speed up the process. Standardizing license agreements is beneficial to both sides of the deal: the licensor expends less resources in modifying each deal, and the licensee knows what to expect and gets the deal faster. (***Note:*** The same goes for non-disclosure agreements [NDAs] which encourage open communication with private companies, helping find the best fit for licenses and collaborations.)

An example of this is the Carolina Express License Agreement established by the University of North Carolina's (UNC's) main campus in Chapel Hill. UNC's Office of Technology Development unveiled the Express License in December 2009 and 4 months later the first license was signed. The Express License standardizes the business terms for all university-led pharmaceutical-based start-ups. Regardless of the market potential, the royalty structure is the same. By limiting the Express License to deals with professors, students and staff, UNC established a preferential situation to encourage home-grown entrepreneurship while still protecting the university's interests in commercialization. (More information is available from the UNC Office of Technology Development at http://otd.unc.edu.)

Another way to streamline TTO efforts is to provide basic technical and "how to" information about processes, procedures, and forms on a user-friendly Web site.[2] Other streamlining efforts to consider include the following:

- Having basic license agreement templates that apply to all licenses—either across the entire organization or from specific departments within the larger organization (i.e., specific templates might be needed for pharmaceutical licenses)—with all negotiable sections as attachments
- Developing term sheets for simple and rapid business-term negotiations, which can be attached to the standard license agreement
- Establishing specific processes, forms, and requirements for negotiations and then training TTO staff on those best practices, rather than allowing individual license managers to develop their own forms and requirements, which leads to inconsistency and confusion.

Support start-ups and small businesses

Start-ups and small businesses often are a key path for technology transfer from publicly funded R&D organizations, whose technologies tend to be embryonic in nature. Because these technologies have not been prototyped or sufficiently characterized for a company to directly

[2] For more information, see "How to Build an Effective Tech Transfer Office Web Site" by Karen Hiser, available on the Publications page at http://www.fuentek.com.

implement them into a product line, many will not be licensed and further developed by established, larger companies that do not have the infrastructure (either from a cost structure or facilities perspective) to support early-stage prototyping and development. Despite these technologies showing promise in fulfilling a market need in the future, the risks associated with finishing the development required to successfully meet the market need are too high for many large and medium-size companies to bear.

A start-up or small business often is more willing to take on the interim development risks for the much greater return on investment in their exit strategy (e.g., sell the company, license the technology, expand and launch the product). Therefore, TTOs would be well served by offering these small businesses specific support vehicles that can help them through the process when, in fact, there is a mutual benefit in the further development of the technology. Such support vehicles help the start-up/small business further develop the technology, reducing the risks for investors and allowing the business to improve its opportunities for venture or state and federal funding.

Furthermore, because helping establish and support regional small businesses has long been the focus of economic development agencies, universities and government labs are in an excellent position to contribute to that goal. Such an R&D organization can identify the technologies in its portfolio that have the greatest potential for a fit with a start-up as well as which assets it has to commit to the collaborative development of early-stage technologies. The investment industry appreciates not only the reduction in risk provided by such arrangements but also the lack of dilution of equity for partnerships with public organizations, particularly government labs. These development projects may also be candidates for federal SBIR/STTR[3] grant funding to reduce the concept to practice in Phase I (up to $100K) and develop an advanced prototype in Phase II ($750K), neither of which dilute equity while investing in the development.

Educate inventors

Helping the innovators within the publicly funded R&D organization understand how to work with industry collaborators and licensees of their technology is a worthy investment by the TTO.[4] For example, a venture capital workshop for internal researchers provides an opportunity to discuss the issues involved when collaborating with a start-up company. This type of workshop can stimulate and enhance the quality of interactions between the R&D organization's innovators and regional businesses.

[3] Information about the federal government's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs can be found online through the main government portal at http://www.sbir.gov.

[4] See the author's blog post "Invest in Your Inventors: Training Pays Off," available at http://blog.fuentek.com.

Economic Development Agencies: Serving as TTO's Bridge to Industry

Most economic development agencies have a wealth of connections and information that can help neighboring R&D organizations target their technology transfer efforts to have a greater impact on the local economy.

Provide useful data

Most geographic regions—particularly those with a large federal lab or research university—contain a cluster of interconnected companies and associated institutions in one or more particular fields. Similarly, the employees in these industry clusters have specific qualities, such as exceptional pharmaceutical skills, extensive knowledge of materials, or low labor costs.

This type of information is often at the fingertips of economic development agencies, yet it is often untapped by the neighboring R&D organizations. Providing these organizations' TTOs with information about these industry clusters—as well as the clusters' competencies—allows them to better understand the region's economy, which in turn helps them prioritize and target their technology transfer efforts.

The information typically provided in industry cluster analyses that would be of greatest interest to R&D organizations' TTOs includes the following:[5]

- What are the existing, emerging, or converging areas of specialization in the region?
- What are the large or rapid-growth markets?
- Which are the global or export-oriented companies?
- In what industries is employment so concentrated that it exceeds the national average?
- Which businesses are interdependent upon each other?

The answers to these questions give TTOs the information they need to develop an industry-driven strategy to capitalize on regional innovation assets and competencies. By deploying its technology transfer resources strategically, the R&D organization can achieve its goals while simultaneously enhancing regional economic development.

Contribute to TTO match-making efforts

Commercialization and other technology transfer successes are achieved when the technologies of the R&D organization align with needs of a company (and vice versa). The biggest challenge is finding the match between what the R&D organization has and what industry needs. That kind of match-making is the focus of much of the work in TTOs at publicly funded R&D organizations, and economic development agencies have a role to play.

