science progress

Creating a National Innovation Framework

Building a Public-Private Support System to Encourage Innovation

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INTRODUCTION AND SUMMARY

Science, technology, and innovation experts in the United States today almost unanimously agree that our country needs to launch a collective national effort to accelerate U.S. technological- and innovation-based growth. Amid a global economic downturn during which other nations are boosting their already significant public- and private-sector efforts to build more competitive, innovation-led economies, the United States stands almost alone in the world without a national innovation framework.

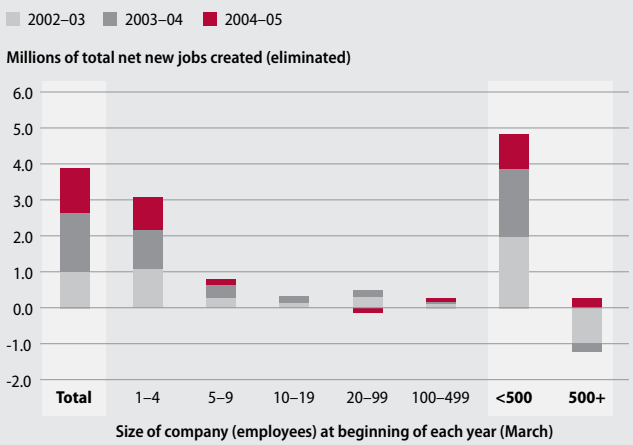
The result? Our country is beginning to lose its innovation leadership and national competitive advantage because we do not coordinate innovation policy across federal, state, municipal, and university boundaries and do not adequately support high-growth entrepreneurial companies. The federal government pours approximately $150 billion annually into basic scientific research but then largely fails to ensure this money results in the kind of broad-based economic growth that makes our products and services the most competitive on the planet.[1] This is a travesty because it is innovative small businesses that have generated between 60 to 80 percent of net new jobs annually over the last decade as they grow and prosper, according to the U.S. Small Business Administration.[2] These same companies also employ 30 percent of high-tech workers such as scientists, engineers, and information technology workers.

Today's economic crisis, however, is also an opportunity to restimulate our knowledge economy, if recent history is any guide.

FIGURE 1

Total U.S. cumulative net new job creation 2002 to 2005

In the three years after the 2001–02 recession



After both the 1990-91 and the 2000-01 recessions, small businesses of less than 20 employees were by far the dominant job creators in our country.[3] The Office of Small Business Advocacy in the Small Business Administration shows that during the three years after the 2000-01 recession, the smallest of our companies (one to four employees) provided 79 percent of the net new jobs in the subsequent three years. Similarly, after the recession of 1990-91, small businesses created 89 percent of net new jobs (see sidebar for case studies in Pennsylvania and Kansas).

INVESTING IN INNOVATIVE SMALL COMPANIES WORKS

The Small Business Administration's Office of Small Business Advocacy collected data on the states of Pennsylvania and Kansas as case studies for their analysis of small business-driven job creation. Both states have aggressive technology-based development programs to help their state economies transition to innovation-based growth. Both cases proved significant examples of places where job creation and net new jobs were attributed to small businesses.

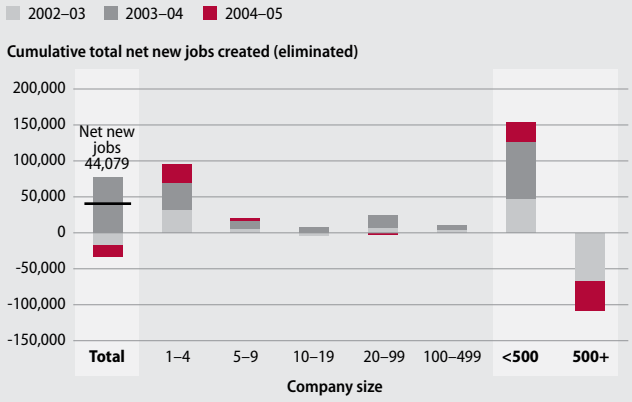
Pennsylvania created a total of 44,079 net new jobs after the 2001 recession (2002 to 2005), despite large companies (those with more than 500 employees) eliminating 107,992 jobs (see Figure 2).

Kansas-based companies created a total of 18,354 net new jobs in the same three years (2002 to 2005)—new employment that also was attributed to the growth of small firms in the state (see Figure 3).

FIGURE 2

Pennsylvania builds jobs through innovative small businesses

Accumulative net new job creation in 2002–05 after 2001 recession

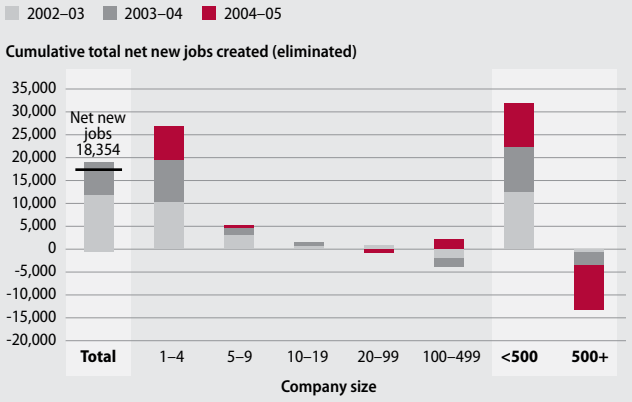


Pennsylvania companies created a total of 44,079 net new jobs in the three years after the 2001 recession (2002 to 2005). 94,522 jobs were created by companies with one to four employees (214 percent of the total); 119,871 jobs were created by companies with <20 employees (272 percent of the total); 152,071 jobs were created by companies with <500 employees (345 percent of the total); large companies (more than 500 employees) eliminated a net total of 107,992 jobs (-245 percent of the total) in three years.

FIGURE 3

Kansas builds jobs through innovative small businesses

Accumulative net new job creation in 2002–05 after 2001 recession



Kansas companies created a total of 18,354 net new jobs in the three years after the 2001 recession (2002 to 2005). 26,587 jobs were created by companies with one to four employees (145 percent of the total); 33,405 jobs were created by companies with <20 employees (182 percent of the total); 31,548 jobs were created by companies with <500 employees (172 percent of the total); large companies (more than 500 employees) eliminated a total of 13,194 jobs (-72 percent of the total) in three years.

