Deloitte.

Government in the innovation economy:
Finding untapped value by transforming federal technology transfer

The problem

As countries ramp up their research and development (R&D) spending to challenge the United States as the global innovation leader, it is increasingly important that the US take measures to improve the efficacy of its innovation process. One area prime for improvements is federal technology transfer—the phase when innovations are transitioned from federal government labs to the commercial market[i]. The federal government tech transfer process struggles to ensure that these lab developed technologies find a use in the commercial marketplace due to inefficiencies and inconsistencies.

While the value of federally funded research is undeniable (consider the Internet, global positioning systems, etc.), quantifying the return on investment (ROI) is often challenging. In simple terms, billions of dollars are invested in government R&D programs to develop robust intellectual property (IP), but too often this IP languishes on the shelf with limited commercialization activity. For example, as described with traditional metrics, in 2014 total federal R&D investment was $130.8 billion[ii] while the total annual income generated from licensing was only $194 million[iii]. While licensing revenue isn't the sole method for measuring commercialization success, a monetary return on

R&D investment of only 0.15%[iv] is shocking and underscores the need to improve the way in which technologies are transferred to industry. Data suggests that every active license between the federal government and commercial entities contributes to roughly 18 jobs and $5 million in national economic activity per year on average[v], so not getting IP to market is also a huge missed economic growth opportunity.

The deficiencies of federal technology transfer become more evident when compared to the exponential change occurring in the private sector. The pace of progress is now being measured on a different time scale and government must match industry's intensity during the "hand-off" process or forfeit its commercialization window. For a technology to advance to the point of commercial use, and generate positive economic returns, it must overcome the proverbial "valley of death," the region of technology maturity where development funding and private investment are scarce. Difficulties at this medium maturity stage are often ascribed to misaligned incentives for government and too poor of a risk-reward profile to justify business investment.

To bridge this divide, the entire strategy for federal technology transfer must be realigned to more effectively facilitate the placement of technologies in the hands of private companies with the means and incentives to drive it to market. The creation of patents and the subsequent licensing thereof is no longer a sufficient measure of innovation success. Universities have moved away from touting licensing revenue and scientific breakthroughs to listing the companies founded by alumni or created on campus (e.g. Facebook and Harvard, Intel and MIT, Google and Stanford). Improving the federal technology transfer process requires abandoning the "if we build it they will come" mentality. This traditional "push" mindset to technology transfer must be balanced with "pull" strategies that require commercialization conversations and industry input early in the R&D process. In doing so, federal agencies will improve efficiency and transparency as they encounter greater budgetary scrutiny and must demonstrate positive returns on public investments.

The opportunity

As US government leaders seek the greatest value for each tax dollar spent, federal technology transfer can realize massive efficiency gains through the adoption of improved processes and technologies that are successfully deployed in the private sector. Implementing these advancements will enable government to better address the "valley of death" by proactively developing data supported strategies to survive the proverbial expanse.

From a technology standpoint, recent advances in fields including data management, information processing, and automation opens the door for dramatically more efficient and effective technology transfer. Artificial intelligence (AI) and machine learning can be leveraged to help improve the efficiency of technology transfer by identifying potential targets through matchmaking algorithms. Novel techniques such as crowdsourcing and gamification are being used in various forms to accelerate innovation by tapping into the collective intelligence of the masses. Socializing technologies with a community of potential adopters also improves the chances for a successful transfer event.

To implement these and other best practices, systemic challenges that span the federal landscape must first be dealt with. Culture, talent, information systems, and processes are all critical to executing an organizational strategy, but vary widely among federal technology transfer agencies. The underlying causes of this problem are generally attributed to a combination of a lack of employee incentives, poor transparency, little outside collaboration, fear of failure, difficulty attracting and retaining high quality talent, lack of training at agencies, and missing interagency synergies. Too often federal labs push patented technologies to the commercial sector without the necessary sweat equity or the know how to effectively have them adopted by commercial entities. If the government acted to update its policies and implement them across the federal landscape, the federal R&D units, including the innovation engines that are the federally funded research and development centers (FFRDCs), would be better positioned to make material contributions to the 21st century innovation economy.

