



Technology Transfer Processes in Federal Agencies

*Matthew Riggins, Lead Author and Researcher, Georgetown
University McDonough School of Business*

*Roger London, Technical Expert and Project Manager,
Chesapeake Crescent Initiative*

Report on Technology Transfer Processes in Federal Agencies

Objectives

This study was conducted from December 1, 2008 until February 12, 2009. Its purpose is to better understand the dynamics of the technology transfer (TT) processes in various federal agencies in order to identify:

- Bottlenecks, obstacles or other roadblocks that impede the success of TT, and;
- Potential solutions that would help to overcome these obstacles (resources, policy, etc.)

Technology transfer is defined by the Federal Laboratory Consortium for Technology Transfer (FLC) as “the process by which existing knowledge, facilities, or capabilities developed under federal research and development (R&D) funding are utilized to fulfill public and private needs.” It is important to note, however, that there are many variations of technology transfer, as knowledge can flow between agencies, from the government to private entities, or even from private entities to the government. For further information on technology transfer basics, see: <http://www.federallabs.org/home/faqs/>

Over the course of this study, eight interviews were conducted with TT officers and experts in various federal agencies and laboratories. Interviewees include:

- John Emond, Innovative Partnerships Program, National Aeronautics and Space Administration (NASA)
- David Appler, Office of Technology Transition, Department of Defense (DOD)
- Mojdeh Bahar and Steven Ferguson, Office of Technology Transfer, National Institutes of Health (NIH)
- Sarah Bauer and Valerie Blank, Federal Technology Transfer Act (FTTA) Program, Environmental Protection Agency (EPA)
- Scott Deiter, Office of Technology Transfer, Navy Surface Warfare Indianhead (Navy); Director, Federal Laboratory Consortium (FLC) for Technology Transfer
- David Koegel, Office of Laboratory Policy & Evaluation, Office of Science, Department of Energy (DOE)
- Terry Lynch, National Institute of Standards and Technology (NIST)
- Tom Stackhouse, Office of Technology Transfer, NIH National Cancer Institute (NIH NCI)

Results of Research

Consumers versus Researchers

Before analyzing obstacles and their potential solutions, it is important to note that each agency's TT program is unique. Agencies and labs clearly have very different missions, but the most significant difference for the purposes of this report is that some agencies are "consumers" of innovation while others are not. Consumers of technology perform research and development to further the agencies' mission and then purchase/implement (consume) the technology within their agency. The best example of this is the Department of Defense, which funds research into missile technology (for instance) in order to improve its war fighting capabilities and then purchases the technology for adoption by organizations within the DOD. On the other hand, some agencies engage in research and development to further their mission but are not the eventual customer; non-agency entities purchase and incorporate agency innovations. The best example of this is the NIH, which funds research into cancer-fighting drugs in order to improve the health of the public but does not own/operate hospitals, medical devices and is not a pharmaceutical company. The NIH does not develop technology for its own consumption.

This consumer/researcher principle is important to consider when analyzing strategies for improving the commercialization of federal research, primarily because there is a predefined market for the technologies developed by some agencies. Any commercialization effort must take into account the potential market and customers for a technology being developed. Still, the obstacles to technology transfer are broad enough that they affect all agency labs similarly.

Obstacles

Funding

There are severe funding limitations for TT within federal agencies. The Stevenson-Wydler Act of 1980 required agencies to devote "sufficient funding" to TT programs, but the lack of clear funding requirements cause agencies to treat TT as an unfunded mandate. They will identify a person or persons in charge of TT for a particular lab, but will provide little to no funding beyond the staffer's base salary, requiring employees to take on TT responsibilities on top of the work already assigned to them. For instance, the Energy Policy Act of 2005 required the DOE to name a "TT Coordinator," but did not include specific funding for the personnel. Therefore, these responsibilities fell to the Under Secretary for Science, Dr. Raymond Orbach.

Identifying the "right" private sector partner

Federal agencies struggle to locate and identify companies for partnership opportunities. The DOD has noticed that because TT is outside of the traditional procurement arena, it is sometimes difficult for companies to find the vast amount of technology available for licensing. On top of this, agencies frequently have difficulty in simply being able to find a company with the financial wherewithal to complete a successful agreement. At the NIH, for example, most of the research being performed is basic science that requires heavy investment. Therefore they try to identify partners that have the ability to make these investments, mostly established companies (not typically start-ups).

Even once these potential partners are identified, however, they may not be interested. There is significant risk involved with making large investments in new, untested technology. Start-up companies and other relatively untested and risky private sector entities are often the ones that express the most interest in these technologies. However, because of a lack of cash flow, they often don't meet the statutory mandates for exclusive license agreements. But from the start-up's point of view, an exclusive agreement is extremely important because it will give them a competitive advantage to procure investment capital or generate customers. This "chicken-and-egg" phenomenon often stifles any hope of formulating a licensing agreement.