Source: Small Business Administration.

Furthermore, small- and medium-sized enterprises produce between 14 times more patents per employee than large corporations, another key measure of innovation-led growth.[4] Indeed, small companies are a key source of innovation for themselves and for large companies in terms of fueling mergers and acquisitions as well as technology licensing activities. Many new commercially viable ideas for new products and services and other technological discoveries flow out of small start-up companies commercializing publicly funded research—companies that go on to become major players or are acquired by others to boost their own competitive advantage. Either way, our economy benefits enormously.

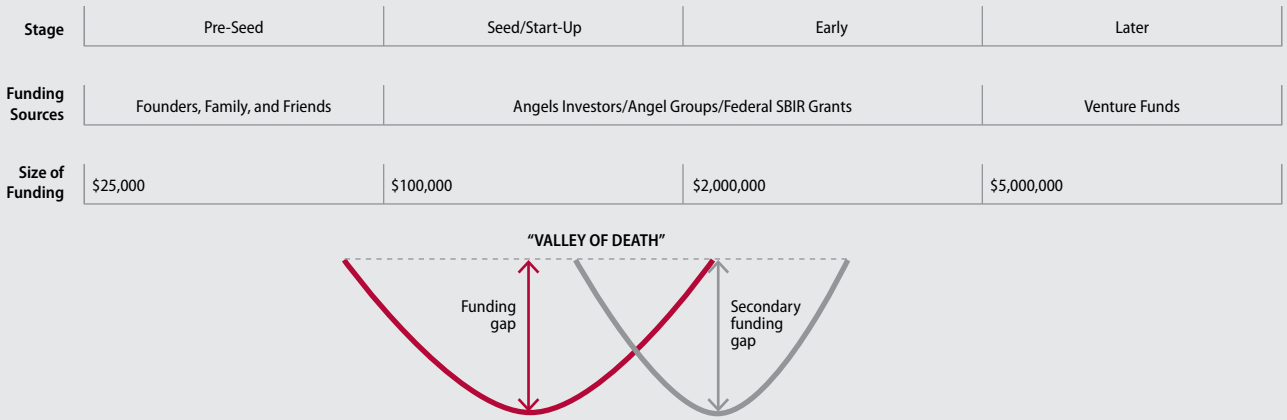
What worked after the last two recessions, however, may not work so well today given the fragile nature of our financial markets, which is why we need a national innovation framework to help ensure this commercialization process runs more smoothly and efficiently. In fact, the already massive funding gap for young innovative companies—the other Achilles' heel of our innovation-led economy—has only grown wider over the past decade. The so-called "valley of death"—the early-stage funding gap for young entrepreneurial companies (see Figure 4)—has always existed for early-stage innovation and entrepreneurs, but it has widened because of the current national economic crisis.

Venture capitalists are husbanding their financial resources to keep their current portfolios of startup companies alive and have already moved further up the financial cycle. The average investment by venture firms last year was $8.3 million per investment and only about 4 percent of the capital went to early-stage companies.[5] Angel investors—individual investors with a keen eye for technology—who previously had filled the role of assisting some startups cross this valley of death reduced their investments by over 26 percent in 2008, and the availability of investment capital among angels decreased dramatically by 40 percent over the same period.[6]

FIGURE 4

The innovation capital "valley of death"

Commercializing innovative products and services is where investment money is most needed but least available



When seed/start-up and early-stage companies cannot entice investors due to longer time tables for commercialization and lack of an upside in investing early

To be sure, past federal efforts to coordinate the complex mix of policies and federal funding have resulted in significant new programs and much-needed investments that have clearly helped to grow technology companies in the United States. The passage of the Bayh-Dole Act in 1980—which allowed universities to patent innovations that grew out of government-funded basic research—is responsible for the continuing flood of new companies with new ideas (backed by private investment capital) into our economy. And the Small Business Innovation Development Act in 1982—which established the rule for federal agencies to commit 2.5 percent of their extramural research budgets to the Small Business Innovation Research program, or SBIR—continues to serve as key bridge financing for start-up companies working in areas to address unmet needs in public health, defense, energy, telecommunications, and aerospace—all science arenas that boast intensive research-and-development requirements.[7] The findings from the recent assessment of the SBIR program by the National Academies indicated that the program leads to significant new knowledge formation and intellectual property disclosure, and affects commercial outcomes.[8]

(There is currently an ongoing debate about the future of the SBIR program in Congress. The SBIR program is one of the most innovative public funding programs in the world, and it must be reauthorized on a longer-term basis of at least six to eight years with many of the suggested enhancements by the National Academies' Assessment.)

Other government programs since then have also helped to boost our nation's innovation-led economy. One is the Technology Innovation Program of the National Institute of Standards and Technology to accelerate innovations in areas of critical national need, which has produced significant results. Other efforts, however, were more scattershot and certainly less coordinated. We will detail these efforts in this paper before turning to our own set of recommendations to weld the successful innovation programs and funding mechanisms into a far more effective national innovation framework.

And what are those recommendations?

We argue in the pages that follow for a national effort to support innovation, entrepreneurship, and the advancement of both technologies and early-stage businesses. Specifically, we propose a new National Innovation Framework to structure and strengthen an integrated system for the strategic acceleration of the nation's innovation economy. Most importantly, we propose through this framework to formulate widespread participation of multiple interests including federal and state government, the private sector, universities, foundations, and the investment community. Our National Innovation Framework contains three new structural elements for a widespread national innovation strategy:

1. The Federal Innovation Partnership and a National Innovation Advisor
   - This new partnership program and new office would coordinate federal technology innovation programs through a Federal Innovation Partnership with a new high-level National Innovation Advisor who has access to the president.

2. The National Innovation Seed Fund and Technical Assistance Grant Fund
   - This funding program would create a $2 billion National Innovation Seed Fund, or NISF, to invest in experienced early-stage capital providers, including venture capital and

angel funds as well as other public and/or private funding authorities. The purpose of the NISF is to jumpstart new knowledge economy jobs that will shape America's future alongside a Technical Assistance Grant Fund that would provide entrepreneurial support resources and services to portfolio companies and NISF fund managers.

