



Building BRIDGES

Between Academic Institutions, Business and
Government to Bring Innovation to the Marketplace

*Documentation of Best Practices in Academic and Corporate
Collaboration from New Jersey and Other Regions*

The NJPRO Foundation under the direction of Chair Charlene Brown wrote this report with research support being provided by MEP Consulting.

NJPRO is grateful to former Congressman Bob Franks for his vision and encouragement to look into this issue. We dedicate this report in his honor.

The NJPRO Foundation invites you to join the public dialogue on this report beginning July 2010 at www.njprofoundation.org.

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NJPRO wishes to acknowledge Christopher Emigholz, a former Trustee, for all of his hard work and dedication on this report as well.

Cover background graphic was created in part at www.wordle.net.

Individuals are encouraged to cite this report and its contents. In doing so, please include the following attribution:

NJPRO Foundation on BUILDING BRIDGES BETWEEN ACADEMIC INSTITUTIONS, BUSINESS AND GOVERNMENT TO BRING INNOVATION TO THE MARKETPLACE; DOCUMENTATION OF BEST PRACTICES IN ACADEMIC AND CORPORATE COLLABORATION FROM NEW JERSEY AND OTHER REGIONS, Trenton, NJ: NJPRO Foundation, June 2010.

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A REPORT FROM



**EXECUTIVE
SUMMARY**

Executive Summary

NJPRO's newest report, *Building Bridges Between Academic Institutions, Business and Government to Bring Innovation to the Marketplace*, shows that a critical part of New Jersey's economic development is the research and development provided by the State's institutions of higher education. The economy today has become more reliant on innovation to drive its growth, especially with New Jersey's high-tech economy, so colleges and universities need to collaborate with business to help meet their strategic and research needs. Higher education institutions must serve as the foundation for research to support innovation.

The research in *Building Bridges* was conducted by independent researchers for The New Jersey Policy Research Organization (NJPRO), the policy-research affiliate of the New Jersey Business & Industry Association. It followed up one of the key findings of NJPRO's July 2008 report entitled *Economic Policies and Solutions: Making NJ A Better Place for Doing Business*. In order to be competitive, that report pointed out that New Jersey should encourage innovation in our technology-driven economy through increased research and development funding at State colleges and universities and cultivating academic partnerships with private industry. It includes in-depth interviews with experts on this topic from academia, private industry, government and nonprofits, as well as background on why higher education-business partnerships are so critical, models on how to collaborate, a description of what is currently going on in New Jersey, examples from other states, and recommendations to upgrade New Jersey's efforts.

Other states are pursuing collaboration and innovation more aggressively than New Jersey, and if New Jersey does not catch up to them, its economy and its growth potential will lag behind. An example of this is the fact that New Jersey ranks 27th in the nation (14 percent below the national average) in the percent of its university research funded by private industry. Another example is that New Jersey ranks 18th in the nation in total university research and development expenditures, behind neighboring states and similarly-situated states that we compete with such as New York, Pennsylvania, Maryland, Massachusetts, Virginia, North Carolina, Georgia and Michigan. If a business like Bristol-Myers Squibb chooses to expand in one of the states at the forefront of higher education-business collaboration like Massachusetts (example mentioned on page 22 of this report), New Jersey State government will lose the opportunity to gain revenue from new jobs and business expansion. New Jersey's colleges and universities will lose the ability to attract top research talent and

dollars to universities in Massachusetts, and New Jersey businesses will continue to fall behind other states in creating new products. Businesses may even follow Bristol-Myers Squibb in expanding elsewhere.

While New Jersey needs to do more to spur innovation, the State is not bereft of work in this area. Governor Christie's transition reports discuss the need for these types of partnerships and economic growth appears to be a priority for his administration. The legislature has already become involved in promoting higher education and business working together for economic development. An incubator network and several non-profits already exist in New Jersey to drive innovation.

But, unfortunately, this is not enough. Changes need to occur in New Jersey to better position the State's innovation pipeline. Examples from California, Maryland, Texas, Ohio, Massachusetts, New York and Utah are provided to help New Jersey.

To drive innovation and growth, collaborations need to occur in a variety of ways. NJPRO recommends that:

- 1** the Governor drives the message that academic, industry, nonprofit and government leaders need to work together to identify their strategic needs and create a technology roadmap,
- 2** an existing State agency be empowered to build and maintain a database of university research and development efforts and resources,
- 3** an existing State agency be empowered to serve as the liaison/interface between higher education and business,
- 4** the State should investigate innovative ways to bridge the funding chasm between early research support and later business support,
- 5** the State should foster the development of an entrepreneurial culture so that future scientists better understand what it takes to start a business,
- 6** the Governor's proposed New Jersey Partnership for Action should utilize higher education-business partnerships to attract new businesses to the State, and
- 7** an existing State agency should be tasked to optimize the amount of federal dollars that New Jersey brings in to the State for research.

A REPORT FROM



**BUILDING
BRIDGES**

Building Bridges

Higher education is a critical part of many states' economic development strategies. Whether it is in creating and attracting the brainpower and degrees, training the workforce, employing thousands of residents, creating a wealthier population, creating tourism revenue, or the research and innovation they foster, higher education significantly impacts the economy. Yet, many states better engage and foster higher education institutions' role in economic development than New Jersey. This is a glaring deficiency of past economic growth strategies for the Garden State. Since New Jersey's economy is at the higher end of the knowledge economy than other states, innovation needs to be the economic growth driver and higher education research needs to be the emphasis of its role in economic development.

The objective of this report is to advance innovation in the State of New Jersey to fuel economic growth. The report does that by investigating best practices in the area of academic and corporate collaboration, understanding key hurdles and success factors involved in successfully executing these partnerships, and providing recommendations on how effective collaborations can be initiated between academia and industry.

- Given the current economic environment and the broad-based reduction in available funding at the federal, state, academic and corporate levels, this report seeks to develop recommendations that are not only innovative and cost-effective, but also leverage existing efforts within the State of New Jersey.
- Based on interviews with multiple stakeholders within the State, it is clear that significant attention and effort is already being focused on improving academic/industry collaboration. Many of these efforts have proven to be highly successful and will be highlighted in this report.
- One overriding objective of this report is to provide a series of recommendations that are not only actionable but appropriate for the State of New Jersey to undertake. It is recognized that to be effective these recommendations need to focus policy action on areas that make a positive contribution to academic/industry partnerships while not interfering with existing successful collaborative efforts in the State.
- NJPRO has developed a list of seven (7) recommendations that we think are both appropriate and achievable. These recommendations were developed directly from the feedback we received through our in-depth interviews with academic, business, government and non-government organization leaders.

Background on this Report

In July 2008, NJPRO released a report, *Economic Policies and Solutions: Making NJ a Better Place for Doing Business*, which introduced a set of actions and policies to improve the State's business climate. NJPRO surveyed business leaders, compared the ways other states retain and attract firms, and recommended short- and long-term policies New Jersey can adopt to make its business environment friendlier. NJPRO formed the basis of these recommendations from the collected perceptions of New Jersey's business leaders, their innovative ideas for growing business in the State, and a review of best practices in other states.

The report prioritized five policy recommendations in which Recommendation #2 was to:

Encourage innovation in our technology-driven economy through increased research and development funding at State colleges and universities and cultivating academic research partnerships with private industry.

Since the publication of our *Economic Solutions* report, New Jersey has entered into a deeper recession and faces high unemployment rates. Its business climate is in even direr straights and the need for innovation and economic growth is needed more than ever. Capitalizing on our higher education system and industrial base, the State has the opportunity to link academia and business together to help jumpstart innovation. Furthermore, there is the potential to work to improve the amount of federal and private funding our colleges and universities receive through these partnerships.

Currently in New Jersey our universities are not feeding the innovation pipeline at a rate as great as other states. Private industry in New Jersey is the leading source of research and development (R&D), largely due to the pharmaceutical industry. While New Jersey ranks in the 1st quartile for industry-performed R&D, we lag in academic R&D spending. New Jersey must strive to increase academic R&D spending and diversify the areas of health, science, engineering and technology where these R&D dollars are spent in order to better compete with the challenging global economy we face.

The objective of this report, *Building Bridges Across Academic Institutions, Business and Government to Bring Innovation to the Marketplace*, is to further investigate Recommendation #2 by studying best practices in the area of academic and corporate collaboration, understanding key hurdles and success factors involved in successfully executing these partnerships, and providing recommendations on how effective collaborations can be initiated between academia and industry.

To gather the necessary data and information to produce a set of recommendations, several approaches were employed. First, research was conducted using existing published information on this topic area, including, but not limited to, two reports issued by the National Research Council: *Government-Industry Partnerships for the Development of New Technologies and Understanding Research, Science and Technology Parks: Global Best Practices*. Second, a series of in-depth interviews were conducted with a broad range of individuals from universities (both in and out of New Jersey), private industry, state agencies and non-government organizations. These interview participants were selected based on their front-line experiences with academic and corporate collaborations and their extensive experience in initiating and managing these collaborations towards successful outcomes. The information exchanged during these interviews and the ideas expressed by the individuals participating provide much of the basis on which the recommendations in this report were formulated. Finally, NJPRO developed several conceptual frameworks to organize the information and to provide the context for understanding the dynamics of different academic/corporate collaborations.

