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## Building a DARPA for development

The U.S. government is considered a leader in the application of innovation and technology to address global development challenges. The Obama administration has built on that reputation with new resources, policies and initiatives over the past four years.

In just the latest example, the U.S. Agency of International Development (USAID) announced in December the launch of the Higher Education Solutions Network, a five-year, \$130 million partnership with seven American and foreign universities to establish “development labs” that will apply science and technology to identify and address key global challenges in areas such as global health, food security and persistent conflict. This initiative has been described as the beginnings of a “DARPA for development,” a reference to the U.S. Department of Defense’s research and development organization, the Defense Advanced Research Projects Agency.<sup>26</sup>

DARPA is one model for the promotion of technology and innovation by government. Another is the National Institutes of Health (NIH), which has a very different mandate and structure. Both agencies were cited at the Brookings Blum Roundtable as possible archetypes for the design of a government entity dedicated to furthering an innovation agenda for global development.

Here we explore these two models, both held up as exemplars of good practice, to see what lessons and insights they provide to guide the U.S. government’s evolving global development agenda. This analysis can help to answer two questions that were raised at the roundtable that are central to formulating the U.S. government’s approach to technology

and innovation as it applies to development:

First, what is an appropriate role for government in supporting innovation and technology for development? The case for government support for innovation and technology is justified by invoking several market failures that government intervention can help to overcome. However, poorly designed interventions can introduce distortions rather than appropriate incentives for researchers, entrepreneurs and investors, while overreach can crowd out other actors rather than catalyzing their engagement.

Second, what does a joined-up policy on technology and innovation for development look like? The U.S. government is engaged in many activities, from supporting the invention of scientific breakthroughs, to establishing competitive mechanisms to spur innovation through experimentation, to taking innovative solutions to scale or removing barriers to scaling up. These activities involve various parts of government, ranging from USAID and the State Department to the Energy, Health and Agriculture departments and the U.S. Patent and Trademark Office. As with other aspects of the government’s global development policy, understanding and improving how these various moving parts relate to each other is a key criterion for effectiveness and coherent policymaking.

### DARPA and NIH

DARPA was established in 1958 as part of the U.S. government’s response to the launching of the Soviet Union’s Sputnik satellite. Its core mission is to maintain the technological

“The U.S. government started investing in what became the Internet in 1969, and it wasn’t until the mid-1990s that it really became a commercially viable and driven phenomenon. So even in very rich countries, the state still plays a very important role in supporting fundamental research and supporting long-term high risk research. The federal government has some models like DARPA that do a really phenomenal job of supporting breakthrough technologies and we have to figure out how we can create some of those models to support development as well.”

— Tom Kalil

*Deputy Director for Policy, White House Office of Science and Technology Policy*



Photo by Alex Irvin

superiority of the U.S. military and to prevent technological surprise by America’s adversaries by facilitating and sponsoring “revolutionary” research into advanced technologies and systems. DARPA is distinguished from other research and development offices in the Department of Defense by its independence from the military and its focus on high-risk, high-payoff projects that deviate from, rather than incrementally improve, the military’s existing technology.<sup>27</sup> The agency is relatively small, with 240 employees contained within a flat, nonbureaucratic structure. Its research program is flexible and organized around a collection of typically three- to five-year projects each defined in terms of a specific technological challenge. It has a budget of approximately \$2.8 billion, 98 percent of which is invested outside the organization, primarily in universities and in industry.

NIH, an agency within the U.S. Department of Health and Human Services, is responsible for conducting and supporting biomedical and behavioral research to prevent, detect, diagnose and treat disease and disability. With its origins tracing back to the late 19th century, today NIH consists of 27 quasi-independent institutes or centers, each with its own research agenda and budgets. These institutes and centers support research primarily through the provision of competitive grants to external researchers at universities, medical schools and other institutions around the world. NIH also has an in-house research program with over 10,000 government scientists, technical support staff, nonemployee trainees, and postdoctoral fellows focused on long-term and high-impact science. NIH has a budget of \$30 billion, representing a quarter to a third of total biomedical research funding in the U.S.; 90 percent of this budget is spent externally.

A review of DARPA and NIH activities indicate seven key functions fulfilled by one or both agencies:

- 1. Setting sector research priorities:** Through the development of goal-oriented projects, external competitions and the provision of grants to outside parties, both agencies signal which areas they consider research priorities. This can incentivize other actors to organize themselves around the same goals.
- 2. Providing public financing where there are insufficient commercial opportunities:** Both DARPA and NIH focus their investments in areas where private returns are limited and that would therefore face limited or no finance in the absence of government funding. Limited commercial opportunities can be the result of various factors: The investments may be in public goods or basic research where the benefits of successful investments cannot be internalized but are enjoyed by others; financial returns may be limited by the price that can be charged to low-income customers; research gaps may necessitate longer-term investments that the market cannot provide; or investments may be high risk.
- 3. Transitioning technologies:** Both agencies endeavor to have technological and research discoveries put to use. Though much of DARPA’s research by definition has no immediate application, the agency nevertheless seeks to facilitate its adoption by having relevant members of the military oversee research projects with the expectation that this can help identify uses for the technology when they are brought to market. NIH’s program project grants and center grants support multidisciplinary projects and programs that integrate basic research with applied research, and promote research on clinical applications.
- 4. Facilitating collaboration:** Both DARPA and NIH seek to bring together different parts of their respective communities through the design of grants and projects. In



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the case of DARPA, program managers are encouraged to instigate cooperation among grantees in order to spur more innovative thinking on a specific concept or technological approach. NIH's model is deliberately aimed at supporting the cross-fertilization of public and private biomedical research.