3. The National Private-Public Partnership Innovation Program
   - This new nonprofit program, modeled on the already up-and-running Innovation America public-private partnership program, would accelerate the growth of the entrepreneurial innovation economy in America and oversee the National Innovation Seed Fund by coordinating government, university and private-sector players in early-stage investment capital, commercialization, technical and entrepreneurial mentoring, and workforce development related to innovation development.

As we will demonstrate in this paper, the time is now to implement these three elements of a national innovation framework. Together, we believe these programs will again set our nation on the road to innovation-led economic prosperity in the 21st century that could well trump 20th-century successes.

EARLY EFFORTS WITHOUT A CENTRAL MODEL

Technology and innovation experts around the country came to recognize in the 1980s and 1990s that the United States was losing its cutting-edge competitiveness in science, technology, and innovation despite the vast amounts of federal funding for basic research and development. A consensus was growing that the federal, state, and municipal governments in league with universities and federal laboratories needed to work together more cooperatively to build our scientific estate and innovation leadership.

By the middle of the 1990s these grave concerns resulted in a series of early efforts to address the problems—efforts that in hindsight prepared the groundwork for what needs to be done today but alas were not followed up on at the end of the decade. Still, these early efforts need to be briefly explored for the early consensus they brought to U.S. innovation policy prescriptions.

In early 1995 these concerns first found collective voice when former Governors Richard Celeste of Ohio—a Democrat and creator of the Edison Programs in Ohio—and Dick Thornburgh of Pennsylvania—a Republican and creator of the Ben Franklin Technology Partners program—formed a bipartisan, 20-member State-Federal Technology Partnership Task Force consisting of national leaders including governors, state legislators, research-and-development leaders, and chief executives from business and academia.[9] These leaders worked in collaboration with the Carnegie Commission on Science, Technology and Government; the National Governor's Association; the American Society of Mechanical Engineers; the White House Office of Science and Technology Policy; and the National Conference of State Legislatures to evaluate opportunities for collaboration between the state and federal technology programs.

The task force made recommendations on ways to redefine the state-federal science and technology relationships and generate enhanced innovation and commercialization—with the emphasis of the taskforce on greater cooperation. One of the major outcomes of the task force was the creation in late 1995 of a national nonprofit organization, the State Science and Technology Institute by the Battelle Memorial Institute, which has a mission to improve state and regional economies through science, technology, and innovation. SSTI exists today and continues to work to achieve this mission and became a free-standing organization in 2000.

That same year, John Gibbons, Assistant to the President for Science and Technology, announced the creation of an interagency review of science and technology programs to help foster better state and federal government cooperation to advance national goals. This review was initiated in response to growing state investments in science and technology and the need to enhance state-federal partnerships to realize greater national benefits. The interagency review was led by U.S. Department of Commerce Undersecretary for Technology Mary Good under the auspices of the National Science and Technology Council chaired by the president. The group had representatives from all federal science and technology agencies.

In 1997, President Bill Clinton created the U.S. Innovation Partnership to coordinate federal and state efforts to stimulate the development and use of new technologies that could help the United States meet the common goals of generating economic growth, improving our schools and health care, better protecting the environment at a lower cost, and reinventing government at all levels. USIP task forces were established around specific areas and some policy recommendations emerged. Alas, both the USIP and the undersecretary for technology in the U.S. Department of Commerce ceased to exist under the Bush administration.

Starting anew in 2005

Many of the recommendations offered by the State-Federal Technology Task Force in 1995-1996 and USIP in the late 1990s are relevant today. And they should be revisited under the Obama administration with the major difference being the role of innovation not just on technology. Indeed, after six years of neglect under the last administration, federal and state leaders on both sides of

the political spectrum began to develop their own strategic approaches to innovation policies. Some of those efforts included:

- **THE NATIONAL INNOVATION ACT OF 2005.** The NIA, sponsored by Sen. John Ensign (R-NV) established a President's Council on Innovation to develop a comprehensive agenda and coordinate federal effort to support innovation.[9]
- **THE NATIONAL COMPETITIVENESS INVESTMENT ACT OF 2006.** The NCIA, sponsored by Sens. Ensign and Joseph Lieberman (D-CT), established a President's Council on Innovation to develop a comprehensive agenda and coordinate federal effort to support innovation.[10]
- **THE AMERICA COMPETES ACT OF 2007.** The ACA, the work of a bipartisan group of lawmakers, built on the NCIA to increase research investment, strengthen science & technology educational opportunities, and develop an innovation infrastructure. Many of the recommendations from ACA have gone unimplemented.[11]
- **THE NATIONAL GOVERNOR'S ASSOCIATION INITIATIVE OF 2007.** This effort created the Innovation America Partnership, which established a public-private partnership to coordinate innovation efforts with outlined roles for state, federal, and private jurisdiction. Governor Janet Napolitano of Arizona—now Homeland Security Secretary—led this effort. Gov. Napolitano also created the Innovation America Foundation.[12]

In addition, last year two important new efforts to create a nationwide innovation policy body were launched: one in the Senate and one from a leading nonprofit technology policy group. In Congress, the National Innovation and Job Creation Act of 2008 was introduced by Senators Susan Collins (R-ME) and Hillary Clinton (D-NY), which sought to establish a National Innovation Council to improve the coordination of innovation activities. And later that year the widely discussed proposal to create a National Innovation Foundation—which would coordinate technology and innovation policy under one roof and then pool and leverage investments—was proposed by Robert Atkinson of the Information Technology and Innovation Foundation.[13]

Many different elements of these programs are a part of our proposed National Innovation Framework, but we would argue that they have not been adequately networked together to achieve the sustainable collective outcomes the United States needs today to create an integrated national innovation strategy. Our goal is to establish that integrated operating model so that the United States can construct a fully networked and optimized infrastructure for the greater coordination and success of overall U.S. innovation strategy—an integrated network that leverages the best that the federal government and state governments, universities and nonprofit groups, and the private sector can bring to the table.

We believe it is important for existing state and federal agencies to retain their current funding and implementation roles so that they can maintain their mission-oriented goals and not lose time sparking a new, innovation-led economic recovery. But we recognize that better coordination is absolutely imperative.