Based on interviews with multiple stakeholders within the State, it is clear that significant attention and effort is already being focused on improving academic/industry collaboration. Many of these efforts have proven to be highly successful and will be highlighted in this report. The concept of academic/industry collaboration is neither novel nor untested in New Jersey; multiple parties (government, academic, business and non-government organizations) have approached these collaborations in different ways and have experienced common successes and failures. This report will codify these successes and failures into a set of collective best practices and include the experiences of other states.

It is well documented that government involvement, both at the federal and state levels, can play a positive role in the development of effective academic and industry partnerships. The conclusions of the National Research Council's committee on *Government-Industry Partnerships for the Development of New Technologies* found that "partnerships constitute a vital positive element of public policy, helping to address major challenges and opportunities at the nexus of science, technology and economic growth."¹ NJPRO believes that New Jersey government can play a role in fostering and supporting such partnerships in the State and has crafted recommendations that it believes will enable these partnerships to precipitate sustained economic growth and job creation.

Why We Need Collaboration and the Resulting Innovation

To achieve the desired level of innovation that will help drive New Jersey's economy, there must be a true partnership between the State, business and higher education

where all are invested, all are engaged and all are benefitting. If the State of New Jersey fails to catch up to other states and nations in these endeavors, we will ultimately lose out on the economic growth and the budget help that would result.

Additional evidence of the need for innovation can be seen in the report, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Future*, initiated by Congress and completed by the National Academy of Sciences, National Academy of Engineering and the Institute of Medicine of the National Academies.² Congress was interested in seeing what the federal government can do to promote scientific and technological advancement. This report pointed out how critical it was to take an active role to maintain our competitiveness, and it discussed higher education-business partnerships as one way to do so. Specifically, it called for improved structures and additional tax incentives to promote those partnerships.

The State of New Jersey, its business community and its institutions of higher education need to collaborate for innovation, as was recommended for the federal government. Through NJPRO's prior research, the *Gathering Storm* report and a quick review of where various state economies find themselves in the current difficult economic times, it is clear that innovation is a key to economic growth and improving State budget conditions.

The State needs innovation and business-higher education collaboration because they will help grow the economy and, accordingly, its tax revenues. It has gotten harder and harder for states to spend or cut their way out of difficult budget situations, but economic growth through innovation can be a way to save the State budget from looming disaster.

Business needs innovation and collaboration with colleges and universities because that will be where the growth is in the 21st century. It is harder for American businesses today to compete in terms of price and to grow with merely more sales and market share, making innovation the desired way to grow.

Colleges and universities need innovation and collaboration with business because they need to demonstrate their relevance to economic growth. In a State where higher education aid has been less than desired for years and in a time where no entity can expect more support from the government, New Jersey's colleges and universities must show how they can grow the economy to justify their State government support.

Understanding How Academic/Industry Partnerships Drive Growth

In order to put into context any discussion of academic and industry collaboration, and exactly how it can grow the economy, NJPRO has developed four types of collaboration that could lead to economic growth and job creation in the State of New Jersey. It is important to recognize that these four growth drivers are not necessarily mutually exclusive. Equally important is the fact that multiple drivers can be leveraged simultaneously by different parties to achieve the objective of economic growth and lasting job creation.

1 Direct Academic/Corporate Collaboration

Definition: Collaboration between academia and private industry that may take numerous forms, including grants/fellowships; joint initiative/joint participation; sponsored research or direct university/corporate collaboration (see detail on University/Corporate Collaboration models).

Overall Benefit: Job growth

Benefits to University: Increased revenue, development of key skills, access to corporate know-how.

Benefits To Company: Access to new technologies, workforce development and goodwill.

Example: UMDNJ and Novartis working together to build clinical trial capabilities is an example of a direct partnership. If successful, this program would be a significant source of sustainable revenue.

2 University Based Start-Ups

Definition: Faculty or student-developed innovation that is spun out of a university as a start-up company. The start-up may then go into the incubator network if it needs additional technical, business plan or scaling assistance.

Overall Benefit: Job growth – NJ Commission on Science and Technology (NJCS&T) estimates that 87 percent of the start-ups that go through its 14 incubator facilities stay in New Jersey upon “graduation.”

Note: The State ranks 16th in the number of firms originating from colleges and universities set against the funding these institutions receive. (Source: CFED, 2006 Development Report Card for the States)

Examples: Princeton Power Systems, Inc. was started in 2001 during college when co-founders Darren Hammell and Erik Limpaecher won the Princeton University Business Plan Competition. The company designs and manufactures advanced power electronics. Within months of incorporation, they received angel investment as well as State grant money. With several hundred employees, a dorm room start-up has transferred into a viable business.

3 University Growth/Expansion Infrastructure

Definition: Funding through various sources (e.g. corporate collaboration, federal or state research funding, NIH grants, etc.) that leads to the university building new research centers or capabilities.

Benefits: Job creation

Benefits to University: Lower capital expenditure, development of skills, attractive for recruiting.

Benefits To Company: Access to new equipment, labs and workforce development.

Example: The Stem Cell Institute of New Jersey is a joint effort of UMDNJ-Robert Wood Johnson Medical School and Rutgers University to focus world-class research on stem cells to treat and cure diseases. The Institute was given seed funding from the State. Since the Institute's inception, staff researchers have won grants to further research. Additionally, the university research team has partnered with pharmaceutical and bio-tech companies.

4 Attraction of Corporations to the State Based on University Assets

Definition: Corporations are incented to move operations or develop operations in New Jersey because of a specific academic area of expertise or assets/facilities that a university may have that creates a competitive or strategic advantage for the company.

Overall Benefit: Job creation

Examples: A large food company from Europe that makes gluten-free bread with production facilities in Italy looking to make an entry into the US market. This company is working with Rutgers Food Innovation Center and, if successful, could lead to a manufacturing facility in the State that translates into 100 jobs.

Collaborative Models

In addition to the four growth drivers, it is worthwhile to briefly explore the different forms that academic/industry collaborations can take. It should be noted that there is no single best model and that certain models are more appropriate for certain situations. It is not uncommon for an academic institution or company to engage in several, if not all, of the collaborative models described below.

- **Grants/Fellowships** – funding provided directly by a corporation to a professor or graduate student to advance an area of science.
- **Joint Initiative/Joint Participation** – joint industry project (multiple companies in similar field) jointly fund a project to advance a particular area of technology or science.
- **Sponsored Research** – company directly funds a university and pays for research to solve a specific problem.
- **Direct University Collaboration** – university partners with a single corporation to advance an area of science.
- **Corporate Sponsored Awards, Entrepreneurship and Mentoring** – corporation sponsors an award to be given to student-developed technology or start-up, or corporation volunteers the time of professionals to assist students in developing start-up or innovation.

Recommendations

One overriding objective of this report is to provide a series of recommendations that are not only actionable but appropriate for the State of New Jersey to undertake. It is recognized that to be effective these recommendations need to focus policy action on areas that make a positive contribution to academic/industry partnership while not interfering with existing successful collaborative efforts in the State. With this perspective in mind, it is the hope that these recommendations will strengthen the existing efforts and provide much needed State support to make these initiatives not only successful in the long term, but also enable the State to help foster the spread of best practices in universities and corporations. NJPRO's intent is to champion tested policies and to err on the side of caution, emphasizing that new policies, laws and regulations should all be analyzed for their true costs and benefits. We also recognize that the State is currently in a fiscal crisis and should utilize existing resources.

To that end, NJPRO recommends that the New Jersey Partnership for Action identifies one of its three organizational elements, Choose New Jersey, New Jersey Business Action Center (NJBAC) and the New Jersey Economic Development Authority (EDA), as the State agency to best help implement our recommendations. While the New Jersey Commission on Science and Technology (NJCS&T) has a mission to assist in these efforts, a broader reach can be found at the Partnership for Action. As the

newly appointed hub for economic development activity and with its component organizations acting as recruiters for business to the State, the Partnership for Action is poised to match companies with institutions, develop innovation in its tech centers, and provide financing opportunities. It is critical that institutions are a key partner in the recruitment of new businesses and help make recommendations to bring innovation to the research and development sector. The EDA, Choose New Jersey and NJBAC all could compliment the State's efforts and work to attract out-of-state companies to New Jersey.

Recommendation #1

Governor Christie should take the lead to drive the message of academic, industry, venture capital, government and non-government leaders working together to identify their strategic needs and create a technology roadmap for the State of New Jersey.

SUMMARY:

- Recognition by the Governor's administration that the State can be a catalyst for change and that this type of partnership is a priority for economic growth. To that end, the Governor convenes key stakeholders to develop a process for creating a technology roadmap.
- Provide a structured setting within the Partnership for Action where academic and business leaders can build relationships, make connections and develop technology roadmap(s) for the State of New Jersey. Each institution needs to take a leadership role in helping to make this happen with the Partnership.
- Roadmap(s) should focus efforts on technology areas that best leverage the existing intellectual and physical assets of the State and provide NJ with a source of competitive advantage.
- Focus on creative ways to get universities, industry and government to work together to pursue federal and foundation grant opportunities. This can be organized as a quarterly event and organized by the Partnership for Action.

