

Response to the National Institute for Standards & Technology Request for Information Regarding Federal Technology Transfer Authorities and Processes



Submitted To

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1. Introduction

RTI International appreciates the opportunity to provide input to NIST on issues related to Federal technology transfer practices, policies, regulations and laws. RTI is a nonprofit research corporation established in 1958 in Research Triangle Park, North Carolina. We perform research and technical services primarily for U.S. Federal clients, as well as companies, universities, and international governments. RTI has commercialized technologies developed with the assistance of Federal funding through licensing agreements and the establishment of technology spin-offs. Since the 1960s, RTI's Innovation Advisors have supported technology transfer and innovation activities at a number of agencies including the National Aeronautics and Space Administration (NASA), NIST, and the Department of Justice. Our Innovation Economics Program conducts evaluation of technology commercialization programs and efforts at the National Institutes of Health (NIH), DOE, and NIST, among others.

According to the National Center for Science and Engineering Statistics, Federal agency obligations for research and development activities totaled \$118 billion in FY2017, of which nearly \$33 billion was invested in intramural research.¹ This substantial investment in science and engineering supports agency mission objectives, contributes to the economic prosperity and public health of the U.S. population, and also is leveraged to generate innovations in U.S. firms. Through our experience in facilitating and evaluating Federal technology transfer, working with industry to find new technologies to enable their new product growth, and conducting our own licensing and commercialization efforts, RTI has a particular perspective on technology transfer rooted in research, analysis, and practice. In light of this, we offer the following observations and recommendations in response to the NIST Request for Information on Federal technology transfer authorities and processes. We welcome any subsequent inquiries or requests to clarify our response.

2. Response to Questions

Question 1: What are the core Federal technology transfer principles and practices that should be protected, and those which should be adapted or changed?

Principles and Practices to Retain

Since their inception, the Stevenson-Wydler and Bayh-Dole Acts have contributed significantly to the emergence and success of technology transfer offices in American universities and non-profit research institutes. Many technologies that would not have otherwise been developed have reached the market, to the benefit of the American taxpayers who funded the original research. While both Acts have had their critics,² we believe that the legal environment for Federal technology transfer, as established through the Stevenson-Wydler Act and subsequent legislation, is fundamentally sound and should not be subject to wholesale change.

Principles and Practices to Change

A number of analyses of technology transfer activities at Federal laboratories have highlighted perceived deficiencies that impede the commercialization of Federally-developed intellectual property through licenses and spin-offs.³ We believe that changes in policy and practice are warranted to improve the efficiency and effectiveness of technology transfer efforts. Any changes should be consistent with the following principles:

1. Federal policy should recognize that technology transfer is a legitimate and important activity of Federal agencies, and that these agencies should be provided adequate authority and resources to develop the human capital and technical capabilities needed to facilitate such activity. Technology transfer cannot be accomplished efficiently or effectively if agency personnel and systems are overburdened and over-extended.

¹ https://ncesdata.nsf.gov/fedfunds/2016/html/ffs2016_dst_008.html

² See, e.g., Sweeney, M. (2012), *Correcting Bayh-Dole's Inefficiencies for the Taxpayer*, 10 Nw. J. Tech & Intell. Prop. 295, and Mowery, D. et al. (2001), The growth of patenting and licensing by U.S. universities an assessment of the effects of the Bayh-Dole act of 1980, *Res. Pol.*, 30, 99-119.

³ See most recently, Government Accountability Office (2018), *Federal Research: Additional Actions Needed to Improve Licensing of Patented Laboratory Inventions*, Report GAO-18-327.

2. Technology transfer from Federal entities to the private sector and other organizations should promote transparency and accountability through the open dissemination of information about Federal technology transfer activities, subject to the protection of proprietary and confidential data. These activities represent an important component of overall public investment in research and development, and therefore the public should be informed about the extent of these activities and their impact on the U.S. economy and society.
3. The Federal government should recognize that technology transfer is a two-way relationship, where information and expertise flow between the private and public sectors to facilitate commercialization. Technology transfer activities should be viewed as a collaborative relationship between entities, not simply as a set of transactions. Therefore, agencies should promote the strength of such relationships rather than only optimizing individual transactions, and should provide a range of options to engage the private sector as a partner to government in commercialization and innovation. Also, policy should recognize that commercialization and innovation requires in many cases the participation of multiple agencies, private firms, and intermediaries, and these networks of relationships should also be supported and encouraged.
4. Federal technology transfer has a tendency to focus on formal intellectual property (primarily patents) as the mechanisms of technology transfer. In our view, agencies contribute to economic growth and innovation through a broader range of knowledge transfers, including the dissemination of guidelines, best practices, expertise, and technical capacity. These informal mechanisms provide invaluable knowledge to the private sector, and should be recognized and promoted under the umbrella of technology transfer policy.
5. Smaller firms and nonprofit organizations may lack the resources to scan a broad range of Federal agencies and information sources in the search for candidate Federal technologies to support innovation and commercialization. To the extent possible, agencies should assist such entities in their efforts to identify relevant technologies and to execute licensing and other agreements to enable transfers of technology.