That's why our National Innovation Advisor and federal innovation partnership program would convene to evaluate effectiveness, return on investment, and redundancy in programming in order to reduce any unnecessary overhead and maximize the amounts of funding invested in outcome-driven research and commercialization. Further, this new coordinating effort will identify gaps that exist in federal technology innovation programs and respond better to the current economic environment. This effort will enable our National Innovation Seed Fund to fill a major early-stage funding gap for innovative entrepreneurs in the United States. We now turn to this National Innovation Framework.

THE NEED FOR A NATIONAL INNOVATION FRAMEWORK

According to the recent Global Innovation Index study completed by the Boston Consulting Group, the National Association of Manufacturers, and the Manufacturing Institute, innovation leadership has shifted to more nimble emerging and developed economies, where their governments are investing heavily in science and technology and innovative approaches to increase their respective market shares of the global knowledge economy.[14] Foreign counterparts have successfully plucked best-practice strategies and approaches in supporting entrepreneurship and early-stage business development. Combined with the primary competitive advantage of cheaper labor costs, these efforts are now paying big dividends for these societies.

Analytical chemistry in China, clinical trials in India, biomedical engineering in Singapore, and a number of back-office and other outsourced industries have gained strong footing abroad and have effectively cut into America's competitive share in high technology. The study ranked the United States eighth in innovation leadership behind Singapore, South Korea, Switzerland, Iceland, Ireland, Hong Kong, and Finland. The study evaluated both innovation inputs, such as fiscal and education policies, and outputs such as patents, technology transfer from basic university research, research and development, and business performance (see Table 1).

TABLE 1

Global Innovation Index

Countries surpassing the United States in innovation

Ranking	Country	Score
1	Singapore	2.45
2	South Korea	2.26
3	Switzerland	2.23
4	Iceland	2.17
5	Ireland	1.88
6	Hong Kong	1.88
7	Finland	1.87
8	United States	1.80
9	Japan	1.79
10	Sweden	1.64

Source: Boston Consulting Group and the National Association of Manufacturers.[14]

The Global Innovation Index also called for a bold national innovation strategy to encompass their recommendations, but they did not propose a central operating model for widespread implementation. What our nation needs is a National Innovation Framework—an operating model that offers less complexity, more accountability, and more cooperation among businesses, technology organizations, innovators, investors, entrepreneurs, policymakers, and university leaders. We use the term "operating model" because the provision of any service—and we consider innovation policy implementation a service that involves the interaction of multiple actors from both the public and private sectors alongside appropriate government involvement—requires implementation beyond the control of any one governmental agency.

The better designed and anticipatory this operating model is, the better it will be in delivering and implementing innovation policy that boosts our country's economic competitiveness and job creation in a timely fashion and at the most efficient cost to taxpayers. Today's leading high-tech and innovative businesses and industries that are the quickest to identify, carve, and sustain their business models are the most successful. They may not be the fastest to discover something innovative, but they are the fastest to piece together all the necessary components to become exceedingly profitable.

Yet at the same time we must help mobilize those that are quick to discover. Any single discovery can be an innovation that forms the basis for a new company or business opportunity for the inventor who improves the chances for success of another company but lacks the keen business knowledge to accelerate these discoveries. Many discoveries today are sitting on the shelves of universities, research laboratories, and corporations and go undeveloped for widespread public benefit due to the lack of know-how and underavailability of early-stage capital (see Figure 5 for a diagram of this technology lifecycle).

The upshot? The formation of a comprehensive innovation lifecycle business model—from discovery to product development to rapid distribution to end-user satisfaction—that delivers success through wealth creation, sustainability, and consumer trust is sorely lacking. To be sure, technology transfer offices at some universities, astute venture capitalists, and corporate research directors on the prowl bring all these elements together to create incredibly competitive and growing companies (think Google Inc). Yet a comprehensive national innovation framework to make this happen more consistently still eludes us. That's why we believe a shared National Innovation Framework—a prioritized operating model that structures a collective national response for the strategic acceleration of the country's entrepreneurial innovation economy—is now sorely needed.

Our National Innovation Framework would provide the best networked approach, leverage our innovation resources, and provide assistance to the growth of high-tech companies that are continuously changing the shape of our world. In turn, the growth of these very companies fuels our economic and job growth and serves as a considerable national competitive advantage to retain the highest skilled national talent and compete with the rest of the world on science and technology.

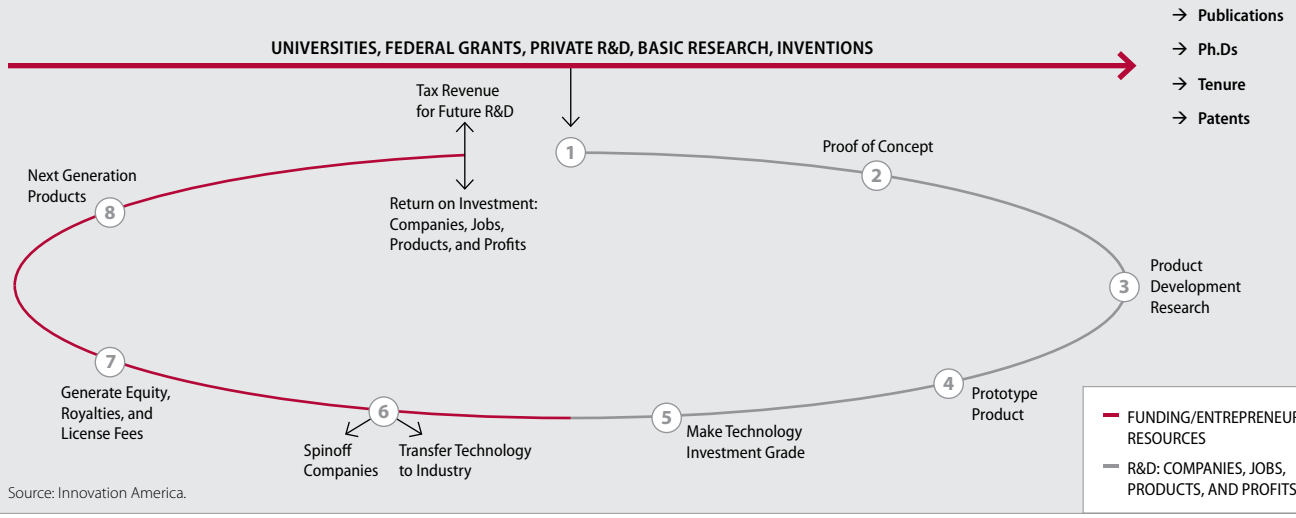
At the center of the framework sits a National Private-Public Partnership Innovation Program, which is a nonprofit organization composed of leading public- and private-sector innovation players. The organization would draw on the expertise of its partners to administer a $2 billion National Innovation Seed Fund and advise a collaborate effort with a federal National Innovation Advisor in the White House on how to tailor national innovation strategy to best meet the needs of newly emerging technologies and services (see Figure 6).