OVERVIEW:

Governor Christie has many challenges on the horizon as the State prepares to emerge from the economic recession that plagues the nation. While the State suffers from a predicted budget deficit in the billions of dollars, innovation can be the key to developing new industries within our economy. There has to be recognition that the State can serve as a catalyst to bring together the best from academia with the marketing savvy of the business community. Within NJPRO's *Economic Growth* report, we featured several states where the Governor made it a priority to bring together key stakeholders to leverage resources and bring about market transformation. NJPRO suggests the new administration convene college/university presidents and industry leaders to discuss what's going on, build it from the top down, and then develop a forum to create a technology roadmap.

We have learned that as State government looks to investment opportunities to stimulate job creation and lasting economic growth, it often focuses on a particular technology area (currently there is a strong emphasis on life sciences with organizations such as BIO1) to devote resources and assistance. While well-intentioned and successful, this process often develops without input from the parties that would have a direct role in executing the technology vision. Universities, corporations, venture capitalists, local government and non-government organizations all play a role in successfully translating the economic growth vision into reality. Currently there are several types of group interactions and forums that take place periodically across the State, but they often are narrowly focused or have only a few of the necessary parties in attendance. NJPRO recommends extending this concept to the State level and bringing together multiple parties to provide input regarding the direction the State takes to promote technology development. Having this input would utilize the strengths of existing university know-how and expertise, the business and market understanding of corporations, the return on investment perspective of venture capital, and the resources of the non-government organizations to provide a technology roadmap—one sound in its economic growth potential and actionable.

OPPORTUNITIES: BUILDING ON CURRENT EFFORTS

Numerous forums currently exist in New Jersey that bring together academia, industry, venture capital, non-government organizations and State government in different settings with different objectives.

Successful models, such as the one employed at UMDNJ under the direction of Dean Kathy Scotto, Vice President of Research, employ a forum to bring different parties together to solve specific scientific problems or initiate programs. UMDNJ has adopted a focus group approach where they pull in deans from Princeton, Rutgers and NJIT, as well as State and local officials and pharmaceutical and advocacy groups. The interconnections and relationships formed at these focus group meetings have created an ad-hoc network of people that work together. NJPRO recommends using this successful model and others from around the State and creating a State-sponsored group.

Recommendation #2

Empower an existing State agency or non-government organization to build and maintain a central database of current university research and development efforts, intellectual assets, scientific capabilities and equipment.

SUMMARY:

- A centralized database of New Jersey academic R&D, intellectual assets, capabilities and facilities that companies can search to find an academic partner.
- Database could enable universities to understand parallel or additive efforts ongoing at other universities in the State so that collaborative cross-school initiatives might be recognized and facilitated.

- Database can be used as an effective marketing tool for universities similar to the Industrial Liaison Program at MIT where resources are responsible for identifying technology and marketing it to companies who pay for participation (effectively paid marketing). Other institutions like Partners Healthcare (MA) have internal resources that are paid liaisons that search out technologies within the research groups and serve as ambassadors to industry. In addition, they are charged with creating connections and identifying potential collaboration opportunities.
- Industry benefits from access to a broad set of information across multiple disciplines and skill sets at the universities, making it cost effective for them to find the resources they need efficiently.
- Database development to be conducted cost effectively by using existing resources at one or more universities (e.g. database development could be a semester project for a group of computer science graduate students).

OVERVIEW:

One of the more significant challenges universities and companies face when it comes to initiating a partnership is the lack of transparency of activities between parties. Often universities and corporations conduct their research in operational or functional silos where little visibility on the research exists even within their respective larger organizations.³ One obstacle those universities willing to partner often face is effectively marketing their existing research or research capabilities to the outside corporate world. Even the largest and most successful universities at academic/industry partnerships like MIT and Johns Hopkins spend considerable effort identifying and marketing to prospective partner companies.⁴

Similarly, corporations often have no clear insight into a university's research efforts and whether those efforts may be of interest to them. Furthermore, private industry must keep its own R&D efforts confidential to preserve trade secrets and maintain competitive advantage. They are therefore unlikely to be willing to participate in a collection of their R&D initiatives into a third-party database. Larger corporations may be more effective at scanning for applicable research at the university level, but this capability is not shared across all of the corporations that look to partner with universities. Having the Commission manage a database would allow for our State college/universities to showcase their R&D to companies. To quote the old adage, professors have to "publish or perish." With that mindset, it is important that our universities develop into research powerhouses to attract top academic talent. If the State can build on existing programs that are nationally renowned, than attracting top talent becomes easier. Sharing what is going on within our universities helps to elevate the research. Translating innovation into the marketplace further advances professors beyond the realm of academic journals. Similarly, this would also help other agencies such as the Partnership for Action and its sub-organizations, the EDA, Choose New Jersey and NJBAC, to recruit and retain private industry by helping to highlight what

is being done at our universities without jeopardizing any trade secrets.

NJPRO has identified the opportunity to aggregate data on the collective research efforts, intellectual assets, scientific capabilities and equipment of the universities within the State of New Jersey. This proposed database would benefit both the university and corporation in several ways. The university can showcase its research and intellectual assets in a cost-effective manner, marketing itself to prospective corporate partners. Researchers in different universities across the State can identify colleagues that they may be able to collaborate with or make researchers aware of facilities and equipment that they may be able to utilize. For corporations, this database would enable them to efficiently analyze different areas of research to find prospective collaboration partners.

OPPORTUNITIES: LEVERAGING UNIVERSITY CAPABILITIES

It is recognized that although such an effort as described above has significant challenges, NJPRO believes that innovative and cost-effective ways can be investigated to achieve this objective. To address any challenges, NJPRO believes that with both State and university support, access to and flow of information through designed processes can be adopted to collect and maintain the necessary data. This would require the full participation of the universities and their respective offices to be successful. Within several of the State universities resides the necessary technical knowledge to implement such a database system. NJPRO recommends leveraging these resources to design and build the database and have a data collection system that would support this database. Additionally, NJPRO recommends looking at what other states have done to capitalize on money available from the American Recovery and Reinvestment Act (ARRA) to see what we can leverage as we build upon our current resources. For example, in Utah, the Utah Science, Technology and Research Initiative (USTAR) was allocated \$33 million to be used on research teams, faculty research for commercialization of breakthroughs, research and technology outreach programs, and catalyzing commercialization through Utah public institutions. There may be opportunities to apply for federal money to help jumpstart these efforts.

Recommendation #3

Empower the agency in Recommendation #2 to serve as the interface between the collective academic assets of the State and corporations that want to do business with those universities.

SUMMARY:

- To administer the database as set forth in Recommendation #2, empower an existing agency or organization to maintain the database on an ongoing basis. NJPRO recommends that this agency would be within the NJ Partnership for Action.

- The agency will also serve as the matchmaker between industry and academia and as a hub for cross university contacts.
- The Partnership for Action's efforts will not replace existing offices at universities (e.g. technology transfer) but will be additive and the first point of contact between two prospective parties interested in a collaboration.
- An advisory board made up of university and industry leaders would meet periodically to help support the Partnership for Action's efforts in administrating this database and matchmaking between parties.
- A resource within the Partnership for Action would be appointed to administer the data collection from universities and find creative ways to get data into the system (see note on incentives).

OVERVIEW:

In addition to the issue of transparency as highlighted in Recommendation #2, there is the simultaneous challenge of effective management and facilitation of the match-making between university and corporation. NJPRO proposes that in conjunction with the development of the common database of intellectual assets, the agency responsible for data collection and integration also be charged with the role of facilitating the interface between academia and industry.

Today, most of the matchmaking between the university research effort and a corporate research effort is conducted on an ad-hoc basis. Often partnerships are initiated when a faculty member and corporate representative meet at a conference or symposium and establish a relationship. While these relationships often lead to successful collaborative efforts, they do not occur in a systematic fashion and are not based on a sustained process. Since the Partnership for Action will be looking to attract and grow business, this database would give the agency an additional tool to recruit. However, the Partnership should work with the NJCS&T to make sure all State agencies are assisting in the process.

NJPRO recommends that a more centralized function be created to provide a mechanism for bringing these two parties together. Effectively, this agency would be the

Note on Incentives:

It is not unusual for multiple parties within a larger organization to miss opportunities for collaborative efforts. Throughout this report we count on two sources to encourage more collaboration between independent institutions.

First is activation energy and administrative support from the Partnership for Action in the body of an entrepreneurial leader.

Second, follow up and communication from the senior Partnership for Action leader, recognizing and praising effective collaboration to improve participation.

starting point for a corporation interested in working with a university in New Jersey. The corporation, with the assistance of agency staff, would be able to search for applicable research and then be introduced to the appropriate individual or office at the university. Similarly, when corporations do participate in the database, universities can use this agency to identify companies that might have an interest in their research.

