Innovation Partnership Networks in the Midwest

A Pilot Project of the Federal Laboratory Consortium Midwest

FLC™
Federal Laboratory Consortium for Technology Transfer
Midwest Region

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ON BEHALF OF
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Executive Summary

This pilot study documents the network of Midwestern federal labs and different types of technology-based economic development (TBED) entities. The Midwest Federal Laboratory Consortium commissioned the Indiana Business Research Center (IBRC) to collect data on entities that either have, or are interested in, facilitating the transfer and commercialization of technologies developed in federal laboratories.

Data on nearly 250 TBED entities that have a presence in the Midwest were collected into a database. The IBRC research team also conducted more than 50 interviews with TBED staff to gather information and recommendations on how to strengthen the relationships between labs and TBED entities pursuant to expanding the commercialization of technologies developed in federal labs.

Key Findings

- Only a small percentage of the TBED organizations that were interviewed had direct or indirect relationships with federal laboratories.

- Organizations with direct ties to federal laboratories tend to be based on proximity.

- Labs need to improve customer service, licensing procedures and disseminating information on available technologies.

- Incentivize federal laboratory personnel—researchers and technology transfer employees—to be more entrepreneurial. TBED organizations reported a marked difference in the higher number of their clients licensing technologies from universities rather than federal laboratories. Universities typically have incentives to encourage faculty and researchers to commercialize their research.

- Entrepreneurs are the linchpin between federal technologies and other TBED entities in technology commercialization and strategies need to focus on cultivating relationships with them. Without entrepreneurs, either private individuals creating start-ups or within established businesses seeking to extend their reach into new markets, technology just sits on the shelf.

- Entrepreneurs need technical and financial help. Entrepreneurial start-ups often rely on personal savings, family and friends, angel investors and government grants to fund these critical early stages.

  Work to expand and develop successful and new models of tech transfer and commercialization. While entrepreneurs drive the federal technology commercialization, some venture capital firms have established direct relationships with federal laboratories, for example, LabStart at Los Alamos National Laboratory. Allied Minds Federal Innovations has a relationship with NSWC Crane to expedite T2 to small business enterprises for commercialization.

Motivation

Technological innovation has long been recognized as a key driver of economic development at the local, state, regional and national levels. The Innovation Network Partnership Inventory (INPI) is one strategy conceived by the Federal Laboratory Consortium (FLC) to improve the transfer and commercialization of federal technology developed at federal research laboratories.

The goal of this pilot study is to gain a better working knowledge of the direct and indirect relationships various technology development, transfer and commercialization organizations have with federal laboratories by compiling a database of any entity that may play a role in technology-based economic development (TBED). The Midwest FLC commissioned the Indiana Business Research Center to help develop this database and chronicle the key take-away issues and recommendations that would strengthen the relationships between federal labs and TBED entities.

The scope of the pilot project is geographically defined to include TBED organizations and federal laboratories located in the six states of the FLC's Midwest region, namely, Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin.

Based on innovation indicators used in two studies on the "new economy" that is driven by science and technology, the six states in FLC's Midwest region registered a middling performance when compared to the 50 states. The appendix presents the details and rankings in greater detail. These middle-of-the-pack rankings suggest the innovation ecosystems in all six states in the FLC's Midwest region have ample room for improvement.

Methodology

The researchers used a two-pronged approach to conduct the study. The first approach focused on gathering data on TBED entities with existing relationships with federal laboratories. To identify these entities, members of the FLC team contacted the respective Office of Research and Technology Applications (or its equivalent) at several laboratories.

The second prong cast a wider net. The IBRC research team focused on TBED organizations in the Midwest that may or may not have relationships with federal laboratories. The IBRC team used Internet searches and phone interviews to find and document these organizations. The research team gauged their interest in pursuing such relationships in the future if they did not currently have relationships with federal laboratories.

In total, nearly 250 TBED entities were incorporated into the database, which can be found at www.ibrc.indiana.edu/studies/database/FLCMWpartnershipinventory.xls. These entities included technology advocacy groups, business incubators and accelerators, state and regional economic development organizations and venture capital firms. To the extent possible, the research team interviewed representatives of the organizations in the database in order to better understand the direct or indirect relationships these entities have with federal labs. Out of the 249 entities in the database, 135 have been called at the time of this writing. Those 135 calls resulted in 51 interviews for a response rate of nearly 38 percent.

TBED Entity Profile

The entities of the 249-member database can be categorized into four broad groups. **Table 1** presents the entity count by type and state.