As our chart illustrates, key private and non-profit technology organizations, such as SSTI, National Association of Seed and

FIGURE 5

The Technology Lifecycle Business Model

How basic research and development leads to innovation and commercialization



Source: Innovation America.

Venture Funds, American Society of Mechanical Engineers, the Association of University Technology Managers, the Community Development Venture Capital Alliance and the Angel Capital Association, would work with federal agencies and their technology program managers. These efforts would be reported to a new National Innovation Advisor and the investment managers of an experienced public-private innovation seed-stage fund—through the National Public-Private Partnership Innovation Program, or NPPPIP. In this way, the best innovation strategy, advice and policy execution would be coordinated through a single organization with a direct link to the president and key private-sector and nonprofit leaders. We now will present the individual components of our National Innovation Framework to demonstrate how these three programs would work in tandem.

FEDERAL INNOVATION PARTNERSHIP AND NATIONAL INNOVATION ADVISOR

Leading programs for a national innovation and competitiveness agenda

The keys to the success of this national innovation framework are the partnerships and federal leadership created in this operating model. Over the past 25 years, a new global innovation system has evolved in the United States, with support from government and industry for basic research in universities, nurtured by rapid growth in venture capital and implemented by industrial and services companies through strong investments in research and development, capital equipment, and information technology. This highly complex system of innovation, however, requires much closer collaborations and more alliances among federal funding agencies and private investors, industries, universities and government labs.

More than simply utilizing technology, *innovation is the ability to take new ideas and translate them into commercial outcomes by using new processes, products or services in a way that is better and faster than the competition*. The ability to do this requires an inclusive process among individuals, institutions, and organizations that results in new business models, new forms of engagement and, ultimately, new companies. Today, new companies create a greater portion of job growth than do established larger companies. In the new economy, innovation and productivity are the cornerstone of competitiveness and prosperity.

Our Federal Innovation Partnership program would address the lack of government coordination around national innovation and competitiveness. There has never been one federal agency or cabinet-level position responsible and accountable for overseeing the total federal technology investment portfolio. Nor is there one federal agency or advisor overseeing the balance of investment and technology research, which should be managed in innovation portfolio. The major objective of our federal innovation partnership program would:

- Align investments in programs strategically
- Access bridges into the commercial marketplace faster
- Eliminate redundancy
- Identify gaps in our nation's technology portfolio
- Decrease administrative costs
- Measure outcomes to align performance of the programs.
- Serve as a clearinghouse of information and resources
- Require federal agencies to communicate and collaborate with one another to galvanize the country around a strategic innovation and competitiveness agenda
- Catalyze cooperation among the federal agencies on a shared innovation agenda

It is important, however, to form the Federal Innovation Partnership around the existing programs that the nation is using to support technology development and transfer, education, workforce and economic development, and industry-university collaborations. Initial programs identified that form the basis of this partnership boast about $3 billion in federal funding and include but are not limited to the following programs:

FEDERAL TECHNOLOGY INNOVATION PROGRAMS

- Small Business Innovation Research grants program
- Small Business Technology Transfer Research grants program
- Technology Innovation Program
- Manufacturing Extension Partnership
- Workforce Innovation in Regional Economic Development program
- Federal Laboratory Consortium
- Experimental Program to Stimulate Competitive Technology
- Experimental Program to Stimulate Competitive Research
- Industrial Technology Program
- Partnership for Innovation
- Engineering Resource Center
- Industry-University Cooperative Research Centers

FEDERAL INNOVATION CAPITAL PROGRAMS

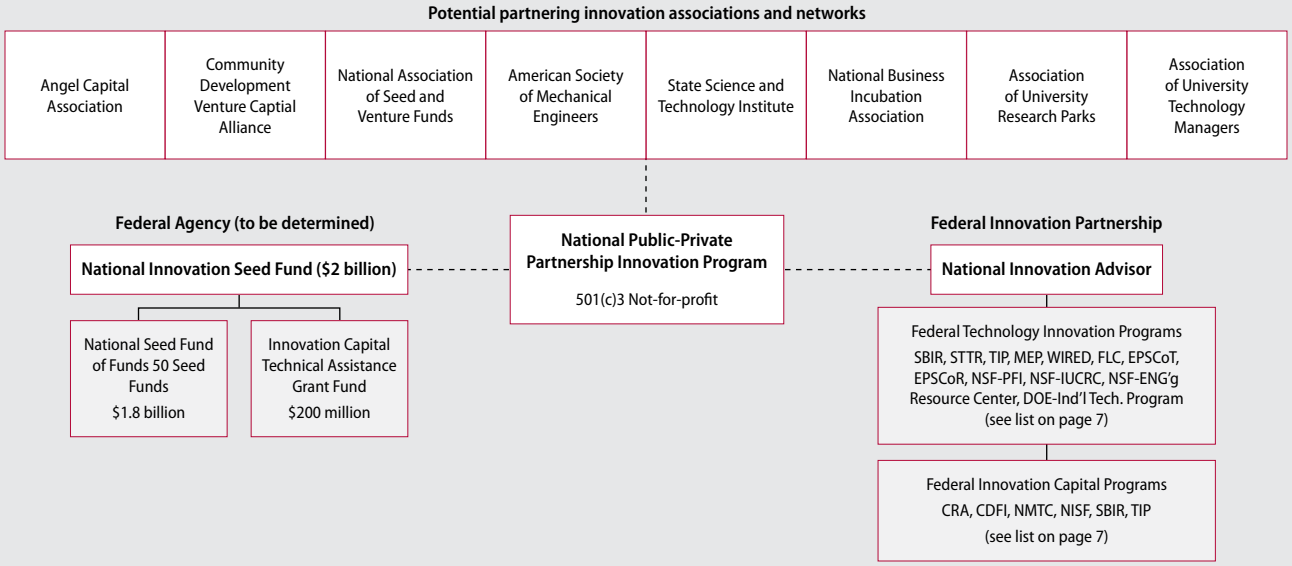
- Small Business Innovation Research grants program
- Technology Innovation Program
- Community Reinvestment Act
- Community Development Financial Institutions
- New Market Tax Credits