OPPORTUNITIES: LEVERAGE EXISTING ORGANIZATIONS AND EFFORTS

In order for this agency to be effective, the State needs to develop the new procedure with a few parameters in mind. First, the agency should not be designed to replace existing Industrial Liaison⁵ programs at the universities but should be seen as additive to those existing efforts. Second, participation in the database and associated program needs to be linked with existing research programs to highlight what is being done in the tech transfer arena. Third, the management of this interface agency should be composed of individuals with diverse backgrounds from the academic, scientific and business world. Finally, to be effective, the agency should appoint an experienced administrator familiar with the academia and business world and with strong leadership skills.

Recommendation #4

Investigate innovative ways to bridge the funding chasm between university-supported early stage research and later stage business support as provided by the existing State-sponsored incubator network.

SUMMARY:

- Early stage companies are by nature high risk; they are therefore not attractive investments for most prospective lenders.
- Funding, while important to these early stage companies, is not the only key to success; access to know-how, facilities and equipment are often of equal importance.
- Leveraging existing programs in the State like BEST at Rutgers and PRISM at Princeton enable those start-ups to get the help they need to move forward.
- Connecting small business/start-ups with universities can be a function supported by the agency and database as laid forth in Recommendations #2 and #3.
- Establish tax credits for angel investors.

OVERVIEW:

Money is at the heart of all research: who is funding it, what the return will be, how much is available to complete a project, etc. Currently in New Jersey, there is some funding for research but it is not as leveraged as it could be. NJPRO also acknowledges that State funding for anything is uncertain in the current difficult economy, but it is important to prioritize innovation and re-allocate funds where possible towards this critical growth driver. While there is a finite amount available for any given subject area, New Jersey has not fully explored federal grants. Similarly, a key component to having successful collaboration is a healthy investor community with both venture

capitalists (VCs) and angel networks that can provide bridge funding to small start-ups coming out of the universities. Universities and small start-ups often suffer from a common foe: matching dollars. In order to qualify for county, state or federal grants, there is many times a requirement to have matching equity.

Often, entrepreneurs active in the earliest stage (pre-revenue) start-ups in New Jersey have few funding options outside of Federal SBIR and ATP grants. While the SBIR and ATP award programs can be effective, there is no way that all entrepreneurial activity can be adequately funded. Undergraduate and graduate students involved in companies spun out of universities often have the support of their institutions until graduation. In the case of faculty, this support might continue for a more extended period of time. Many of these companies are ineligible for entry into one of the State of New Jersey’s 13 incubators because they may have unproven technology or other significant gaps in their business plan. In addition, early stage start-up companies are by nature high risk. Therefore, they do not often attract attention from the venture capital community, which is increasingly looking to later stage “proven” companies to add to their portfolios. While angel investment can play a valuable role in providing funding to these university-spawned start-ups, there will always be companies that go unfunded.

Ranking of Top 5 NJ Academic Institutions by Funding Source

R&D EXPENDITURES AT UNIVERSITIES AND COLLEGES, RANKED BY ALL R&D EXPENDITURES, BY SOURCE FUNDS: FY 2007

(Dollars in thousands)

Rank	Institution	All R&D Expenditures	Federal Government	State and Local Government	Industry	Institution Funds	All other Sources
1	John Hopkins U., The	\$1,554,103	\$1,362,836	\$4,870	\$27,453	\$76,474	\$82,470
2	U. CA, San Francisco	\$842,840	\$467,402	\$24,578	\$45,659	\$145,705	\$159,496
3	U. WI Madison	\$840,672	\$469,076	\$32,780	\$25,090	\$238,934	\$74,792
4	U. CA Los Angeles	\$823,083	\$488,846	\$12,981	\$39,731	\$161,738	\$119,787
5	U. MI All Campuses	\$808,731	\$577,201	\$6,850	\$36,282	\$145,970	\$42,428
6	U. CA, San Diego	\$798,896	\$475,708	\$26,072	\$44,768	\$132,658	\$119,690
7	Duke U.	\$781,843	\$459,122	\$17,895	\$181,072	\$79,872	\$43,882
8	U. WA	\$756,787	\$620,375	\$10,692	\$63,560	\$41,650	\$20,510
9	OH State U. All Campuses	\$720,206	\$313,242	\$112,272	\$142,177	\$102,158	\$50,357
10	Stanford U.	\$687,511	\$534,787	\$6,002	\$54,181	\$46,522	\$46,019
11	PA State U. All Campuses	\$652,144	\$370,789	\$69,662	\$93,535	\$116,041	\$2,117
12	U. PA	\$648,247	\$449,687	\$7,542	\$42,427	\$63,310	\$85,281
13	Cornell U. All Campuses	\$641,936	\$367,094	\$71,223	\$23,398	\$116,868	\$63,353
14	U. MN All Campuses	\$624,149	\$337,966	\$56,877	\$29,432	\$105,379	\$94,495
15	MA Institute of Technology	\$614,352	\$476,318	\$689	\$81,570	\$10,213	\$45,562
57	Rutgers, The State U. NJ All Campuses	\$311,612	\$135,933	\$33,205	\$9,599	\$99,216	\$33,659
72	U. Of Medicine and Dentistry NJ	\$236,834	\$126,101	\$14,640	\$17,395	\$53,969	\$24,729
92	Princeton U.	\$188,732	\$119,171	\$1,332	\$4,822	\$52,392	\$11,015
135	NJ Institute of Technology	\$88,699	\$41,330	\$5,289	\$965	\$29,458	\$11,657
219	Stevens Institute of Technology	\$25,684	\$22,809	\$525	\$1,668	\$682	\$--

Source: 2007 National Science Foundation and MEP Consulting analysis

Looking at the chart, one can see that nationwide our universities are competing for R&D expenditures. However, if federal or industry dollars are reviewed, there is a great opportunity for growth in those two sectors. With Wall Street in our backyard, there is an opportunity to pull in venture capitalists, as well, to help meet this goal.

Several innovative approaches and programs exist in New Jersey to support these early stage companies. NJPRO recommends taking the knowledge gleaned from these efforts and applying them in a broader scale.

OPPORTUNITIES: SUCCESSFUL MODELS TO LEARN FROM

BEST⁶: The Rutgers Business, Engineering, Science and Technology (BEST) Institute is an exciting new collaboration between the Rutgers Business School and the Vice President of Research. Participating schools include the School of Law, School of Engineering, School of Pharmacy, School of Environmental and Biological Sciences, and the School of Arts and Sciences.

BEST's mission is twofold:

1. To commercialize the innovation stream produced by Rutgers University faculty and students.
2. To educate and train faculty and students in the commercialization of innovation.

BEST identifies commercially viable Rutgers innovations and, through the BEST venture fund, creates start-up companies around these innovations. BEST then finances, incubates and nurtures these companies so that they become viable enterprises.

BEST will integrate students and faculty into its operations and provide entrepreneurship-oriented education and training through experiential learning that spans the gamut of intellectual property commercialization, from lab to marketplace.

PRISM⁷: The Princeton Institute for the Science and Technology of Materials (PRISM) is an interdisciplinary research center at Princeton University. Its mission includes graduate and undergraduate education and research, which will have a long-term impact on society. The key element of PRISM is the integration of the sciences and engineering with work spanning from fundamental theory through applications. PRISM interacts closely with industry, government laboratories and other academic institutions.

Research in PRISM can be broadly categorized as falling into four main scientific directions: Quantum Materials and Structures, Large-Area Materials, Optics and Sensors, and Bio-Nano Interface. A guiding principle of PRISM is to not only deepen our strengths in traditional areas of materials science and photonics, but also to pursue emerging opportunities at the intersection of traditional fields. One exciting intersection is that between the communities of "hard materials," such as

semiconductors, and that of “soft materials,” such as organic or biological materials and soft condensed matter.

PRISM offers a formal undergraduate program leading to a Certificate in Materials in which students take core courses within PRISM and electives offered by departments and conduct research with PRISM faculty. At the graduate level, PRISM offers a multidisciplinary program in cooperation with academic departments. PRISM also conducts extensive educational outreach programs on several levels.

Research is supported by a wide range of government agencies (State and federal), industries and foundations. Programs of special note at PRISM include the Princeton Center for Complex Materials (PCCM), funded by the National Science Foundation Materials Research Science and Engineering Center (NSF-MRSEC) program; Princeton Center for Mid-InfraRed Technologies for Health and the Environment (MIRTHE), funded by the National Science Foundation Engineering Research Center (NSF-ERC) program; and the US-Africa Materials Institute, also funded by the NSF.

The relatively small size of Princeton University insures a close interaction between scientists and engineers across industrial and academic boundaries. Those outside of Princeton, especially industry, bring important long-term challenges and provide a path by which their discoveries and advances can be translated into practice to have a large impact on society. Such interaction is promoted by the two central research facilities. The Micro/Nano Fabrication Lab (MNFL) and the Imaging and Analysis Center (IAC) are multi-user facilities open to industrial collaborators, other academic institutions, industrial affiliates and joint research programs.

Recommendation #5

Foster the development of an entrepreneurial ecosystem through modifications to university curriculums adding additional business training into science programs.

