FINANCING SCIENCE

The Federal Role in Catalyzing Innovation

Beyond the Beltway and Through the Networked Economy

By Richard Seline and Steven Miller

THE 2008 PRESIDENTIAL CAMPAIGN prompted significant discussion about the role of the federal government in supporting innovation and competitiveness, especially in strategic areas such as alternative energy, globalization, and heath care—building on an already vigorous debate about the role of the federal government in catalyzing innovation. Several efforts, such as *Rising Above the Gathering Storm*, led by the National Academies, and *A Roadmap for American Innovation*, led by the Council on Competitiveness, produced recommendations aimed at supporting the science, technology and business competitiveness of the United States in a complex world.

These serious discussions about federally inspired innovation take on even more significance amid the economic meltdown now faced by the American people and our government. We know, however, that innovation does not happen at the national level. It happens in individual companies, communities and regions, where business, government, academic leaders and policymakers collectively address the relevant challenges, operational needs, and regional strengths of local, national and international businesses.

As the new Obama administration develops its innovation, economic development, and workforce policies, it should look to build and sustain regional and networked efforts, rather than only crafting broad national policies. The work of innovation can be inspired or stymied by the regulatory, operational, and funding mechanisms adopted by the federal government and Congress. What has limited prior administrations is the failure to leverage federal investments and initiatives conducted throughout the country—often based on the

aspirations of local business, civic, academic, and entrepreneurial interests—and align them around a highest common denominator for transforming the economy and society. We live in a networked economy that is not reflected in federal grants and initiatives that are distributed across the country into silos of community needs, and therefore fail to leverage knowledge, experience, and accelerated sources of innovation.

This view of the primacy of federal-regional innovation partnerships stems from more than 20 years of work in assisting local, regional, state, and federal governments in building strong technology-driven economies. Over this period, there has been a shift in the thinking about the development and support of local industry clusters. As originally articulated by Harvard University's Michael Porter in the late 1980s, traditional cluster theory argued that all assets, companies, and business- and financial-related value chains must be located in a contained regional area. In our observation, however, industry clusters no longer require the presence of all facets of research, operations, management, and distribution in order to contribute to the strength of a regional economy.

In today's global and domestic hubs-and-nodes clusters, research and discovery is based on a specific institution or industry campus in one location, manufacturing in a second node, and distribution hubs in other places. Rather than focusing on specific physical assets, the most important element for successful regional, innovation-led economic development is the leveraging and networking of regional assets to best deploy the human talent—the "know-what and the know-how"—that is central to competitiveness and wealth creation. Our national economic strategy has been based for far too long on individualized responses to individualized communities, never considering the linkages of knowledge or competency in contributing expertise that must be networked to hasten competitiveness and innovation in and among "communities of practice."

In the three case studies that follow, we highlight examples of the federal government catalyzing regional or networked innovation through the development of new models of collaboration. Some of these, such as the U.S. Department of Labor's pioneering Workforce Innovation in Regional Economic Development, or WIRED, initiative, are focused on workforce strategies in specific regions across the United States. Others, such as the Central Intelligence Agency's In-Q-Tel venture capital program and the National Cancer Institute's advancement of cancer cure initiatives, are focused on addressing longstanding national security/intelligence and medical Grand Challenges.

All three initiatives, however, share the same goals of building innovative partnerships in order to effect a transformation in the delivery and impact of federal services. The Grand Challenges confronting America demand new frameworks for engagement—not from a command-and-control central system but through a networking of networks across the spectrum of U.S. ingenuity, creativeness and entrepreneurial spirit. In an uncertain economy undergoing sometimes agonizing restructuring of business and government operating models, these networked partnerships and frameworks should suggest best practices for the Obama administration, Congress, governors, and mayors—and above all for the citizens who will benefit from these transformative systems of collaboration, innovation, and delivery.

CENTRAL INTELLIGENCE AGENCY
In-Q-Tel

The Central Intelligence Agency in the late 1990s needed to develop innovative technologies to meet the demands and needs of the post Cold-War era but faced the challenge of how to do so in a rapidly changing marketplace. Ruth David, then head of the science and technology directorate, understood that commercial and consumer markets were so highly active in both discovery and the attraction

of the best product development minds that the U.S. intelligence community could no longer rely on being the first-in-line for obtaining consistently innovative tools, nor recruiting the workforce and skills required to keep pace.

Tasked with identifying and accelerating a new framework—one that would be highly transparent and significantly more public than ever before—David determined the agency should effectively partner with the private sector, including research universities, angel and venture capital investors, and emerging technology companies. In this way, the CIA could leverage government, academic, entrepreneurial, and private sector resources toward novel products, services, and even skilled workforce development objectives.