Question 2: What are the issues that pose systemic challenges to the effective transfer of technology, knowledge, and capabilities resulting from Federal R&D?

In our observation, systemic challenges are the primary impediment to the proper functioning of the Federal technology transfer system. While individual laboratories and agencies display excellence in their transfer and commercialization efforts, best practices are not consistently adopted across the Federal government, and effective relationships between agencies are not encouraged as a component of Federal technology transfer. We highlight the following challenges that require particular attention.

1. **Information flows across Federal agencies are impeded unnecessarily by administrative and legislative restrictions.** Inconsistencies and conflicts in the policies and practices across agencies and laboratories complicate efforts to realize the synergies possible through the combination of technologies and capabilities of sets of agencies. We note many cases where innovation in the private sector was enabled by the use of multiple technologies sourced from multiple agencies.⁴ Difficulties in coordinating and managing relationships across agencies deter firms from pursuing such opportunities.
2. **Firms and other organizations have difficulty in searching across agencies for technologies, capabilities, and knowledge.** Individual agencies vary in their approach to marketing technologies and how they publicize what they offer. Previous attempts to develop a central clearinghouse of available Federal technologies have been ineffective due to the failure to account for agency autonomy and management needs, differences in the terminology and taxonomies used at different agencies to describe technologies, and limitations in the technologies deployed to build such clearinghouses. In particular, agencies tend to define technologies as individual patents, whereas effective innovation involves the integration of knowledge, various types of intellectual property, and other intangible assets to enable capabilities.
3. **Technology transfer practices, templates, and procedures within agencies and across agencies are not standardized, causing confusion and delays in the process.** Too often, agencies treat each transaction as a “one-off” case that requires special authorization and terms, which complicates negotiation and extends the time required for a transaction beyond the limits of private entities. While technology transfer is necessarily decentralized to account for the specific missions and operations of individual agencies, broader frameworks for managing and conducting transfers of technology and knowledge could bring greater coherence to government-wide commercialization practices. Also, agencies could use a more consistent suite of expertise and tools to improve their ability to assess and value technology assets properly, improving consistency with market conditions.
4. **Regulations restricting the activities and availability of Federal scientists and engineers prevent private firms from accessing the human expertise that they need to adopt and commercialize Federal technologies effectively.** One adage in this domain is that “technology transfer is a contact sport.” Firms may need to engage Federal inventors as consultants in the process, but are prevented from doing so by civil service requirements.
5. **Government-wide reporting needs improvement.** While NIST is diligent in fulfilling its duty as the authority for reporting on Federal government-wide statistics and information on technology transfer activities, the quality and detail of those reports are limited by limitations on the data shared by agencies, the narrow scope of reporting, inadequate resources devoted by agencies to collecting and organizing transaction data, and the inability to leverage modern approaches to information exchange and dissemination.

⁴ See, for example, Walsh, AC et al. (2017) “Social and economic impact of the commercialization of the Argus II artificial retina in the United States.” *The Journal of Technology Transfer*. <https://doi.org/10.1007/s10961-017-9610-z>.

Question 3: What is the proposed solution for each issue that poses a systemic challenge to the effective transfer of technology, knowledge, and capabilities resulting from Federal R&D?

We envision a number of steps that the Federal government could implement on a broad basis to address these issues.