Case study—Amazon.com, Inc.

Jeff Bezos, founder and CEO of Amazon.com, Inc., often credits Amazon's success to the sheer volume of experiments the company performs daily, monthly, and yearly. Private companies like Amazon embrace experimentation, failure, and iteration. For a public research initiative to enjoy similar efficiencies with transferring marketable technologies, it must apply and prove its technologies early and often, with the objective of constantly improving successful commercialization.

⚙ The bold play

Selective centralization of key elements of the federal technology transfer universe would help improve the efficiency and efficacy of commercialization activities and enhance the economic impact of federally funded technologies. While some functions and systems must exist at the point of innovation, others are not only conducive for centralization, but doing so would provide strategic insight into national interests and enable the government to better implement tech transfer strategies. A bold play to centralize key technology transfer elements will enable a shift in focus towards national economic impact rather than the antiquated proxy metric of IP licenses. In doing so, the government can achieve:

01. Greater accountability
02. Better aligned incentives
03. More attractive risk profile for federally developed technology
04. Increased commercialization success

While the idea of centralization tends to generate concerns of government bureaucracy, a central office may minimize administrative burdens by reducing the number of agencies and actors involved in technology transfer decisions. For some large organizations with a broad array of activities, such as the Department of Defense (DoD), centralization of technology transfer efforts may be a two-step process. Organizations like these might be well served by first consolidating tech transfer activities within their own agency before ultimately merging efforts with the rest of the federal government.

Case study—DataTribe

Some private organizations have already demonstrated the value of having business champions, or organizations with expertise in managing the tech transfer business considerations, participate in the tech transfer process. DataTribe, one such organization, has also taken on the role of investor to support the successful transfer of federal government technology to commercial entities that develop the technology further and bring it to market[vii].

Case study—Manufacturing USA

National labs and manufacturing institutes play a strong role in developing American technology capabilities while also strengthening the local economy. A recent study showed that efforts to coordinate the manufacturing institutes through Manufacturing USA resulted in significant network effects in terms of added value to members and progress towards the institutes' missions[vi]. Much of this happened even after the initial injection of federal funding, as commercial groups saw the returns in IP worth their investment.

A central authority for the entirety of the federal government can better engage the technology ecosystem and incentivize consortiums of industry and academia to collaborate. By consolidating and potentially automating processes and systems, a centralized office would free up local field offices to strategically engage their region or mission space. The field offices could become more integrated in the overall research process to ensure commercialization is considered throughout the development process. Engaging researchers to gain an understanding of the evolving commercialization potential of their technologies is an important element in increasing technology transfer success. By centralizing the associated information, industry would gain a line of sight into the pipeline of innovations that are likely to be available in the mid- to distant-future.

Many government leaders recognize the need to posture federal agencies to more effectively contribute to our nation's innovation economy. This is no small task as it requires that the entire system become more attentive to the interface with industry. The proposed centralized office would be equipped with personnel with expertise spanning the private and public sectors and it would aim to:

- Promote innovation networks through the creation of cross functional consortiums.
  - Foster collaborations between federal organizations and private companies to drive government technologies to commercialization, with guidance and support from business champions.
  - Pursue collaborative business models earlier in the research cycle that de-risk technology development by diffusing costs and broadening pools of available talent and resources.
  - Identify commercialization opportunities by looking beyond individual agency's mission domains.
  - Provide agencies with a greater perspective into the state of innovation across the federal government to inform collaborative research opportunities.

- Streamline and standardize processes across the federal government.

  – Create streamlined processes and boilerplate agreements that are suitable for a wide-range of potential partners and can be enacted on a time scale consistent with industry's needs.
  – Identify best practices within the federal government and industry and standardize those practices across the tech transfer ecosystem.
  – Continuously experiment and innovate with tech transfer processes at a small scale to identify more effective methods, and then quickly scale up across federal agencies once the methods are proven.