Such an array of programs perfectly illustrates why these programs are not widely understood or recognizable in the world of innovation and need to be administered through a Federal Inno-

FIGURE 6

A National Innovation Framework[15]

Combining the best innovation programs through a public-private partnership innovation program



vation Partnership program. But at the same time, the wealth of program expertise in all of these programs should not be lost in the name of consolidation. For this reason, the federal innovation partnership program would include federal-level program administrators of the listed programs and other federal representatives deemed appropriate by the National Innovation Advisor and the Obama administration.

We believe outstanding amounts of knowledge exist in the federal agencies through managing these programs and it's important to retain some level of independence in program administration. The Federal Innovation Partnership would add a level of oversight and ability to leverage resources and the strategic updating of programs to respond to the current global innovation environment. The chairman of the Federal Innovation Partnership would be the National Innovation Advisor, who will be an advisor to the President on strategic issues related to national innovation and competitiveness.

No cabinet level position in the Administration currently exists for maintaining America's position as the global innovation leader, as well as making sure that federal agencies collaborate with each other and leverage resources effectively. The national innovation advisor in tandem with the Federal Innovation Partnership program would ensure consistency in the way the programs are administered and made accountable and they will work to update and enhance programs to meet the changing nature of what it takes to stay competitive globally.

Currently the federal budget for the listed Federal Technology Innovation Programs is approximately $3 billion. These programs effectively launch new technologies from the federal laboratories, small businesses, nonprofit research organizations, universities, and other centers of excellence in the United States. It will be important for the National Innovation Advisor to monitor the balance of the federal investment portfolio between basic, applied, advanced, and mature technologies and industries to improve our competitive position globally and recommend new programs, investments, and initiatives where needed.

The other programs represented in the Federal Innovation Partnership are existing Federal Innovation Capital Programs, which provide financial incentives for innovation-based development. Very few of these programs have been structured to support the rapidly growing entrepreneurial innovation economy of the United States. This needs to change. Our policy framework would enable this reform to happen at a federal level coordinated through the White House to ensure effectiveness.

As our National Innovation Framework chart on page 7 illustrates, the Federal Innovation Partnership program would work through the National Public Private Partnership Innovation Program to coordinate investments from the public-private National Innovation Seed Fund to direct innovation investment capital efficiently but opportunistically around the country. This public-private partnership of existing innovation associations and networks would provide outreach and investment-intelligence roles between the states and regions, and allow the federal government to align technology innovation investment programs with federal, state, regional and university programs.

NATIONAL INNOVATION SEED FUND

A collective response to financing innovation-based businesses

The United States is currently losing is its innovation leadership and national competitive advantage by not supporting high-growth entrepreneurial companies. According to the U.S. Small Business Administration, innovative small businesses have generated between 60 to 80 percent of net new jobs annually over the last decade. These young companies employ 30 percent of high-tech workers such as scientists, engineers, and information technology workers.

Furthermore, small-and medium-sized enterprises produce between 14 times more patents per employee than large patenting companies. In short, small companies are a key source of innovation for themselves and for large companies in terms of fueling mergers, acquisitions, and licensing activities. See the diagram in Figure 7 for a quick understanding of the financing lifecycle that creates this innovation.

The current seed-stage and early-stage funding gap, which has always existed for early innovation and entrepreneurs, has widened recently because of the current national economic crisis. Banks and hedge funds are failing, and loans and lines of credit for working capital are at extremely low levels and unavailable for some. Venture capital has moved "upstream" to where the average investment by firms last year was $8.3 million per investment. Only about 4 percent of the capital went to early-stage companies, with all other investment activity occurring in later stage deals. Private and angel investors who once attempted to fill most of this gap reduced their investments by more than 26 percent in 2008, and the availability of investment capital among this category has decreased dramatically by 40 percent.

Over the past decade, state governments have led the charge in their own jurisdictions to address this early-stage financing gap or what has come to be known as "The Valley of Death" in the world of entrepreneurship. But now state budgets are also in crisis mode and have less money to invest in technology-based economic development initiatives. Recently Ohio, Kansas, Connecticut, and Pennsylvania, just to name a few, have all either reduced economic development spending or suggested wide consolidations to control it.

TABLE 2

Survey Finds Financing for Innovation in Crisis

Seed- and early-stage investors and entrepreneurs are struggling more than usual

Venture Funding
90 percent of the already-funded companies can't obtain follow-on funding to get to the next level. Without this follow-on funding, they will die and a generation of great ideas will die along with them
75 percent of the money received by seed- and early-stage venture funds comes from private investors
70 percent of the money needed to fill this early stage investment gap is less than a million dollars per company
60 percent of early-stage funds aren't making any new investments
Entrepreneurial Companies
75 percent of the companies investors are putting money into can't leverage that money into bank financing
42 percent of the companies investors are putting money into have been stripped of their lines of credit

In April 2009, the National Association of Seed and Ventures Fund, at the request of the Small Business Administration, surveyed seed- and early-stage venture funds as well as entrepreneurial support professionals to find out the state of seed- and early-stage funding for innovative-based entrepreneurial companies. The survey found that 70 percent of seed/early stage venture investment funds are having a difficult time raising capital from private investors, pension funds, local, county and state authorities. The most startling finding was that nearly 90 percent of the already-funded companies surveyed are currently unable to attract follow-on capital, and that 70 percent of these companies need less than a million dollars to continue their business and product development (see Table 2).[16]

The upshot: there is a desperate need among a lot of young entrepreneurial companies for not a lot of seed- and early-stage financing rounds—and that capital cannot be found.