SUMMARY:

- Provide university undergraduate and graduate students with more hands-on entrepreneurial and cross discipline training as part of their curriculums.
- Build and scale new successful programs like BEST, Rutgers’ Masters of Business and Science degree and UMDNJ’s Clinical Translational Initiative.
- Coordinate internships and co-op programs for students to begin working in companies in New Jersey. Gives students an opportunity to be exposed to industry while still in the classroom.

OVERVIEW:

The existence of an entrepreneurial culture and ecosystem at the university level is often cited as one of the leading contributors to the success of academic/industry

partnerships. Universities like MIT have been successful in commercializing intellectual property (IP) with corporate partners due to several key factors including: entrepreneurial spirit that pervades the institution, reputation for academic excellence, critical mass of researchers/research, and a willingness to work with private industry.⁸ In terms of entrepreneurial culture and teaching entrepreneurship what many thought leaders in the State would like to see is a strengthening of those existing entrepreneurial programs and have more hands-on experience.

OPPORTUNITIES: SCALE SUCCESSFUL PROGRAMS

This type of program is perhaps best demonstrated by three current efforts:

- UMDNJ - The Master of Science (MS) in Clinical & Translational Science is designed to train future team leaders in clinical and translational science research. The program consists of a combination of integrative didactic and hands-on educational experiences that provide students with a global, yet detailed, perspective on the complex continuum of translating hypothesis-driven basic research findings into clinically useful and commercially viable tests or treatments. Graduates of the program utilize the knowledge obtained to design and oversee programs, facilitate and manage collaborations, and lead

Fort Devens and Fort Monmouth

New Jersey has the opportunity to learn from Massachusetts who had a military base close and needed to redevelop the area. Capitalizing on the location near Harvard and MIT, the state was able to redevelop the base to attract new industries that collaborated with the nearby schools. New Jersey based Bristol-Myers Squibb was one of the companies that located a new facility at Fort Devens.

research teams in clinical and translational research. The MS degree in Clinical & Translational Science is awarded by the UMDNJ- Graduate School of Biomedical Sciences.⁹

- Rutgers - BEST program where students from the MBA and other programs actively work as part of their curriculum to build a business and create a start-up in the real world.

• Rutgers’ Master of Business and Science¹⁰: On December 14, 2009, the New Jersey Presidents’ Council approved the new Master of Business and Science (MBS) degree at Rutgers, The State University of New Jersey for the New Brunswick and Camden campuses. Newark approval is expected in early spring. The MBS degree is part

of a national movement of Professional Science Master programs that bring together master’s level study in science or engineering with “plus” courses in business and policy. Rutgers is the only university in New Jersey that offers a statewide Master of Business and Science degree with concentrations in areas such as Biomedical Engineering, Chemistry, Electrical and Computer

Engineering, Food Science, International Agriculture, Statistics and Biostatistics, and Sustainability. Spearheaded by Dean David Finegold of the School of Management and Labor Relations (SMLR), the new master's degree program involves an unprecedented number and level of partnerships at all three Rutgers campuses in Newark, New Brunswick and Camden.

The Professional Science Master's Program at Rutgers is a combination of an MS and MBA degree with 43 credits: up to 24 credits in the sciences and/or engineering and 19 credits in business. The business and policy component of the degree consists of core courses in finance and accounting, marketing, communication and leadership, management of science and technology electives, ethics and a capstone course, teaching entrepreneurship and intrapreneurship.

Recommendation #6

Push the New Jersey Partnership for Action and its three components (Choose New Jersey, EDA and NJBAC) to utilize higher education-business partnerships as an asset to attract and retain business in New Jersey.

SUMMARY:

- As the hub for all economic development activity, The New Jersey Partnership for Action should include innovation through higher education-business partnerships as a critical component of the State's economic development plans.
- Choose New Jersey should sell the State's higher education-business partnerships and innovation potential as it recruits businesses to come to New Jersey.
- The EDA should target its financing and incentives towards developing and fostering innovation through higher education-business partnerships.
- NJBAC liaisons shepherding businesses through State and local government agencies should include support in navigating higher education's R&D resources.

OVERVIEW:

Productive relationships between higher education and business are an important part of New Jersey's economic development engine. With the Partnership for Action serving as the umbrella organization of all New Jersey economic development activity, the Partnership and its three component organizations, Choose New Jersey, the EDA and NJBAC, must include this collaboration as part of their agenda. Choose New Jersey, a new not-for-profit corporation to help market the State, should have a board member or staff person to sell the different research and development capabilities of New Jersey's universities and how businesses can partner with them. As the financing component of the Partnership, the EDA will continue its prior role but should prioritize financing and incentives that lead to innovation. NJBAC will be made up of business liaisons that will help navigate government agencies for businesses, but navigating the State's colleges and universities for businesses looking to collaborate should be a part of the liaison's job.

OPPORTUNITIES:

- As the Partnership and two of its three components are new to the State and its economic development efforts, it is important to quickly implant into their culture this concept of innovation through higher education-business collaboration.

Recommendation #7

New Jersey higher education institutions need to better leverage federal dollars so that we can bring more dollars into the State.

SUMMARY:

- New Jersey ranks 18th in the nation in total university research and development expenditures behind neighboring states and similarly-situated states that we compete with such as New York, Pennsylvania, Maryland, Massachusetts, Virginia, North Carolina, Georgia and Michigan.
- Ranking 18th in total money spent on university research is unacceptable for a State with a high-tech economy, one of the most well-educated populations, a total population that ranks 12th and an income level that ranks 2nd.
- Bringing more federal dollars into New Jersey for research would obviously spur research, but it would also spur other research dollars from private sources, the State and the universities themselves.

OVERVIEW:

Corporations, private foundations and federal dollars are the major sources of academic research. While the United States spends more federal dollars on military research than any other country, they also invest in science, technology and social sciences. Every year there are billions of dollars up for grabs by America's colleges and universities through federal grant programs. Broken out into different academic disciplines, there is the opportunity for a school to develop in a niche specialty and attract world class researchers to their school or to garner dollars in general areas as well. New Jersey has not led the academic standings in terms of leveraged federal dollars. The State needs to examine what its institutions are doing to get those needed research grants and how they are attracting the leaders of innovation. Additionally, the State should be examining where schools can partner so that they could submit a joint application, or university research plans are made that establish a working relationship with the business community.

Schools also need to assess their staff's ability to write grant proposals. Increased training should be offered so that professors are aware of what is available and how to apply for a grant. But it should also be done in a way that examines what other support staff exist to help complete the grant application. For example, a leading scientist should not be fully removed from the lab completing paperwork if it could be delegated to a lab assistant. The colleges should also see what is feasible for building relationships with the NIH, NSF, etc., to bring representatives on campus to

meet faculty and see the research in action.

OPPORTUNITIES:

Within the past two years, there has been additional funding through the federal stimulus act that is giving universities a competitive edge in a shrinking economy. New Jersey needs to capitalize on this money along with the regularly recurring federal research dollars. New Jersey has been getting some federal research money for years, and must now make a concerted effort to ensure all universities are pursuing these federal opportunities and promote the best practices of universities that have success in finding federal funds. A State agency could be tasked to work with the academic community to make sure New Jersey is leveraging federal dollars to the best of our ability.

Best Practices on Collaborative Models

Best Practices in the area of academic/industry partnership have been well documented and will be reproduced below from a report issued by the National Research Council, including *Government-Industry Partnerships for the Development of New Technologies*. In addition to these well-researched and valid best practices, NJPRO conducted its own investigation of best practices through interviews conducted with academic, industry, and government and non-government leaders.

Build an Entrepreneurial Ecosystem

Entrepreneurship has not always been linked to a science degree. To help foster technological and scientific breakthroughs, it is necessary to start fostering an entrepreneurial culture. Utilizing the NJCS&T to develop that culture is one way to effectuate a Statewide feeling. However, it also has to be felt at the institutional level. At MIT for example, the university has been successful in commercializing IP with corporate partners due to several key factors including: entrepreneurial spirit that pervades the institution, reputation for academic excellence, critical mass of researchers/research, and a willingness to work with private industry. Multiple interviewees stressed the importance of having hands-on experience in developing a project and then taking it to market. In a September 2009 Business Week article¹¹, it was discussed how to teach PhD candidates marketing, finance, HR and product development skills so that scientists that passed these courses could be put in an incubator program and matched with funders. While

“In terms of entrepreneurial culture and teaching entrepreneurship, what I would like to see is a strengthening of those programs and having more hands-on experience. One idea is to take an existing university patent and have a course that builds the business around that patent. So the idea is to shift education more towards the practical from the theoretical.”

-Dr. Peter Reczak
Executive Director NJ Commission on
Science and Technology

some of our State schools are beginning to implement this type of program where non-business majors are being exposed to business topics, it needs to be more widespread.

“Graduate programs or undergraduate programs at state universities need to make part of their curriculum focus on entrepreneurship and have a project attached to that course.” Jim Russo, CEO, Princeton Financial Systems.