Based on a request from the Science and Technology Directorate to "consider all options—even those that have not been on our list of models in the past so that we can signal our seriousness and commitment to attract innovators and their innovations," a small expert team benchmarked all previous federal models, among them laboratories, federal-funded R&D centers, outsourced programs, and initiatives such as the Defense department's Defense Advanced Research Projects Agency, or DARPA. The team then assessed the return-on-investment as well as the risk-mitigation scenarios of each of these concepts.

The outcome: an operational plan for the Central Intelligence Agency's In-Q-Tel project—a first-ever collaboration among the U.S. intelligence community, academic research, and the entrepreneurial community. The In-Q-Tel framework identified approaches for the selection of key technologies, risk management in an environment that sought to harness both the intelligence community's culture of secrecy and the entrepreneurial focus on openness and transparency, along with the criteria for investing the $50 million per year in dual-use products and services.

In-Q-Tel now makes investments in technologies to create sustainable solutions for the national intelligence community. In-Q-Tel measures impact through the value of investments to deploy technologies, ability to strengthen nascent companies, and long-term financial returns on such partnerships versus attempting to only value in-house resources and capabilities.

The lesson for the Obama administration: Not all capital and research capacities rely solely on the lead by the federal government. If federal funds are harnessed toward a focused but characteristically venture capital-style investment model, then the results are new resources (talent, knowledge, dollars) deployed in strategies that mitigate conflicts of interest while accelerating solutions. These results are not just useful for the CIA's spycraft needs, but also for alternative energy, information-based government services, and water-environmental challenges.

NATIONAL CANCER INSTITUTE

Accelerating advancements in cancer cures

Since the 1960s' endeavor to wage a "war on cancer," NCI has dedicated significant resources to support an increasing number of Comprehensive Cancer Centers across the United States. There are now some 64 centers across the country that are designated on the depth of research and capacity to engage the public in education and training, with an annual budget of more than $4 billion distributed to these centers, other designated programs, and the research community.

In 2003, however, then-NCI Director Andrew von Eschenbach decided to try something different. He tasked the entire NCI community (public, private, philanthropic, entrepreneurial, and venture capital-based) to "eradicate cancer by 2012," a moon-shot commitment for ending a disease costing Americans, employers, and the federal budget a minimum of $500 million per year in health insurance payments, treatments, and lost productivity, as well as the loss of lives that could be prevented through a number of new discoveries.

Despite significant successes over the 40-year history of the centers, von Eschenbach convened a

roundtable in 2004 to examine the "scientific, societal, cultural and economic barriers to the success of fighting cancer in order to get a head start on his 2012 goal. This forum, titled "Leveraging Multi-Sector Technology Development Resources and Capabilities to Accelerate Progress Against Cancer," brought together a wide variety of leaders from government, the academic-medical community, and the private sector, including representatives from biotechnology, pharmaceutical, information technology, and investment companies.

In addition, the forum included state and regional economic and innovation-based development entities and organizations, each bringing its perspective on networking relationships and teams for immediate results in applied-translational research and commercialization. There were four primary challenges that roundtable members were asked to address:

- Identify key barriers that stand in the way of optimizing the timely transfer, development, and commercialization of advanced biomedical technologies, including incremental and disruptive technologies, to accelerate progress against cancer
- Explore key regional, national, and other models whereby advanced biomedical technologies are successfully identified, transferred, and ultimately commercialized for broad patient benefit
- Brainstorm and evaluate novel concepts to facilitate the strategic alignment of resources and capabilities from all sectors to remove mission-critical barriers and design novel, innovative approaches to speed the development and delivery of new diagnostics, preventatives, and treatments for cancer
- Suggest actions that can be undertaken by the appropriate sectors in alignment and coordination through networked, shared knowledge system investments

After a series of panels outlining some of the challenges in matters such as drug development, funding gaps, effective multidisciplinary collaboration, regulatory requirements, technology, and other matters, the group identified four primary obstacles to developing effective and innovative cancer technologies: The need to build effective cross-disciplinary collaboration; the need to bridge the gap between late discovery and early development of diagnostics and therapeutics; the need to develop new data standards and information sharing; and the requirement to build effective cross-cutting technology platforms.

Just as the NCI Roundtable was driven by the need for new and effective public-private partnerships that could apply a focused and highly leveraged solution to a specific task, the suggested outcomes put a high priority on the need for a new governance structure that could effectively address funding, technology, and multi-use efforts across a wide geography. Two proposed solutions emerged from the NCI analysis and gathering.