CREATING A NATIONAL INNOVATION SEED FUND

We believe the federal government can play a role in funding these entrepreneurial companies, thereby stimulating innovative job and small business growth. Neither traditional financial institutions nor venture capitalists are providing the gap funding of $500,000

FIGURE 7

Innovation Capital Lifecycle

to $2 million that seed-stage and early-stage companies need to grow. Our solution is to create a National Innovation Seed Fund sparked by a U.S. federal government investment. This fund would make venture investments in that key financing range to structurally address the "Valley of Death" funding needs of small companies, and would be invested equitably and equally throughout the innovative regions of the United States.

This new fund would be structured as a public-private partnership and would enlist experienced early-stage investors to manage the fund. The National Seed Stage Fund managers would work with the NPPPIP to engage the rest of the innovation ecosystem in the United States to ensure strategic oversight and success. The NPPPIP would determine the most experienced early-stage funds that would then invest in innovative companies in their regions. It would collaborate with state technology-based economic development organizations, national seed, angel, and other innovation-based associations and networks to leverage resources and create a connected national community of innovation.

Examples of organizations are the Ben Franklin Technology Partnership in Pennsylvania and the National Association of Seed and Venture Funds. The consortium of partnership organizations would guarantee the effectiveness of the National Innovation Seed Fund by creating quality investment opportunities with the investments and participation of the Federal Innovation Partnership program and the National Innovation Advisor. The overall purpose of the fund is to stimulate rapid knowledge-economy job creation as demonstrated can be done from the data from the Small Business Administration.

Federal money for the new seed fund would be appropriated through an agency such as the Small Business Administration or U.S. Department of Commerce's Economic Development Administration or National Institute of Standards and Technology, and would be managed through the National Public-Private Partnership Innovation Program. The federal agency would manage the contractual relationship with the NPPPIP and maintain administration, audit, and financial reporting functions.

The investments would at some point generate a financial return on investment for the federal government, though for budget purposes those returns would have to be anticipated over the course of 10 years—like any venture capital firm would do—which means funds must be allocated until investment maturity can be realized five or more years into the future. More immediately, however, the $2 billion would be invested in new companies creating new high-skilled, high-paying jobs, thereby adding to immediate post-recession economic stimulation.

These types of seed fund investments would be made right before most venture capital firms would look at investing, which is risky but also rewarding. Many venture-backed companies are or quickly become the most innovative and prosperous companies in the world. A Global Insight report in 2007 found that venture capital-backed companies were directly responsible for just over 10 million jobs and $2.1 trillion in sales in 2005, which represents 9 percent of total private sector employment and 7 percent in total sales.[17] Furthermore, venture capital-backed companies created jobs three times faster and pay significantly more than the average private-sector jobs.

We have studied other sources to gauge the impact of a National Innovation Seed Fund and found that for each $1 billion invested in innovative small businesses a minimum of 100,000 high-skilled, high-wage jobs would be created. The Commonwealth of Pennsylvania's Department of Community and Economic Development, the longest existing organization investing early-stage capital, in 2008 created or retained 8,150 jobs based on a total of $90.7 million in investments or $11,130 per job.[18] If you applied Pennsylvania's $11,130 in seed dollars invested per job to the $2 billion of potential funding for the national innovation seed fund, 180,000 new jobs would be approximately created with the opportunity to retain many of the high-skill and high-paying jobs into the future. This same result was confirmed in a study completed by the Community Development Venture Capital Alliance of more than 50 providers of community development venture funds that make equity capital and grant investments to build entrepreneurial capacity and community wealth.

A NATIONAL PUBLIC-PRIVATE PARTNERSHIP INNOVATION PROGRAM

National innovation intermediary to implement different program elements

Our chart on page 7 illustrates that a non-profit National Public-Private Partnership Innovation Program sits at the center of our national innovation framework. This NPPPIP would administer unique innovation programs to fill the innovation life cycle gaps that exist in America today, including support in the areas of intellectual property and technology transfer, early-stage business and product development, early-stage financing, commercialization, technical assistance and mentoring and the implementation of other programs to address key issues. This program would also oversee the national innovation seed fund investments in tandem with the Federal Innovation Partnership program and the National Innovation Advisor.

Above all, though, this non-profit, public-private organization would act as a strategic mechanism to engage the innovation ecosystem like any strong outreach and implementation-driven organization. Its effectiveness would be supported by the consortium of partnership organizations, in which it will lead and also its partnership with the new Federal Innovation Partnership program and the National Innovation Advisor. The proposed partners in

this organization would include but not be limited to the following organizations, which together represent significant sectors that support the acceleration of the nation's innovation economy:

- American Society of Mechanical Engineers
- Angel Capital Association
- Association of Public and Land-grant Universities
- Association of University Research Parks
- Association of University Technology Managers
- Community Development Venture Capital Alliance
- National Association of Seed and Venture Funds
- National Business Incubation Association
- State Science and Technology Institute

The unique partnership of national organizations and associations practicing innovation-based economic development would provide a point of cross linkage for both practitioners and constituents, enabling it to implement significant programs with the buy-in of a variety of stakeholders including venture and angel networks, business incubators, research parks, university technology managers, and the nation's largest network of engineers. This network will prove to be critical to launch a strategic innovation-based implementation agenda for our country.

Furthermore, this partnership will be able to elevate efforts and directly link with intermediaries and other bodies in states and localities throughout the United States, which is not currently a shared agenda by the federal government. Regional intermediaries have been effective in operating in states and localities to accomplish strategic agendas with multiple partners and many stakeholders.

These organizations can successfully launch a paradigm shift to transition and position places, people, and organizations to nurture innovation-based economies. Our approach introduces the concept of a comprehensive national broad-based innovation intermediary that would fulfill this role. And the ability of the organization to operate outside the realm of the federal government would help ensure swifter implementation and leadership on strategic agendas while receiving input from a National Innovation Advisor with access to the President and Federal Innovation Partnership of government agencies.

A further function of this organization would be to operate programs and serve as an accelerator that advances technologies into the marketplace for the increased stimulation of innovation in the national economy. The partners' deep experience in this organization in early-stage investing would be instrumental in the deployment of the National Innovation Seed Fund as well as our proposed Technical Assistance Grant Fund, which would be administered by this non-profit organization. Support for this fund will come from the same originating agency of the NISF and remain a constant percentage of the overall investment pool.