Table 1: Organizational Distribution by FLC Midwest Region States

Type	IL	IN	MI	MN	OH	WI	Total*
Business Incubators and Accelerators	4	6	13	2	15	5	**46**
Other Organizations (e.g., State Venture Capital Associations, Technology Advocacy Groups)	12	8	13	9	11	3	**57**
State and Regional Economic Development Organizations	3	21	11	14	1	10	**60**
Venture Capital Firms	21	14	27	14	12	3	**91**

*The tabular totals exceed database totals because many organizations have multiple Midwest locations.

While it may not represent a comprehensive list of all TBED organizations in the FLC's Midwest Region, this database does capture a cross-section of organizations and entities involved in technology-driven economic development in each state. For example, the database includes organizations responsible for fostering a more conducive climate for TBED, for example, state and regional economic development organizations. The database also contains business incubators/accelerators and venture capital firms that provide more direct hands-on assistance with technology start-ups in the region. Lastly, the database includes a diverse mix of organizations that play various roles in the TBED process. This "Other" category ranges from market research to prototype development to state venture capital associations or technology advocacy groups that hold meetings and conferences where researchers, investors and entrepreneurs can network and learn about the latest available technologies.

While some were technology generalists, most TBED organizations concentrated on three to four technologies. The most popular technologies included life sciences, information technology, advanced manufacturing and materials, alternative energy (or clean technology), biotechnology, health care services and medical devices, and software. Each of the six states had multiple firms specializing in one or more of these technologies in some capacity.

The geographic reach of the entities varied by organizational type. Most venture capital firms had the broadest reach, investing in any U.S.-based or foreign-based companies that met their investment criteria. Only a few organizations (e.g., Mid-America Healthcare Investors Network) had a multi-state focus. State economic development organizations and state venture capital associations obviously catered to the TBED concerns of their respective states. Finally, the technology advocacy groups and business incubators and accelerators concentrated on certain portions of states (e.g., Northeast Ohio or Southwest Michigan) or specific Midwestern cities like Detroit, Michigan, or Columbus, Ohio.

Findings

Only a small percentage of contacted organizations had direct or indirect relationships with federal laboratories. That said, examining the nature of that relationship provided several valuable insights into the federal technology commercialization process.

Organizations with direct ties to federal laboratories tend to be based on proximity.

For example, some advocacy groups (Nortech and MAGnet) in Cleveland noted relationships with nearby researchers at NASA's Glenn Research Center (GRC). In fact, one of the organizations created a standing ex officio board position for the GRC director. Similarly, an organization in Wisconsin (WISC) reported working for several years with researchers at USDA's Forest Service-Forest Products Laboratory in Madison, and a state-based venture capital firm (Illinois Ventures) reported having direct relationships with the Department of Energy's Argonne National Laboratory. Another firm (Elevate Ventures) is close to securing a partnership intermediary agreement (PIA) with the Naval Surface Warfare Center – Crane Division. Automation Alley in Michigan has a PIA with the U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC). AutoHarvest, another Michigan-based company, has a memorandum of understanding with TARDEC and the Department of Homeland Security. Representatives at TBED entities near Dayton, Ohio, also spoke of the Air Force Research Laboratory at Wright-Patterson Air Force Base.

The laboratories are not well known by all local TBED organizations.

For example, one person at a Wisconsin venture capital firm stated he did not know of any federal labs in his state. Similarly, an employee at a business incubator in Cincinnati believed the Wright-Patterson facilities in Dayton were the closest federal labs. He did acknowledge that there was an Environmental Protection Agency (EPA) office in Cincinnati, but he was unaware of their three federal labs or Health and Human Services' National Institute for Occupational Safety and Health.

Customer service, licensing procedures and information dissemination by labs needs to be improved.

Some TBED entities noted problems they had dealing with federal laboratories. One business incubator in Ohio had trouble reviewing the available technologies in the USDA's Agricultural Research Service (ARS) database. To assist one of their clients, the incubator representatives tried to search the database for technologies with potential commercial applications. They found the database difficult and frustrating to use. Even with their technical backgrounds, they described the process as daunting. The interviewee also noted the search capabilities were not very robust or user-friendly and suggested potential applications that could be added to improve the database. An employee of a state-based venture capital firm in Illinois shared his frustrations when dealing with some technology transfer employees at federal laboratories. He advocated for labs to streamline technology licensing procedures and improve the customer service. While he views federal labs as valuable resources, he thinks their encumbering regulations and bureaucracy are undermining their technology commercialization abilities. In short, how can these processes be made more business friendly?