Resources Need to be in Place to Facilitate Collaboration

A common theme we heard in our interviews is that scientists aren't always savvy about marketing their creation, but need the ability to focus on the research while having someone else explain to the company the results. When it comes to collaboration, there needs to be a conduit that can understand the R&D side, as well as the business translation. At MIT, the Industry Liaison Program (ILP) is staffed with industry veterans who know how corporations work, understand the business side of innovation and know how to speak with key stake-holders in corporations. ILP is very effective in managing relationships between academic researchers and corporations. They can assess what problems the corporations are looking to solve and can identify the research at MIT designed to solve that problem. This ability to manage the relationship allows researchers on an academic track to leverage what they are doing and create a commercial outlet for it.

Open Communication is Key to Overcoming Hurdles

Through our interviews, NJPRO found that communication is a major barrier to collaboration efforts. Whether it be that departments are operating in silos and unaware what is going on in the lab next to them, or is it a broader scale lack of communication for fear of trade secrets being revealed. When it came to business and academia partnering together, sometimes this lack of communication was related to timeframes. The university world is often tied to semesters and the ability to bring in new research dollars over a given time period. There is also the institutional review board (IRB) at schools that must approve the research. While at a company, the timeframes are often determined by the marketplace. As remarked by one of our interviewees:

“One of the most significant hurdles was that the timeline of the corporation and the timeline of the University were often unaligned. The timeline for the corporation and the timeline for the university were significantly different when it came to a deliverable. Being able to match the timeliness of a project relative to an operating organization looking to make a profit is very difficult to do and can be difficult to overcome.”

Since the end result is thought of differently by the two parties, it is necessary to communicate upfront what is expected for the deliverable to insure a positive collaboration.

A REPORT FROM



**CURRENT EFFORTS
IN NEW JERSEY**

Current Efforts in New Jersey

As mentioned in the executive summary, there are currently numerous efforts underway in New Jersey to create and formalize models for academic/industry collaborations. This section will highlight these current efforts from the perspective of the four parties involved: universities, business, and government and non-government organizations.

Partnership Prospects with the Governor

The prospects for further innovation-focused partnerships between business, higher education and government in New Jersey appear promising as Governor Christie's transition reports on Economic Development, Education, and Labor & Workforce Development all included specific support for further collaboration between these entities and better integration of higher education into New Jersey's economic development strategies.

The Governor's Economic Development transition report called for higher education to have a more prominent seat at the table for the State's economic development planning and marketing. It also asked higher education institutions to better incorporate incubators and start-up businesses into their missions. The transition report recommended that the State provide incentives for business and higher education to partner, and it also asked for further assessment of higher education to ascertain the extent of their critical role in New Jersey's economic development.

The transition reports on Education and Labor & Workforce Development were not focused on research, development and innovation, but they still called for better higher education -business partnerships to prepare the future workforce. The Education report did propose a New Jersey Council on Education for the 21st Century to align education and business interests from pre-school through advanced education. This could be for workforce issues, but this Council and/or the more formalized role for higher education in economic development recommended in the Economic Development transition report could be places to initiate, foster and maintain research partnerships.

Existing Legislative Efforts

A-4048 (Roberts, Coutinho, Diegnan, Wisniewski, Chivukula, Spencer)/S-2299 (Lesniak), signed into law in July of 2009, represents a good first step towards encouraging more partnerships between higher education and business, and the State should follow that model to encourage specific partnerships around research

and development and the small business that may develop because of those R&D relationships. The new law allows New Jersey's public colleges to contract with private entities for financial or administrative responsibility for on-campus construction projects, such as book stores or dormitories. Further extending and expanding this concept to public-private R&D partnerships should be explored.

In June the legislature passed, S-917 (Lesniak, Beck)/A-598 (Cryan, Coutinho, Fuentes, Quijano), the Economic Development Authority (NJEDA) has been asked to oversee the redevelopment of Fort Monmouth. NJPRO believes that the Fort's redevelopment must include a focus on technology innovation spurred by higher education-business partnerships. Fort Monmouth has long been home to high-tech systems including the R&D efforts related to electronic material for use by our armed forces. In reengineering the area for economic growth, New Jersey has the opportunity to copy other successful states, such as Fort Devens in Massachusetts, to build their high-tech industries, business incubators and partnerships between academia and industry. However, failure to act by the State may lead to the federal government determining the redevelopment of the area or the development going in an inconsistent direction with the State's economic development plans.

New Jersey Incubator Network

The State of New Jersey has a robust network of business incubators and accelerators. The case for continued support and funding of the Incubator Networks is not only warranted but essential to driving the next generation of technology innovation in the State. Incubators have a strong track record of producing positive results.

Nationally incubators contribute substantial Return on Investment (ROI)¹²

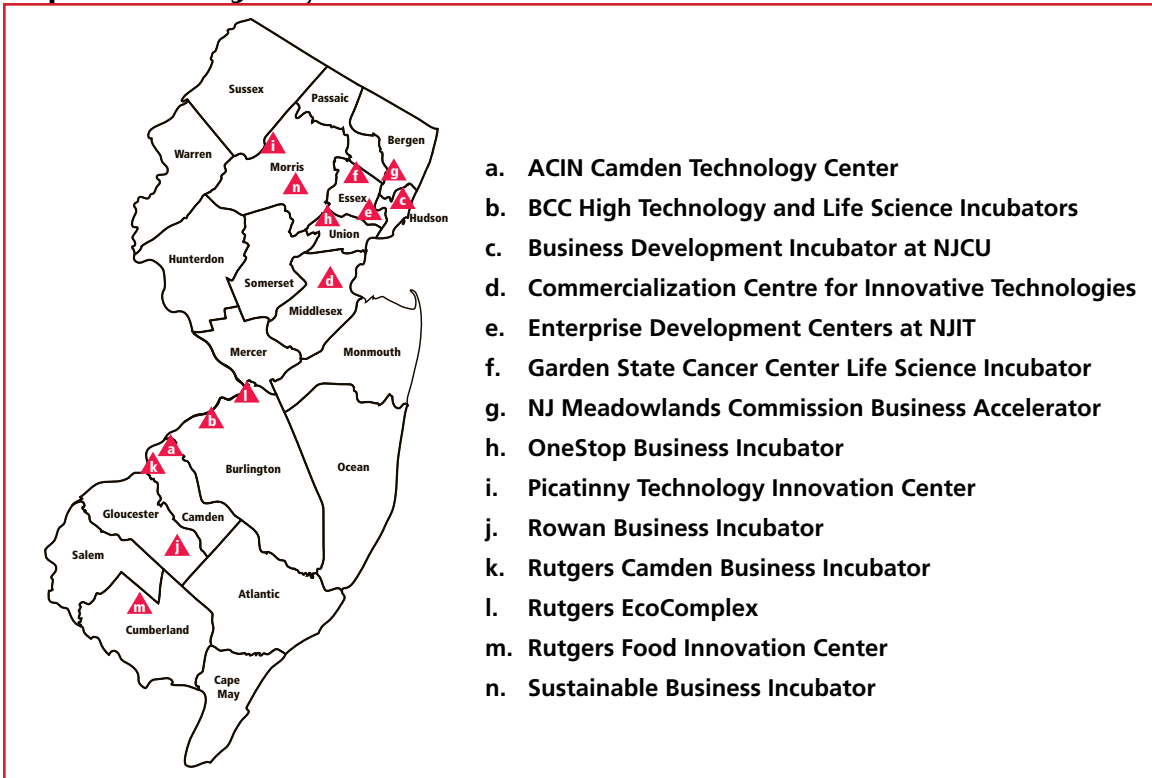
- Nearly half—45 percent—of start-ups were established in the same state where U.S.-born tech founders received their education.
- Historically, 87 percent of all firms that have graduated from their incubators are *still in business*.
- 84 percent of incubator graduates *stay in their communities* (NJ >87percent).
- For every \$1 of public subsidy, it is estimated that incubator clients generate \$30 in local tax revenue alone.

The Impact of Incubators in New Jersey (2009):¹³

- 1,840 higher paying jobs created at \$930 State cost per job
- 660 incubated companies, 80 percent High Tech and Life Science
- \$422 million in aggregate revenue from client companies
- \$115 million in third party funding brought into NJ
- 35 graduated, self-sustaining companies
- 87.3 percent of graduates remain in NJ
- 245 jobs created by incubator graduates

- Nationally-recognized business clusters formed:
 - Life Science
 - Food
 - Defense
 - Clean Tech, Energy and the Environment
 - Urban and Disadvantaged Communities

Map of the New Jersey Incubator Network



- a. ACIN Camden Technology Center
- b. BCC High Technology and Life Science Incubators
- c. Business Development Incubator at NJCU
- d. Commercialization Centre for Innovative Technologies
- e. Enterprise Development Centers at NJIT
- f. Garden State Cancer Center Life Science Incubator
- g. NJ Meadowlands Commission Business Accelerator
- h. OneStop Business Incubator
- i. Picatinny Technology Innovation Center
- j. Rowan Business Incubator
- k. Rutgers Camden Business Incubator
- l. Rutgers EcoComplex
- m. Rutgers Food Innovation Center
- n. Sustainable Business Incubator

University-Supported Programs

The university-supported programs highlighted below are by no means a comprehensive list of academic supported collaborative activities in the State. The programs included in this section are highlighted because they provide excellent examples of effective collaboration models and may serve as models to build on and propagate across all universities in the State.