The proposed Technical Assistance Grant Fund would serve as a support fund for early-stage investing, similar to the technical assistance fund currently affiliated with the New Markets Tax Credit program. The public-private partnership organization would select the best programs for business mentoring practices and due diligence support, and would provide funding for business incubation and acceleration models that incorporate virtual models, including the iBridge Network of the Kauffman Foundation and the National Innovation Marketplace currently supported by the U.S. Department of Commerce.

As project manager of the National Innovation Seed Fund and Technical Assistance Grant Fund, our public-private partnership organization would lead the charge in bridging problems in early-stage financing and commercialization of innovation-based enterprises. It would also operate other programs that are critical to building national innovation capacity, including those engaged in:

- Direct investment
- Commercialization
- Technical assistance, education, and mentoring
- Technology, economic and workforce development
- Networking, strategic planning, marketing, and branding

In short, the core competency of this organization will be the conception and formation of key innovation-based products and services that will assist the networks and leverage resources to the support networks working with individual entrepreneurs and others working to accelerate innovation on a national level.

CONCLUSION

Our National Innovation Framework boasts three core components: a National Public Private Partnership Innovation Program that sits astride a National Innovation Seed Fund and Federal Innovation Partnership Program, and collaborates with a new National Innovation Advisor. Together, the leaders of these components would deliver a central focus and create an optimized and integrated national network of many players that is essential to a national innovation strategy. We believe this structure is the best way not just to implement as well as enact a national innovation strategy.

The United States does not need a top-down innovation strategy that resembles government-led industrial policy, nor would such a proposal survive long in Congress or the halls of the Obama administration. Similarly, the United States simply cannot continue to run the current overlapping but uncoordinated sets of innovation programs that are failing to deliver the common national strategy our country needs to compete successfully in the 21st-century global innovation economy.

Instead, our country needs an innovation program that leverages the best talent from the public and private sector. It is the best policy solution. And it's the best political solution on Capitol Hill. For this reason, we believe a national public-private partnership innovation program is what Congress and the Obama administration should pursue immediately due to our current window of opportunity and the risk of losing ground to competing nations daily.

ABOUT THE AUTHORS

Richard Bendis

Mr. Bendis has distinguished himself as a successful entrepreneur, corporate executive, venture capitalist, investment banker, innovation and technology based economic development leader, international speaker and consultant in the technology and healthcare industries. He currently serves as the founding President and CEO of Innovation America, a national 501c3 not for profit, private/public partnership focused on accelerating the growth of the entrepreneurial innovation economy in America.

Mr. Bendis has been appointed to selected national innovation related organizations and committees that include the White House U.S. Innovation Partnership Advisory Task Force and Co-Chair of the Small Business Innovation Research Committee; the National Governor's Association, Science and Technology Council of the State's Executive Committee, the State Federal Technology Task Force, the National Academies committee on "Competing in the 21st Century: Best Practices in State and Regional Innovation Initiatives"; National Academies National Research Review of an Assessment of the SBIR Program; National Institute of Standards and Technology Manufacturing Extension Partnership National Advisory Board; U.S. Small Business Administration's Angel Capital Electronic Network Board of Directors; American Academy for the Advancement of Science—Nominating Committee and the American Association Research Competitiveness Program Advisory Committee; Council on Competitiveness—Clusters of Innovation Committee.

Mr. Bendis has also served as a board member and representative to the National Association of State Venture Funds—Founding Board member and Executive Committee member; American Society of Mechanical Engineers—Strategic Innovations and Initiatives Committee; State Science and Technology Institute—Founding Board member and Executive Committee member; Eisenhower Fellowships Nominating Committee and the Ernst and Young Entrepreneurial Institute as a national/regional Judge.

Mr. Bendis continues to provide global consulting services to several international organizations including the International Science Parks and Innovation Expert Group, the United Nations, NATO, UK Trade and Industry, European Commission, French Embassy, the German Marshall Fund, and others global ventures.

Mr. Bendis also founded and served as the founding President and CEO of Innovation Philadelphia, a 3 state regional public/private partnership dedicated to growing the wealth and workforce of the Greater Philadelphia Region. Innovation Philadelphia managed a portfolio of programs in four distinct areas: Direct Equity Investment/Financing Assistance; Technology Commercialization; Global/Regional Economic and Workforce Development; and Market Research and Branding. Mr. Bendis is on the IP Board of Directors.

Previously, Mr. Bendis successfully leveraged a career in the private sector (with Quaker Oats, Polaroid, Texas Instruments, Marion Laboratories and Kimberly Services) and the venture capital industry (RAB Ventures) to lead the Kansas Technology Enterprise Corporation. As its president and CEO, he developed KTEC into a globally recognized model for technology-based economic development. Mr. Bendis also successfully built an Inc. 500 healthcare software company, Continental Healthcare Systems, Inc., which he took public on NASDAQ and later sold to an international conglomerate. In addition, Mr. Bendis manages his own angel investment fund.

Ethan Byler

Ethan Byler is Keystone Innovation Zone Coordinator at the Pennsylvania Biotechnology Center in Doylestown, PA. The Pennsylvania Biotechnology Center is a business incubator focused on translational research and business development with specializations in diagnostics and therapeutics for infectious diseases, hepatitis, and cancer. The Keystone Innovation Zone is designed to harness the knowledge of partnering institutions of higher education, private industry, and government resources to nurture and assist early-stage technology companies. Ethan's responsibilities with the Zone include business development, technology transfer, and working with the Regional Biotechnology Council.

Mr. Byler formerly worked for a consulting company focused on technology-based economic development in Washington, DC, New Economy Strategies LLC. His work there included management of regional innovation and growth projects, initiatives focusing on capital formation and entrepreneurship, rural economic development and the design of government led interventions in technology and innovation-based economic development. He has worked on strategies in Pennsylvania, New Jersey, New Mexico, Alabama, Kentucky, Connecticut, Utah, North Carolina, Michigan and Colorado.

Prior to joining NES, Mr. Byler was an Analyst with the Federal Funding Programs at Innovation Philadelphia where he provided technical support on grant applications, business plans, and the presentation materials of early-stage companies attempting to secure financing through private investment or Small Business Innovation Research grant.

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ENDNOTES

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