5. **Knowledge management and dissemination:** NIH and its Web site serve as a repository for the latest information, research, grant opportunities and statistics on health-related issues. NIH also organizes Consensus Development Conferences at which panels of experts appraise new modes of therapy or evaluate existing therapies about which questions have been raised. Since 1977, more than 100 of these conferences have rapidly channeled research findings
- on devices, drugs, and medical or surgical procedures to practicing physicians.
6. **Establishing research protocols/standards:** Through its Office of Extramural Research, NIH has established an extensive set of guidelines on health-related research integrity involving human and animal subjects, scientific peer review and intellectual property.
7. **Strengthening research capabilities:** NIH funds an array of training and research opportunities. Its internal post-doctoral fellowship program, for example, is 4,000-strong and allows recipients to pursue basic, applied or clinical research at one of more than 1,200 laboratories and/or research projects located in more than 10 cities, without having to obtain grants or fulfill teaching requirements.



“The U.S. government should consider how we might take these different invention investments, whether it’s agricultural research, Development Innovation Ventures, Grand Challenges, the Higher Education Network, and all of the federal science partnerships and roll it into one national, scientific institute for development—helping American youth, in particular, but researchers across the board, see this as an area where they can apply their technical skill, and do so with government support.”

— **Rajiv Shah** [@rajshah](#)  
Administrator, U.S. Agency for  
International Development



“Since technological change and innovation are transforming so many aspects of our world, it’s unsurprising that governments, NGOs and the private sector are thinking creatively about how to harness those tools in the cause of fighting global poverty. Detailed consideration and brainstorming about the most advantageous, and appropriate, ways to use technology to bolster global development is essential, which is why the discussions at the Brookings Blum Roundtable are so important and timely.”

— **Strobe Talbott** [@strobetalbott](#)  
President, The Brookings Institution



## Mapping U.S. Development Efforts in Innovation and Technology

A cursory review of some of the government’s recent initiatives to foster technology and innovation for development indicates considerable overlap with the seven functions outlined earlier:

- USAID’s Grand Challenges for Development sets research priorities by bringing innovation and technology to bear on specifically enumerated problems such as reducing maternal mortality; improving global literacy rates; and fostering open government, transparency and accountability through Web and mobile technologies.
- USAID’s Development Innovation Ventures (DIV) facilitates the adoption of innovative concepts or technologies by awarding competitive grants to identify and rigorously test potential high-impact development solutions from social entrepreneurs and then scale up those that prove to achieve results. Applicants for a DIV grant can propose a project at any of the three following stages: (1) up to \$100,000 of seed funding over a year for research, design and prototyping; (2) up to \$1 million to test the concept; and (3) up to \$15 million over several years to scale up a proven development solution, often in multiple countries.
- USAID, the U.S. Department of State, the U.S. Department of Education and the Peace Corps are forming partnerships with a broad coalition of multilateral development banks, United Nations agencies, nongovernmental organizations, foundations and the private sector as part of the mEducation Alliance, to collaboratively explore and catalyze the use of mobile technology to improve educational outcomes.
- The Enterprise Development Network, which was initiated by the Overseas Private Investment Corporation, connects promising small- and medium-sized businesses



pursuing opportunities in developing countries with a network of financial institutions, business consultants, law firms and regional investment agencies to support the scaling up of innovative market-based solutions at the base of the pyramid.

- USAID's Center for Accelerating Innovation and Impact has been developed to improve market-based, scaled-up solutions at the base of the pyramid that promote global health technologies by brokering partnerships, strengthening business acumen among innovators and addressing other bottlenecks in the transition to scale.
- The U.S. Department of Agriculture has formed a partnership with CABI Plantwise to build a global knowledge bank to store information on diagnostic and treatment information for crop pests and diseases. The knowledge bank will serve farmers, researchers and regulators, allowing easier access to USDA research and support the work of CABI Plantwise extension agents at 180 plant clinics around the world.
- NIH and the Department of Energy have developed low-fee licensing agreements to facilitate the transfer and dissemination of government-owned technologies to promote global public health and clean energy consumption through not-for-profit institutions.

This list of initiatives is far from exhaustive, but it gives an indication both of the large number of activities with which the government is involved, and the range of functions it is attempting to perform to a greater or lesser extent. Mapping U.S. development efforts in innovation and technology in this way is thus a useful exercise in documenting the nature and level of U.S. government activity. However, it is a far cry from an overall strategy that defines the intended scope of government involvement and meaningfully links activities

together. As noted at the roundtable, it is unclear to what extent these activities are related to each other, or to the core programming that makes up the bulk of U.S. development assistance. Furthermore, some of the most promising initiatives could easily be swept away under different leadership in the absence of a concerted effort to see them institutionalized.

A "DARPA for development" should aim to be more than the sum of its parts, reflecting a clear vision of the U.S. government's aims and a related set of activities that deliver on that vision. In addition to resolving the central questions surrounding the role and scope of government, a DARPA for development should also seek to provide clarity on issues of governance. The examples of DARPA and NIH demonstrate that the promotion of innovation and technology does not require a standard organizational structure; arguably, the most salient feature of an agency of this kind is how it relates to other government institutions and outside entities with which it hopes to form partnerships. A related challenge is to identify what oversight arrangements can uphold the highest standards of fiduciary and institutional risk while retaining the healthy risk appetite that is necessary to support work that is essentially experimental and uncertain, and where reducing the incidence of development failure is prioritized above the incidence of project failure. ■