- Implement new performance metrics and better incentives.

  – Adopt tech transfer metrics that better reflect the impact of federally funded innovation on the national economy.
  – Standardize metrics to enable performance comparisons across technology transfer entities and hold organizations accountable.
  – Implement performance incentives for government technology transfer personnel that reward successful commercialization of technologies and are attractive to top tier talent.
  – Publish and socialize post mortems for unsuccessful endeavors so that future efforts can benefit from lessons learned.

- Harness big data to provide better visibility into the federal innovation ecosystem to aid in opening federal R&D assets.

  – Centralize data assets pertaining to patents, licenses, etc., from all federal government technology transfer offices.
  – Leverage data assets and advanced information processing technologies like machine learning and AI to perform analyses that seek to increase the likelihood of placement and impact.
  – Increase access to data by external parties through easy to use interfaces to promote visibility into available government technologies and provide transparency of tech transfer performance.
  – Capture and publish additional tech transfer data as generated to enable smarter decision making by all players in ecosystem.

- Raise the stature and reputation of federally funded research.

  – Increase involvement of federal funded research facilities in national innovation efforts.
  – Attract stronger talent through employee incentives, enjoyable work culture, and commercial exit opportunities for employees.
  – Proactively advertise for and pursue the nation's most skilled scientists and engineers.
  – Provide a diversity of career paths, allowing agencies to capture value from employees with long-term and short-term commitments to their organization.

Centralization of technology transfer functions has the potential to not only enhance the impact of federally funded technology, but also improve transparency, provide negotiation leverage, and inform strategic decisions with national implications. In turn this will enable the federal government to move beyond simplistic IP licensing strategies and instead take measures to realize its full potential within the broader innovation ecosystem. Doing so will increase licensing royalties to the government, but moreover, the impact will extend to those elements that are core to the spirit of federal technology transfer (i.e. job creation, US competitiveness, GDP growth, etc.). Through centralization, the federal government can simultaneously reduce waste and improve outcomes for private industry, government agencies, and the American taxpayer. By tuning the federal innovation engine with advanced technologies and techniques, the government can keep pace with the 21st century economy and maintain its leadership position on the global innovation stage. Let's re-ignite the passion America witnessed during the Apollo program and get Americans excited to work with or to work for the federal research system.

Contact

Matt Widmer
Principal
Deloitte Risk & Financial Advisory
mwidmer@deloitte.com
+1 571 882 5140

John Lisciandro
Managing Director
Deloitte Risk & Financial Advisory
jlisciandro@deloitte.com
+1 571 882 5318

i.   National Expert Panel, White House Lab-to-Market Inter-Agency Summit: Recommendations from the National Expert Panel, White House Conference Center, May 20, 2013, p. 2, http://innovationassoc.com/files/WH.L2MSummit.Recommendations.FINAL.Aug.09.2013.-2.pdf, January 1, 2018

ii. National Institute of Standards and Technology, Federal Laboratory Technology Transfer, Fiscal Year 2014: Summary Report to the President and the Congress, October 2016, pp. 8-9 https://www.nist.gov/sites/default/files/documents/2016/10/26/fy2014_federal_tech_transfer_report.pdf, January 4, 2018

iii. Ibid.

iv. Data for calculation from: Ibid.

v.   Data for calculation from: TechLink and University of Colorado Business Research Division, National Economic Impacts from DoD License Agreements With US Industry: 2000-2014, TechLink E-publication, April 27, 2016, pp. 25-26 https://techlinkcenter.org/wp-content/uploads/2017/01/2016-DoD-Licensing-Study-E-Publication.pdf, January 4, 2018

vi. Deloitte Consulting LLP, Manufacturing USA: A third-party assessment of program design and impact, January 2017, pp. 4-7 https://www2.deloitte.com/content/dam/Deloitte/us/Documents/manufacturing/us-mfg-manufacturing-USA-program-and-process.pdf, January 4, 2018

vii. DataTribe, https://www.datatribe.com/, January 4, 2018