Educating and communicating with the private sector

The public and private sectors often speak very different languages. They have very different processes, interests and cultures. Common criticism of the private sector by the government when attempting TT include lack of preparation, poor quality of business plans, poor understanding of the technology and its applicability, and lack of financial viability. Common criticisms of the government by private sector actors include slow processes and overwhelming bureaucracy in decision making. These criticisms are often the root cause of failed TT agreements.

Most interviewees stated that some companies understand how to work with the government, usually because of long-standing relationships or knowledge of the agency. There is still considerable work to be done, however, in educating potential partners on how to approach agencies, as well as how to find available technologies. The DOD has experienced problems educating the private sector about the availability of its research. They have found that most companies believe that most DOD research is classified, but only 3-5% of their R&D is classified. One interviewee stated that while many companies use "tech-mining" (online technology searches), much technology is hidden because of the closed nature of the patenting process. Technologies could be up to 36 months old by the time a patent is issued.

Agency support for TT and overcoming cultural roadblocks

An agency's TT program is only as effective as the resources devoted by the agency. Successful TT programs not only depend heavily on support and awareness from scientists and those conducting research, but also on support from managers, supervisors and up the organizational chain of command all the way to the White House.

The Stevenson-Wydler Act of 1980 included clear mandates for agencies to support TT. However, enforcement of this mandate is inconsistent across and within agencies and labs. Clearly, internal awareness and support from lower level actors like scientists and line managers are vital to an agency's TT program. If the scientist is not educated and aware of the potential for commercialization, and if his or her manager does not make this a priority for the scientist, then TT will simply not happen. Cultural difficulties abound as well, as these governmental employees do not typically possess a natural entrepreneurial spirit. Without significant support from supervisors and directors, TT tends to become less of a priority.

Other statutory limitations get in the way of TT by restricting the amount of interaction a scientist or other government official can have in the TT process. For instance, agencies and labs are

prohibited from providing any funding to a commercialization effort such as a CRADA (Cooperative Research and Development Agreement). They may lend personnel or logistical support, but all financial needs are to be handled by outside partners.

Agency R&D priorities are constantly in flux, and often change with new senior leadership. This creates volatility for ongoing TT projects because it requires Offices of TT (OTTs) to identify new private sector actors to match with the research. For example, NASA focused heavily on life sciences before 2004, and has now all but abandoned this research. The partnerships and relationships built over that time period are therefore less useful.

Finally, agency support can sometimes be difficult to obtain because of the difficulty in measuring TT. Definitions of success vary based on the agency's mission, but a common metric used for identifying successful TT programs is the impact of technologies to meet a public need. This is particularly true for outward-facing agencies like DOE or NIH. The problem with this metric is that it is hard to quantify and communicate. Inward-facing agencies like DOD have a more clear definition of success: technologies that helped complete an internal need. Other metrics that are more easily quantifiable include number of patents, licenses, CRADAs or royalty income. The problem is that these metrics do not communicate the social impact of the commercialization effort.

Obstacles and Possible Solutions

Obstacle 1: Funding

- Any increase in funding must come from Congress, and clearly this is a funding source with many strings attached. However, any increase in the mandated levels appropriated to TT programs by their associated agencies would be very advantageous. Some interviewees estimate that OTTs need an increase of 50%, while others believe that budget stability is more of an issue. All agencies believe that more funding is necessary to improve TT programs. Increased funding would be used for priorities such as patent application processing, patent prosecution, patent attorney fees, additional TT personnel, marketing, etc.
- Because Congress controls TT dollars, the communication to the public of an agency's contribution to the commercialization of research would help to obtain favorable publicity for an agency's mission. For example, the commercialization of NASA's research on miniaturization technology resulted in the eventual development of the pacemaker. If this were known by the public, Congress' financial support for NASA's research would likely increase.
- Technologies often do not develop fully enough to attract commercial investors, who would prefer to invest in more mature technologies. However, research and development activity for the project is usually nearing completion. Therefore, a "Technology Market-Ready Fund" would help to move the research to the next step needed for commercialization. In order to choose the technology that would receive this additional funding, agencies could utilize a review board that would conduct an evaluation or contest among competing ideas. Some

interviewees, however, believe that what is needed for fallow technologies is simply to find the right partner rather than provide more funding.

Obstacle 2: Identifying the “right” private sector partner

- International companies are increasingly being targeted by federal agencies for commercialization because of the global nature of our economy. The majority of interviewees have said that guidance and training on obtaining international patents and licenses would be helpful.
- TT officials have said that improved outreach to nonprofit groups and NGOs, especially regional and local economic development organizations would help in identifying potential private sector partners within a lab or agency’s vicinity. Some interviewees feel that improved outreach to companies is more useful because nonprofits and NGOs have such limited financial resources.