Incentivize federal laboratory personnel (researchers and technology transfer employees) to be more entrepreneurial.

Compared to other sources of technology transfer and commercialization, federal labs lag. At several business incubators/accelerators and venture capital firms, for example, there was a marked difference in the number of their clients licensing technologies from universities rather than federal laboratories. A venture capitalist in Indiana suggested this distinction may be caused by differences in the incentive structures. She noted that university researchers are allowed to profit from companies started based off of their research by being paid

consultants. This added economic incentive may create a more entrepreneurial climate at universities than federal laboratories.

Many of these TBED entities also reported having closer relationships with university researchers and university technology transfer employees. When asked why, some interviewees explained they had more frequent interaction with them, no doubt because university staff initiated the contact. This finding may merit further inquiry in an effort to ascertain possible strategies to improve relationships between TBED organizations and federal laboratory researchers and technology transfer personnel.

Entrepreneurs are the linchpin between federal technologies and other TBED entities in technology commercialization.

Several interviews revealed many venture capital firms did not play (or have in interest in playing) a brokering role between entrepreneurs and federal laboratories. For instance, several venture capital firms noted that they were inundated with prospective business plans—thus eliminating their need or desire to help broker relationships between technology development and technology commercialization. One venture capitalist stated, "We invest in businesses not technologies! And technologies are what come out of federal labs." This quote highlights the critical, yet precarious, work required before federal technologies can be commercialized.

Entrepreneurs do the heavy lifting. They are the ones who must traverse the "technology valley of death" between prototype and profit. In most instances, the entrepreneurs are responsible for finding and licensing the federal technology of interest. After successfully licensing the technology, the entrepreneur then has to create a prototype (or proof of concept) and demonstrate the market for the product or service via a compelling business plan in order to attract the attention of organizations like business accelerators and venture capital firms.

Entrepreneurs need technical help.

During the early stages of the commercialization process that transforms technologies into business start-ups, entrepreneurs licensing federal technologies need technical and financial assistance. Given the amount of up-front work required of technology-based entrepreneurs, it is disquieting that only two TBED organizations the research team interviewed provided entrepreneurs assistance with some of the critical early tasks. One Wisconsin firm determines the potential market for products developed with new technologies. This firm's new product assessments help entrepreneurs determine if there is a market for their product or service and its size and growth potential. Given that many technologies developed in federal labs will not have a commercial application, market research and new product assessments can help identify which technologies have the most merit. An entity in Michigan that helps entrepreneurs develop prototypes to show proof of concept is a model for providing such assistance. The mission of this university-based product development center is to provide "the necessary engineering design tools, engineering staff, materials analysis, product packaging guidance, software development and other similar services leading to the development of a functioning prototype to meet the needs" of its clients. While other entities in FLC's Midwest Region offer these services, finding them and adding them to the FLC technology transfer network is crucial in expanding the technology commercialization capacity.

Entrepreneurs need sources for capital.

The initial spadework work involved in building entrepreneurial visions and creating business plans requires funding. At the early stages, entrepreneurs must often rely on their own savings, family and friends, angel investors and government grants. The Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) awards were designed to fund this critical initial commercialization phase. Both

awards are issued in phases. Phase 1 awardees use the funds to ascertain a technology's feasibility and potential commercial applications. Only Phase 1 award recipients are eligible for Phase 2 awards that allow the awardees to continue transforming their technologies into venture-ready businesses. Phase 3, the final award level, provides awardees resources to concentrate on the commercialization of the business. Many Phase 3 awards are unfunded, however, so awardees must begin securing private capital. The question then becomes: Have the SBIR/STTR awards been effective in fostering T2? Are technologies from federal labs well represented? Are there constraints that limit SBIR/STTR uptake of FLC technology?

Work to expand new models of tech transfer and commercialization.

Some venture capital firms are becoming more involved in the entrepreneurial activities of commercialization and have established direct relationships with federal laboratories. In 2009, two venture capital firms, the Verge Fund and Arch Venture Partners, joined to create LabStart—an initiative to commercialize technologies coming out of all federal laboratories. Currently, LabStart works closely with Los Alamos National Laboratory examining two to five new technologies per week, but it is looking to expand to other federal laboratories. This appears to be a promising joint venture that may be worthy of replication.