1. **Federal procedures and restrictions on interagency information sharing need to be revisited and reformed**, such that agencies can exchange information relevant to technology transfer more readily, and external intermediaries and firms can integrate such information easily. Solutions to this issue can leverage current Federal government efforts in evidence-based policymaking, such as the recommendations on information sharing proposed by the Ryan-Murray Commission.⁵ In addition, policies should provide incentives to facilitate and encourage cross-agency collaboration.
2. A renewed attempt to develop a cross-agency platform for searching, identifying, and licensing technologies should be undertaken to take advantage of modern technologies such as semantic search, machine learning, and collaborative work. We recognize that NIST and the Federal Laboratory Consortium on Technology Transfer, as well as certain agencies (especially NASA and DOE), are investing in platforms to make technologies and capabilities available across multiple laboratories. To be most effective, a platform should integrate the following features:
 - The ability to describe and search technologies in terms of applications and business needs, not in terminology from patent law or technical specialties. As an example, defining a technology only in terms of its patent codes does not help firms to assess if that technology fulfills a need or enables a critical capability. Advances in semantic search and text analytics can be used to power search engines that define technologies using a rich ontology that combines descriptions of a technology's application areas, market relevance, and potential capabilities. Rather than building a centralized database of technologies, the Federal government could create a federated search system where agencies expose their technology inventories to search and provide associated information that can be parsed and processed such that technologies are tagged with a consistent set of taxonomies.
 - Mechanisms for interaction such that platform users can provide confidential feedback to agencies about specific technology offerings, exchange information with other users about potential opportunities enabled by those offerings, and initiate private negotiations with agencies to kick off a technology commercialization effort. Such a platform could allow participating agencies to select technologies to market on the platform; obtain input from technology experts, legal advisors and market participants as to the value and potential of IP assets; and provide supplementary information (such as the equivalent of NASA's Technology Opportunity Sheets) to present technologies in business terms. Obviously, those parts of the platform that are open to the public would need to be

⁵ See <https://www.cep.gov/>.

limited to nonconfidential information, such as issued patents and published applications. The submitting agencies could include whatever contextual information it chooses to, and contributors could offer what insights they choose to (obviously mindful of the nonconfidential nature of the site).

3. The Federal government, through the Lab-to-Market CAP goal and the interagency working group on Federal technology transfers, could fund and make available to agencies a generalized framework for assessing, marketing and commercializing technologies. While leaving the framework open to customization that fits each agency's needs, this effort could include a set of standardized templates and agreements for primary documents involved in commercialization (e.g., licensing agreements and technology descriptions), tools for assessing the market readiness of technologies, and best practices in working with outside organizations to collaborate on commercialization efforts. Much as the Defense Acquisition University improved the ability of agency procurement functions to work effectively with contractors, a similar resource with training, templates, and reference cases could be developed for technology transfer offices.
4. Federal civil service guidelines need to be reformed to enable Federal inventors to work directly with licensees and intermediaries in delivering technical assistance during commercialization. While restrictions are needed to ensure that Federal researchers do not develop conflicts of interest or otherwise provide unfair advantage to particular firms, the current regulations are too restrictive. Development of consistent and streamlined exemption policies, and the expansion of entrepreneurial leaves of absence programs (such as the AFRL's Entrepreneurial Opportunities Program⁶) to Federal researchers, are possible methods for providing Federal inventors the flexibility to work side-by-side with private sector scientists and engineers to move a technology to market.
5. Agencies tend to view reporting requirements on their Federal technology transfer efforts as a potential means of evaluating those efforts and punishing underperformers, not as a means to provide proper transparency to the public. Reporting standards and guidelines should be revised so that agencies can share with NIST transaction-level data on technology transfers and also report on non-IP exchanges, but with confidentiality to ensure that proprietary data is not revealed and that agencies are not subjected to punitive evaluation and assessment. This effort would be facilitated by more consistent reporting guidelines and templates, and the development of near realtime systems for logging and describing technology transfer efforts. The annual NIST report could be greatly enhanced by access to more timely agency data, more detailed data on particular transactions, broadening metrics beyond existing measures and accounting for variations in each agency's context, and development of an online dashboard for reporting in place of a static annual report.

⁶ <http://www.wpafb.af.mil/News/Article/1214568/out-of-the-lab-and-into-the-front-office-researchers-boosting-air-force-technol/>

Question 4: What are other ways to significantly improve the transfer of technology, knowledge, and capabilities resulting from Federal R&D to benefit U.S. innovation and the economy? What changes would these proposed improvements require to Federal technology transfer practices, policies, regulations, and legislation?

We believe that the above measures and recommendations would be a positive step towards unlocking the full value to the economy from Federal intramural R&D investments, and would enable firms to enhance their capacity for innovation and competitiveness by leveraging appropriately the resources provided by taxpayer dollars.