- Rutgers:** BEST and Master of Business & Science Program
- NJIT:** Enterprise Development Center
- UMDNJ:** MS in Clinical and Translational Science
- Princeton:** PRISM

RANKING OF NJ ACADEMIC INSTITUTION BY FUNDING AND FIELD OF STUDY

R&D expenditures at universities and colleges, ranked by all R&D expenditures, by science and engineering field: FY 2007

Rank	Institution	All R&D Expenditures	Environmental Sciences	Life Sciences	Math & Computer Sciences	Physical Sciences	Psychology	Social Sciences	Sciences, nec	Engineering
	All institutions	\$49,430,767	\$2,725,120	\$29,763,889	\$1,988,431	\$3,842,391	\$863,358	\$1,781,410	\$949,278	\$7,516,890
1.	John Hopkins U., The	\$1,554,103	\$42,422	\$692,380	\$105,521	\$129,480	\$6,196	\$3,905	\$38,977	\$535,222
2.	U. CA, San Francisco	\$842,840	\$-	\$820,239	\$-	\$22,601	\$-	\$-	\$-	\$-
3.	U. WI Madison	\$840,672	\$77,397	\$541,332	\$20,881	\$56,304	\$9,769	\$41,626	\$77	\$93,286
4.	U. CA, Los Angeles	\$823,083	\$10,083	\$612,248	\$21,444	\$64,325	\$11,718	\$36,093	\$14,572	\$52,600
5.	U. MI All Campuses	\$808,731	\$11,897	\$480,044	\$12,320	\$38,241	\$10,301	\$93,719	\$471	\$161,738
6.	U. CA, San Diego	\$798,896	\$132,814	\$446,301	\$59,555	\$51,646	\$7,799	\$11,522	\$1,382	\$87,877
7.	Duke U.	\$781,843	\$14,772	\$669,354	\$10,655	\$18,842	2,847	\$25,470	\$-	\$39,903
8.	U. WA	\$756,787	\$91,765	\$513,821	\$6,900	\$34,067	\$9,933	\$19,216	\$-	\$81,085
9.	OH State U. All Campuses	\$720,206	\$9,896	\$397,652	\$41,802	\$27,428	\$5,835	\$46,746	\$30,494	\$160,353
10.	Stanford U.	\$687,511	\$23,208	\$407,985	\$27,490	\$64,642	\$7,983	\$13,407	\$-	\$142,796
11.	PA State U. All Campuses	\$652,144	\$55,506	\$202,986	\$52,812	\$56,783	\$22,594	\$25,606	\$516	\$235,341
12.	U. PA	\$648,247	\$750	\$525,729	\$9,919	\$29,279	\$6,173	\$33,059	\$12,125	\$31,213
13.	Cornell U. All Campuses	\$641,936	\$6,457	\$409,577	\$26,978	\$86,822	\$4,994	\$29,431	\$-	\$77,677
14.	U. MN All Campuses	\$624,149	\$13,953	\$455,889	\$24,528	\$24,961	\$13,508	\$27,786	\$-	\$63,524
15.	MA Institute of Technology	\$614,352	\$26,227	\$191,916	\$50,660	\$99,257	\$968	\$6,405	\$22,444	\$216,475
57.	Rutgers, The State U. ALL	\$311,612	\$28,785	\$157,977	\$18,642	\$37,734	\$12,573	\$25,226	\$1,664	\$29,011
72.	U. of Medicine and Dentistry NJ	\$236,834	\$-	\$236,834	\$-	\$-	\$-	\$-	\$-	\$-
92.	Princeton U.	\$188,732	\$18,373	\$38,002	\$15,095	\$36,754	\$9,292	\$19,139	\$-	\$52,077
135.	NJ Institute of Technology	\$88,699	\$-	\$-	\$10,051	\$13,941	\$-	\$1,308	\$12,413	\$50,986
219.	Stevens Institute of Technology	\$25,684	\$4,279	\$2,242	\$1,311	\$1,220	\$-	\$-	\$1,302	\$15,330

Source: 2007 National Science Foundation and MEP Consulting analysis

Non-Government Organizations

In addition to State-sponsored agencies and the efforts of both public and private universities, there are several non-government organizations that are active in fostering and supporting academic/industry partnerships, entrepreneurship and technology clusters.

BIO-1—Bio-1’s goal is to make Central New Jersey (CNJ) the next “hot spot” for the global bioscience industry by creating high-quality, high-paying jobs and a skilled workforce. The five-county BIO-1 partnership is named for the Route 1 corridor from Rutgers to Princeton, around which most of CNJ’s biotech firms are clustered. The CNJ region, comprising Hunterdon, Mercer, Middlesex, Monmouth and Somerset counties, has received \$5 million available under the Workforce Innovation in Regional Economic Development (WIRED) program from the United States Department of Labor (USDOL). The WIRED grant will be used to transform the rich array of existing bioscience education and training and economic development initiatives into a world-class bioscience talent development system.

New Jersey Entrepreneurial Network (NJEN)—NJEN is a non-profit organization providing educational and informational services to entrepreneurs, investors, persons in related fields and the public in general. The meetings are attended by a select group of entrepreneurs, company executives, venture capitalists, angel investors, investment bankers, and professional services providers. The meetings are held at noon on the

first Wednesday of every other month from September through May or June, most often at the Princeton Marriott Conference Center, 100 College Road East off Route 1 in Princeton, New Jersey.

New Jersey Entrepreneurs Forum (NJEF)—NJEF was formed in the mid-1980s by entrepreneurs, consultants and investors involved in the development of technology companies. The organization has operated as a training ground for technology entrepreneurs ever since.

In addition to its focus on Central New Jersey and the many technology companies in the region, NJEF has also been a supporter of New Jersey's technology incubators, the NJ Venture Fair, and the various technology transfer programs of the NJ Commission on Science and Technology.

In 1995, having received program support from the Commission for several years, the management of NJEF “spun-off” the program and formed the private non-profit corporation that operates today. Originally operating as an enterprise forum, the current NJEF mission is more focused on training technology entrepreneurs and providing the basic skills required to start, manage and finance a new company.

Einstein's Alley—Einstein's Alley is a private, non-profit economic development initiative located in Central New Jersey. Its mission is to foster economic growth through advocacy and delivery of services that will attract new companies to the area, retain existing business and encourage the growth of jobs and services.

New Jersey Technology Council (NJTC)—NJTC provides business support, networking opportunities, information, advocacy and recognition of technology companies and their leaders. Founded in 1996, NJTC's more than 1,200 member companies work together to support their own enterprises while advancing New Jersey's status as a leading technology center in the United States. Company growth is fostered through access to financing sources, programs on successful management and marketing strategies, collection and dissemination of industry-specific information, and an employee recruitment network.

Healthcare Institute of New Jersey (HINJ) —HINJ is a trade association for the research-based pharmaceutical and medical technology industry in New Jersey. Founded in 1997, the Institute serves as a unified voice for the industry and seeks to build awareness of this industry's impact on New Jersey's quality of life and economic well-being. There are currently 35 members of the HealthCare Institute of New Jersey.

BIO NJ—BIO NJ is organized to acquire and coordinate resources critical to building successful biotechnology enterprises and enhance the awareness of New Jersey's biotechnology industry.

A REPORT FROM



**MODELS FROM
OTHER REGIONS**

Models From Other Regions

California—University of California¹⁴

The University of California (UC) is an extremely complex system of research-oriented universities that encompasses ten campuses, three national laboratories, and more than 200,000 students, and a faculty of 1,600 (including 55 Nobel Laureates). The technology transfer system is largely decentralized with each campus reporting through its own management structure. The Office of the President plays more of an advisory role rather than mandating practices and actions to the individual campuses.

Some of the Key Lessons¹⁵ learned coming out of the UC Technology Transfer system includes:

- Policy is an important anchor.
- Strong legal support is key.
- Information systems are important to achieve consistency.
- Proximity is key (but not essential) to strong relationships.
- Leverage operational economies of scale.
- Stay connected (to each other and to clients).

Key Challenges:

- Creating awareness in the faculty of what it's like to work with a company.
- Create awareness in business on how to work with academia.
- Technology transfer activities are different between academia and industry vs. industry to industry and these differences need to be understood by the company to be successful.
- Common understanding of timelines, goals and objectives.

Maryland—Johns Hopkins¹⁶

Johns Hopkins is continuously involved in academic/industry collaborations. From the technology transfer perspective, this equates to licensing out technologies spawned from R&D that is occurring at the university. Hopkins conducts over 100 licenses per year, and while not all can be classified as collaborations, all involve agreements between the university and a company. While most of Hopkins funding is from the federal government, it still does between \$100 – \$200 million in corporate-sponsored research per year. In addition, they are in the process of building a Bio Park that will be involved in academic/industry collaborations. Approximately half of collaboration initiatives each year are initiated by direct faculty–industry relationships. Johns Hopkins does not currently have incubators but works with

local and state government to develop facilities (e.g. Bio Park). Maryland currently has tax credit programs that have kept 50 percent of the 22 start-ups coming out of Hopkins in state and early stage grant programs of \$15,000, \$75,000 and \$200,000 that help support early stage companies.