First was the recommendation that the Department of Health and Human Services, NCI, the White House, and 10 major philanthropic and venture investment leaders combine resources to create a $3 billion Advancement Accelerator for Cancer Cures, which would work much like the In-Q-Tel model but focus on networking solutions in an open-source teaming setting. Second was the decision by General Electric Co. and IBM Corp. to act on that decision by committing to invest adjacent to several of the comprehensive cancer centers and regional innovation "eco-systems" in areas of bio-informatics, biomarkers, and bio-imaging. These three sub-technology challenges were declared critical not only to cancer, but also to research and discovery of other diseases.

Therefore, with a proposed $3 billion venture fund and new networks of collaborative commercialization, the opportunity to eradicate cancer by 2012 became perhaps more achievable than in prior strategies and initiatives. Although the venture fund was not approved by the Bush White House for further exploration, the venture and philanthropic communities began to link their interests and to drive new investments in market-ready solutions.

Lessons for the Obama administration: Bringing together all the interested parties to define the innovations necessary for addressing a core challenge or targeting a specific opportunity, and then in turn putting the correct level of resources and governance together for implementation, can enable the federal government to be a true catalyst for demonstrative transformation of a long-standing costly issue to American society and the economy. In turn, by first examining the value chain of the current delivery system, then tweaking or wholesale revamping the system through new technologies, partnerships and collaborations, federal intent and goals can meet with accelerated timelines and responses beyond the traditional yearly budget objectives or even four-year political cycles.

DEPARTMENT OF LABOR

The Workforce Innovations in Regional Economic Development program

Every year, the U.S. Department of Labor distributes nearly $18 billion through formula grants and contracts to train, retrain, and otherwise assist employees and employers in developing new skills to meet the demands of the marketplace, or worse, to respond to major dislocations, offshoring, and negative trade scenarios. And every year, through a program under the Workforce Investment Act, governors and, in turn, state employment and labor agencies acting in concert with local workforce investment boards allocate these federal funds intended to ensure the nation's competitiveness and skills capabilities of all citizens.

Problem is, this established public workforce system is increasingly misaligned to the needs of industry, job creation, sustainable skills certification, and a host of other challenges confronting our nation's economy, which is more attuned to new global business models than the traditional manufacturing, smokestack days when most of the federal programs were designed. Simply put, ensuring at one and the same time a safety net for those most vulnerable to the ill consequences of globalization and focusing on the transformative employment, career, and certification of competencies required a different set of tactics and mechanisms.

A new approach was required to build upon congressional mandates given to the Department of Labor. These included the Workforce Act of 1998, which required a role for the private sector in the operation of regional workforce efforts, and Community-Based Job Training Grants, which sought to create partnerships between community and technical colleges and the public workforce system.

Despite these recent efforts at labor market reform—supported by both Democratic and Republican administrations—there remained the clear recognition that the workforce system, broadly defined to include public- and private-sector and academic programs, was not sufficiently and quickly responsive to address the needs of both businesses, industry clusters and individual workers in the global economy. New partnerships had to be created to support, at the regional level, the successful development and deployment of human talent that would drive innovation and support the competitiveness of American companies.

In 2005, the Department of Labor Employment and Training Administration launched the WIRED initiative, which is designed to better align efforts in workforce and economic development with regional innovation capacity building. In addition, WIRED's unique request for proposals suggested that regions should broaden their own workforce perspective to include high schools, four-year and graduate-degree universities, community colleges, philanthropic and faith-based organizations, and most important, the emerging technology and entrepreneurial sectors fostering and catalyzing innovations and new industries.

Over an 18-month period, 40 regions throughout the country have been awarded WIRED grants totaling $350 million, and a new national pilot project commenced to determine how best to realign and

transform the structures, relationships, networks, and delivery systems for addressing global challenges and innovation-based opportunities. The new program at a stroke reframed how policymakers approached the public workforce system and renewed their commitment to seek transformations at both the regional and the federal levels of government.

For too long there has been a disconnect between federal workforce training efforts, led by the Employment and Training Administration, and federal economic development efforts, led by agencies such as the Economic Development Administration and the Department of Commerce's National Institutes of Standards and Technology programs, as well as other federal interests at the departments of Energy, Defense, Transportation, and the Small Business Administration. WIRED sought to address this challenge by creating replicable structures and incentives that rewarded joint funding by multiple local, state and federal agencies, thereby breaking down traditional barriers of separate financial mechanisms and evolving the partnerships between federal and regional delivery systems for improved, real-time solution identification and response.