[5] Waits, MJ. "The Added Value of the Industry Cluster Approach to Economic Analysis, Strategy Development, and Service Delivery." *Economic Development Quarterly* 14(1):35–50 (February 2000).

Economic development agencies can foster technology transfer between local industry and neighboring (and even far-flung) universities and government labs by collecting the needs and interests of local companies and then sharing them with R&D organizations as a consolidated list, spreadsheet, or database. Doing so helps TTOs identify connections between what their R&D organization have and what the local industry needs more quickly.

The challenge for economic development agencies will be connecting with the many university and government R&D labs that may have technologies that are relevant to the regional industries. No single database containing all university or federal lab technologies currently exists. Until a consolidated "portal" becomes available (which is likely to happen eventually but not in the near term), technology information is available only directly from the R&D organizations themselves.

However, a reasonably efficient alternative exists that economic development agencies can leverage. An economic development agency should partner with technology transfer trade associations, providing them with the list of industry needs in the region for distribution to their members. The two key associations are the Association of University Technology Managers (AUTM™) and the Federal Laboratory Consortium for Technology Transfer (FLC), whose members compose virtually the entire academic and federal systems. Once AUTM and/or FLC distribute the need information, the R&D organizations then can approach the economic development agency with vetted opportunities directly. Once this connection/relationship is established between an economic development agency and the trade association, it can become a regular vehicle to identify connections between industry needs and technology opportunities with those of universities and/or government labs.

Provide networking opportunities

Actively engaging with local industry through conferences and community events allows TTOs to better align their technology transfer activities toward local economic development. Hosting—or jointly sponsoring—events that provide opportunities for the R&D organizations (inventors and TTOs) to interact with relevant industries in the region helps the TTO target a new audience of potential licensees and collaborators. For example, a Minnesota-based licensee of a technology developed at NASA's Glenn Research Center (in Cleveland, Ohio) learned of the innovation during the inventor's presentation at a conference sponsored by Minnesota Technology, Inc., an organization at that time funded by the state and now operating as the private not-for-profit entity Enterprise Minnesota.

Economic development agencies would be well served to partner with local TTOs to plan such events collaboratively. For example, the nonprofit Houston Technology Center presents its annual 1-day Gulf Coast Innovation Conference and Showcase. Among its sponsors, supporters, and presenters are the University of Texas System, Lamar University, NASA's Johnson Space Center, and more. Similar events are held by the Wisconsin Technology Council and other states. In January 2009 the Pacific NorthWest Economic Region, Idaho National Laboratory, Boise State University, Boise City, and corporate co-sponsors presented a 2-day Energy Innovation Summit, exploring energy issues, opportunities, and breakthrough technologies in the region.

Provide seed funding

If economic development agencies have funds available, they can help advance early-stage university or federal technology to the point where a local commercial company might have interest. For example, in 2007 the City of San Diego's Economic Development Division began working in partnership with the San Diego Regional Economic Development Corporation (EDC) and the University of California–San Diego's (William J. von Liebig Center for Entrepreneurship and Technology Advancement to develop a "Clean Tech" industry cluster in the region. With a goal of transferring home-grown innovations into the marketplace, the partners announced in March 2008 that they would provide seed funding and business mentoring to university faculty members and researchers in the region to accelerate the transition of their inventions to a commercial venture. Nine months later, the city awarded $50,000 each to three 1-year projects. The San Diego Clean Tech Innovation and Commercialization Program has continued, with a second round of funding awarded in June 2010.

Economic development agencies also can contribute to the transfer of technology between local businesses and government labs located in the region. For example, a partnership between the Maryland Technology Development Corporation, the Frederick County Office of Economic Development, and the U.S. Army Medical Research and Materiel Command established the Fort Detrick Technology Transfer Initiative (FDTTI). The FDTTI provides Congressionally supplied funding for technology development projects where a company can show how the proposed technology will meet the technology needs of the Army and/or the commercialization of Army technologies.

Conclusion and Caveat

The approaches presented in this paper are designed to help R&D organizations and economic development agencies leverage each others' efforts to achieve their respective objectives. In many cases, these approaches may have a positive impact on technology transfer that benefits regional economic development.

Although TTOs and economic development agencies can and should form symbiotic relationships through which each benefits from and helps the other, it is important to remember that the success of their collaborative efforts is highly dependent upon the conditions within the regional industry/competency clusters. A 2004 study by Carnegie Mellon University's Center for Economic Development on behalf of the U.S. Commerce Department's Economic Development Administration found that the characteristics of an industry cluster are as important as the characteristics of the research organization.[6] For example, established clusters with mature products and processes are less receptive to innovation (especially from external sources such as a university or government lab) than are young, emerging clusters. The

[6] Paytas, J. *Universities and the Development of Industry Clusters*. Pittsburgh, PA: Carnegie Mellon University, Center for Economic Development, 2004.

R&D organization can produce the seeds of new firms and industries, but the region must offer a fertile climate for them to flourish.

Nevertheless, the study found that TTOs' efforts are most effective when pursued in partnership with the entrepreneurial infrastructure. Economic development agencies are a key part of that infrastructure. We hope that the strategies offered in this paper provide the guidance and tools needed to form successful, productive partnerships between TTOs and economic development agencies.

If you would like to discuss the concepts presented in this paper in further detail, please contact Fuentek president Laura Schoppe (919-249-0327 or info@fuentek.com).