In the same fashion, Allied Minds Federal Innovations, Inc. (AMFI) has partnered with NSWC Crane, as well as other Department of Defense labs and Federally Funded Research Centers, to identify existing technology and to sponsor research and development collaboration. AMFI was founded by Allied Minds, a Boston, MA, based venture capital group to tap the technical expertise and intellectual property available in the Federal labs. AMFI model is to "form, fund, manage and build start-ups based on early-stage technologies." AMFI is a partner in technology development as well as a resource provider with the goal of launching new companies that will take technology to the civilian marketplace.

Next Steps: Lessons Learned for the Next Study

Conducting this pilot study also generated some practical tips for conducting similar or more formal large-scale projects:

- Include firms using licensed technologies to gain better understanding of the process and pitfalls.
- Focus on angel investors, as well as early- and seed-stage venture capital firms since their capital is critical early in the commercialization process.
- Identify and include entities like the Wisconsin Innovation Service Center (WISC) and LabStart that do due diligence and market assessments.
- Before calling entities, search their websites for a good contact. Calls are more productive if one asks for a specific person.
- Start making phone calls early. Leave ample time during data collection for interviewees to return calls. The research team ended up leaving several messages on first calls to companies.
- Consider using a short (less than 10 minutes) web-based survey with a few short open-ended questions. This can both standardize the data collection process and appeal to interviewees who are busy but want to participate and may prefer to email responses.
- If funding is abundant, conduct a full network analysis of the entire entrepreneurial ecosystem in a region.

Conclusion and Recommendations

Just as the first step to finding new cheese is to start looking for new cheese, this pilot study is just a beginning to begin understanding the location of the new cheese. The findings will help FLC labs better understand the roles of TBED entities and how to strengthen the transfer and commercialization of FLC technology. To summarize the findings and recommendations:

- **Increase federal lab visibility.** Encourage more interaction between lab personnel and TBED entities. For example, lab researchers and technology transfer officers can begin networking (or networking more frequently) at various meetings and conferences (e.g., conferences hosted by the state venture capital associations).

- **Play up proximity.** Market labs to TBED entities in their region and state.

- **Incentivize federal lab researchers and technology transfer personnel to be more entrepreneurial.** While the economic incentives offered to university researchers may not be feasible for federal lab researchers, examining what strategic actions can be taken to foster a more entrepreneurial climate at these laboratories is warranted.

- **Develop new, as well as support existing, initiatives to help entrepreneurs get over the "technology valley of death."**

- **Study and replicate success.** The FLC should conduct periodic studies of entities that have successfully licensed federal technologies. By routinely following up with entrepreneurial firms—both successful and unsuccessful—the FLC and their member laboratories will gain keen insights into the success and challenges of the commercialization process from the entrepreneurs' perspectives.

Appendix

In light of the vital role that technology transfer has in economic development and the country's tepid economic recovery, President Obama in October 2011 requested all executive departments and agencies submit plans detailing how they would "accelerate technology transfer and commercialization of federal research in support of high-growth businesses."

How does the Midwest region fare in terms of innovation and, by extension, how may the region benefit from technology-based development?

Two separate 2010 studies assessed the innovation or "new economy" environments of all 50 states. The Milken Institute's *State Technology and Science Index* "provides a nationwide benchmark for states to assess their science and technology capabilities, and whether they have the ecosystems for converting those capabilities into companies and high-paying jobs." The overall index is comprised of nearly 80 unique indicators divided into the following five major components:

1. Human Capital Investment
2. Research and Development Inputs
3. Risk Capital and Entrepreneurial Infrastructure
4. Technology and Science Work Force
5. Technology Concentration and Dynamism

Meanwhile, the Kauffman Foundation's *State New Economy Index* used 26 measures to gauge how closely a state's economic make-up (structure) resembles the ideal components of the new economy:

1. Knowledge Jobs
2. Globalization
3. Economic Dynamism
4. Transformation to a Digital Economy
5. Technological Innovation Capacity

Based on the total composite indicators used in both studies, the six states in FLC's Midwest region ranked in the middle of the pack. These rankings suggest the innovation ecosystems in all six states in the FLC's Midwest region have ample room for improvement.

Table A1: State Technology and Science Index and State New Economy Index Rankings

State	Milken 2010 Composite Rank	Kauffman 2010 Composite Rank
Illinois	20	15
Indiana	28	37
Michigan	26	17
Minnesota	12	13
Ohio	29	25
Wisconsin	24	29

Source: Milken 2010 State Technology and Science Index Report and the Kauffman 2010 State New Economy Index Report