Other relevant efforts at building innovative local and regional workforce and economic development partnerships included several WIRED institutes, which have been held throughout the country. In April 2007, for example, the Institute on Alternative Energies, held at the National Renewable Energy Laboratory in Golden, Colo., brought together 100 regional stakeholders from industry, academia, and government, with federal officials from the departments of Energy, Labor, Defense, Agriculture, and Transportation, and the Environmental Protection Agency, to discuss best practices and new developments in renewable fuels—the science, technology, commercialization, business development, and ultimately the human capital and skills. The impact from the two-day WIRED Institute was the formation of a multi-agency response on Green Technologies, Green Jobs, and the enhancement of some 68 agencies focused on enterprise and entrepreneurial development forming a more coordinated response in WIRED regions as a further test-bed for collaboration on resource allocation and performance.

Finally, WIRED sparked the need for increased access to real-time data and knowledge sharing, opportunities to network the best minds across the country within and beyond WIRED communities and institutions, and to inspire new innovations in economic-workforce products and services. Through two tools—the Workforce and Innovation Technical Solution Toolkit and the Innovating Nation Internet-based social collaborative network—the WIRED regions and some 1,500 individuals now have access to more robust data and information on the economy, demographics, economic and innovation investments—a whole host of resources never assembled in this manner to assist decision-making, cooperation, and allocation of time and money toward achieving the mission of WIRED nationally and the aspirations and performance metrics locally.

Lessons for the Obama administration: When given the platform, rules of engagement, metrics, and the latitude to "own their destiny," Americans will identify the collaborations and pathways needed to resolve Grand Challenges and day-to-day operational issues plaguing governance by a Beltway mindset. These new innovative frameworks for coordination and partnerships at the local and regional level often are not measured as quickly in Washington as in states and communities, especially in areas of job creation, employment, and business decision-making, which means these WIRED programs are likely to boost U.S. economic competitiveness more creatively and more decisively than the plethora of outdated 20th-century workforce development programs.

Further, by coordinating workforce and economic development at the federal level, governors and mayors can be free to explore and implement new operational plans within their respective geographic domains. Indeed, precisely because WIRED encourages crossing boundaries—including several state lines—the program allows policymakers to

explore the demand-side of the equation over the supply-oriented mechanisms that historically have been limited by Washington federalism. In short, WIRED increases collaboration among elected and appointed officials and their common constituencies of employees and employers, enhancing the forces of economic growth by sharing a common accessibility to talent, skills, and know-how.

CONCLUSION AND RECOMMENDATIONS

In this period of economic meltdown and uncertainty, it is imperative that the government create a framework to unleash the competitiveness and entrepreneurial spirit of community and regional ideas and solutions. This calls for new federal-regional Innovation Collaboratories—intermediaries that connect the reach and depth of the federal mission with the goals and opportunities of local institutions, organizations, and individuals inclined to work as a team in new ways and on new outcomes measured by whether we resolved problems better and faster and less by whether the money was spent according to the demands of the bureaucracy.

The Obama administration, in partnership with the Office of Management and Budget, key congressional committees and staff, federal agencies, and state and local governments, should review all rules, regulations, and barriers that limit the ability to construct new frameworks for action and implementation as well as to create these federal-regional Innovation Collaboratories. This will enable the leveraging of government resources and co-investment opportunities with academia and the private sector.

To focus this transformation, we suggest choosing two or three Grand Challenges—competitive skills, alternative energy, water and the environment, or health care—to target the best private sector/academic/entrepreneurial/philanthropic localized expertise and creative thinking in partnership with White House policymakers, federal department leadership and program staff. All three of our case studies suggest that no matter the setting, there is a willingness among government policymakers at all levels to engage in out-of-the-box design and implementation of structures and governance in order to address 21st-century challenges that no longer can be effectively resolved without new paradigms.

This leads us to our final recommendation: The Obama administration should swiftly embrace an open-source innovation model for innovation-based economic development that establishes pathways for any person, in any institution or garage, with the interest of the country and its future, to become a member of a national and regional team set to expedite and accelerate these new Collaboratories around Grand Challenges. In tandem with new investments in ubiquitous broadband, new emerging wireless communications technologies and collaborative online tools for research and innovation, a national Open Source Innovation Initiative should become the platform for testing ideas with pilot resources.

The Obama administration will have a unique opportunity to break from the stale research, development, and commercialization model of long-term planning and tardy approvals by responding to a crying need to "launch a new moon shot." Our nation has neither the time nor the full financial capital to rely on the traditional ways of encouraging innovation, as is so clearly evident today in national security, health care, and workforce development.

Fortunately, we have at hand new, 21st-century pathways to leverage and exploit—based on existing success through proof of previous pilots. If we are to both manage ourselves through an economic crisis and at the same time leap forward to help the current and next generation of Americans thrive and prosper, then it is time to unleash innovation in the public sector from within federal agencies already prone to be more innovative if not for constraints placed on them by old models and old metrics.

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