Obstacle 3: Disjointed Agency efforts

- Almost all Agencies use their own legal documents. A standardized approach has worked with various universities and could be applied here. Standardized licensing documents would reduce legal issues to both parties
- A TT centralized “knowledge bank” would help to consolidate information from many different agencies and other actors involved in the TT process. There is considerable overlap between agencies, and a platform for consolidating and centralizing technologies and research would be extremely helpful in communicating interagency, as well as with the private sector. This “knowledge bank” would be helpful in not only educating and communicating with the private sector, but also in finding the “right” company (Obstacle 2). Some interviewees caution that this idea would have extreme difficulty without funding and dedicated management.

Obstacle 4: Agency support for TT and overcoming cultural roadblocks

- Simple communication with scientists about the historical and potential size of royalties would help in incentivizing scientists to make TT a priority. All interviewees this is important, and some already make this a priority.
- Improved employee training programs for new hires (i.e. scientists, researchers, managers, etc.) would help to increase education and awareness of TT internally. Training programs vary by agency: some agencies have very strong programs, while others are still struggling to implement their own.
- Many smaller, more isolated labs struggle to gain visibility within the agency and with potential commercial partners. Engaging these labs in a network of other labs would help in consolidating research and knowledge, and in turn fuel commercial opportunities.

- In order to overcome not only funding difficulties, but also cultural roadblocks, OTTs should be incentivized to pursue commercialization by allowing them to take a share of any royalties earned. Some agencies already collect royalties, but many say that the amount fluctuates widely. Some interviewees mentioned that terms of agreements should be negotiated on a case-by-case basis because of the variety of different situations. Ethical issues can also be a factor here, as OTTs should be concerned with the usefulness of a technology rather than the potential earning from a particular technology.

Obstacle 5: Minimal business and entrepreneur interaction

- Build a strong alignment with local universities. Presently there is inconsistent collaboration between business students and researchers. A broad framework would be implemented to insert more business student activity into the research environment. Perhaps consider an actual course at one or more universities to drive interaction and productive output.
- Consider a “shadow program” that embeds business students in the different innovation and commercialization ecosystem for periods of time to gain firsthand knowledge. Students would shadow for entrepreneurs, investors, customers, researchers, and other emerging growth professionals.
- Introduce X-Prize type challenges which attract and encourage commercialization toward specific market needs.

Conclusions and Final Proposals

The technology transfer process within federal agencies has tremendous scale-up potential. The vast amount of research being conducted and dollars spent is astounding. The CCR (Chesapeake Crescent Region) has the most research activity and innovation creation in the country. The CCR also has the largest customer in the country (federal government) and arguably the world. The CCR is not leveraging the fact that it enjoys both ends of the supply and demand curve. We need to provide the systems in the middle to fulfill our potential.

Each agency has incredibly dedicated and passionate representatives, but they simply do not have the resources to take TT to the next level. However, these shortcomings are not impossible to correct.

Overall, the data collected from these interviews suggests that the challenge of finding the right commercial partner is a common challenge faced by each agency or lab. The reasons for this could include poor communication, a fragmented knowledge base, or simply a lack of regional companies and investors with sufficient capital. The FLC has gone a long way in identifying best practices, facilitating communication and identifying technologies with commercialization potential. However, there is much still to be done.

An ideal solution would be the creation of a federally authorized intermediary that would actively seek out companies for partnership opportunities. One limitation of the FLC is that it is often

inward facing, waiting for companies to seek out opportunities from them and providing information for companies interested in partnership. The challenge is to find companies who are unaware of the opportunities. This new intermediary would take a particular technology and seek out companies – more outward facing. This would improve communication to the private sector by making education about federal partnerships more proactive. By helping a company through the licensing or CRADA process, the intermediary would help ease the often difficult negotiations between agencies/labs and private entities.

We also suggest addressing the solution from the demand side rather than just the supply side with an In-Q-tel like program that acts as a buyer's agent for a large consumer of technology. This model has worked out well for them and can be replicated in many other agencies including DOD, DHS, DOT, VA and NASA.

Funding would be a key concern here, as agency TT programs are already slim. In order to identify the best technology projects for commercialization, market analyses should be performed regarding the technology's competitive differentiation, size of market, market trends and other valuable data. Allowing the intermediary to take royalties or equity may help it survive in the long-term, but secure funding would be vital. Relationships with the business and entrepreneur community can support these efforts through the university relationships and shadow programs, as well as X-Prize type Challenges

The benefits of technology transfer can be enormous. It can feed innovation and economic growth, something that is sorely needed at present. The obstacles standing in the way of scaling up this process are not impassable. This report is hopefully a first step toward a better understanding of the technology transfer process, obstacles that impede its success and the potential solutions that are seemingly at our fingertips.