Lessons Learned:

- Providing the resources to support the needs of early stage technologies, including market need assessment, business case development, review of intellectual property, etc., is necessary.
- Connection between academic researcher and company is key, particularly how to put them together and provide the structure for the relationship.

Massachusetts—MIT Technology Licensing Office¹⁷

The mission of the MIT Technology Licensing Office is to benefit the public by moving results of MIT research into societal use via technology licensing, through a process which is consistent with academic principles, demonstrates a concern for the welfare of students and faculty, and conforms to the highest ethical standards.

This process benefits the public by creating new products and promoting economic development.

It helps MIT:

- show tangible benefits of taxpayers’ support for fundamental research.
- attract faculty and students.
- encourage industrial support of research.
- create discretionary income.
- produce new job opportunities for graduates.
- contribute to economic development locally and nationally.

Key Lessons:

- One of the most important things when it comes to collaborations is how the process is structured and how the university thinks about its goals and putting the right resources in place to execute.
- There has to be commonality of goals between the university’s general counsel and the technology transfer office.
- A significant hurdle is that people within academia don’t really understand technology transfer.

New York—Centers of Excellence

One of New York state’s most innovative and ambitious high-technology initiatives is the establishment of “Centers of Excellence” at leading universities. The Centers support high technology ventures through a collaborative approach among the state,

academia, private venture capital companies and other private and public-sector parties. Established to encourage rapid commercialization of scientific breakthroughs, the Centers specialize in nanoelectronics, bioinformatics, photonics, environmental systems, wireless applications, and information technology.

The College of Nanoscale Science and Engineering of the University at Albany-State University of New York is dedicated to the joined forces of academia, industry and government to advance atomic scale knowledge, educate the workforce and spearhead economic investment and growth. It is a primary research and development complex for companies such as IBM, Toshiba, AMD and others. It allows students to learn alongside corporate incubators with top notch talent and equipment. There are more than 2,500 scientists, researchers, engineers, students and faculty working within the complex to advance nanoscience.

Likewise, the Small Scale Systems Integration and Packaging Center at Binghamton University is a research and development organization that works on small scale systems for academia and the microelectronics industry. It aims to perform cutting edge research while attracting world class faculty and building long-term collaborative relationships with federal, state, industrial and academic partners. It has been working on fostering economic development with emerging technology companies in the region and capitalizing on federal grant dollars.

Ohio—Jumpstart

JumpStart¹⁸ is a nationally recognized venture development organization that accelerates the progress of high-potential, early stage businesses with a special focus on supporting women and minority entrepreneurs. It guides smart, motivated, high-potential entrepreneurs to turn their innovative ideas into plans, their plans into operating businesses, and their businesses into rapidly growing ventures.

It selectively invests risk capital in the early stage companies built upon innovative ideas, to accelerate their growth by pairing risk capital with expert guidance.

History of JumpStart Inc.

JumpStart Inc., a non-profit organization, was formed in 2004 by a collaboration between NorTech (the Northeast Ohio Technology Coalition) and Case Western Reserve University. It was created to combine the efforts of four of the region's entrepreneurial service organizations to support the continued emergence of Northeast Ohio's innovative economy.

JumpStart's Focus-Accelerating the Growth of Companies:

JumpStart services are primarily delivered through three lines of business. Each of these businesses offers different services to meet the varying needs of companies

based on their stage of growth, business sector and entrepreneurial profile:

- *JumpStart Ventures* invests in and assists innovative, early stage Northeast Ohio companies that have the potential to generate \$30-\$50 million in revenues in five to seven years. JumpStart Ventures helps companies accelerate their time to venture-readiness by bundling guidance from experienced Venture Partners with seed investment capital.
- *JumpStart Inclusion Advisors* guides high-impact minority and women-owned businesses seeking to raise capital from private investors in order to become larger-scale national and international firms. It also assists high-impact businesses situated in the urban centers of Northeast Ohio, whose businesses directly impact minority populations. By providing intensive hands-on guidance and strategic planning, it enables these high-impact entrepreneurs to articulate high-growth plans, access investment funds, and move their businesses through key milestones.
- *JumpStart TechLift Advisors* guides Northeast Ohio's high-potential technology entrepreneurs. It assists entrepreneurs in creating and articulating high-growth strategic and operational plans, in accessing investment funds and moving their businesses toward key milestones. TechLift Advisors' Entrepreneurs-in-Residence are former technology CEOs, with significant experience in the technology sector, and work with entrepreneurs within that sector.

JumpStart's Value-Added Resources:

In addition to the comprehensive resources delivered through the three lines of business, all entrepreneurs in Northeast Ohio have access to resources such as:

- **Educational Seminars and Events**
JumpStart sponsors, organizes and facilitates educational events with topics specifically geared toward enabling entrepreneurs to build their businesses. For example, the "Growing Bright Ideas" educational series brings national entrepreneurial expertise to the region. It focuses on topics such as capital formation, talent, organizational structure, and sales and marketing. JumpStart also actively participates in and supports the entrepreneurial activities of our regional partners and publicize those events on their web site and through other communications.
- **Communications**
JumpStart offers many ways to stay current on entrepreneurial activity in Northeast Ohio through a bi-weekly e-mail newsletter, *JumpStart Connect*, that highlights the successes of entrepreneurial ventures, current news and upcoming events.
- **Idea Crossing**
Launched by JumpStart, IdeaCrossing is a free online community for entrepreneurs in all stages, accredited investors, business mentors and service providers. Users register and create profiles that are used to match them with the resources they need to grow their businesses. Entrepreneurs are matched to accredited investors and business mentors. Investors can find deal flow that

fits their investment criteria. Mentors can find start-ups to advise, and service providers can promote their services to the entire community. IdeaCrossing is completely private and secure, available at no cost, and requires minimal effort to start connecting and building great companies.

Texas—Emerging Technology Fund

In 2004, Texas was ranked 3rd in the nation for academic R&D expenditures by state by the National Science Foundation, with approximately \$2.8 billion spent. One area the State has invested in is the Texas Emerging Technology Fund (TETF) which is a \$200 million fund that is used for research and development activities in emerging technology industries. Eligible industries are those that will lead to immediate or long-term creation of high-quality new jobs in Texas and/or could lead to medical or scientific breakthroughs.

A 17-member advisory committee of high-tech leaders, entrepreneurs and research experts review potential TETF projects and recommends projects for funding to the governor, lieutenant governor and speaker of the house. All three leaders must then agree on which projects should be funded. The TETF program has three main areas of investment:

- Increasing research collaboration between public and private-sector entities through new Regional Centers of Innovation and Commercialization, where the seeds of an idea can take root in a university lab and grow into a new product marketed by a new or expanding firm.
- Matching research grants provided by both federal and private sponsors to help innovators acquire the capital they need to bring their ideas to life.
- Attracting more top notch research teams from other universities around the nation that will help put Texas universities on the cutting edge of technology research and development.

UTAH—Utah Science, Technology and Research Initiative (USTAR)

In 2006, the Utah state legislature passed Senate Bill 75 to create USTAR. Its goal was to recruit world class researchers to the University of Utah and Utah State University, build state-of-the-art interdisciplinary research and development facilities, and form first-rate science innovation and commercialization teams across the state. In three short years, USTAR has 128 full-time research jobs statewide and 594 jobs related to its building projects. They recruited researchers from around the country to organize within strategic innovation areas while leveraging Utah's industry strengths and building upon academic strengths.

USTAR was set up as a long-term, multi-phase initiative. Four phases have been created to build up Utah's efforts: Phase I: Research Teams and Building; Phase II:

Extramural Funding Growth, Phase III: Technology Development, and Phase IV: Commercialization. The past several years have been spent on increasing federal grants as well as increasing disclosures and patents filed in-state. In one year's time, there was 16 percent growth from 2008 to 2009 in research awards of which USTAR faculty accounted for 27 percent of growth.¹⁹ In terms of taxpayer return on investment, USTAR received \$33.7 million which they were able to leverage for more than \$71 million in federal and industry grants resulting in a 2-to-1 return on investment.²⁰

Additionally, they have started four companies and attracted two to the state while employing research teams focusing on bio devices, nanotechnology, energy, medical imaging and brain medicine, imaging technologies and digital media. Additionally, USTAR is trying to bring innovation to market at the other Utah public colleges and universities by offering Technology Commercialization Grants. In 2009, USTAR secured a federal WIRED grant to create a BioInnovations Gateway (BIG) which will serve as an incubator to the life science industry.

Summary Finding from National Resource Council Report²¹

Excerpts from the report on academic/industry/government collaboration best practices and public-private partnerships, involving cooperative research and development activities among industry, government laboratories and universities, can play an instrumental role in accelerating the development of new technologies from idea to market.

1. Partnerships can facilitate research.

- a) Applications of new biomedical and information technologies, for example, hold the potential for tremendous advances in health and productivity of Americans. Bringing the results of research to the market, from idealist innovations to commercial products, is a genuine challenge. Partnerships can be a valuable mechanism to facilitate this process. The nature of partnerships and their potential role in fostering and sustaining improvements in national security, social welfare and economic growth are, therefore, issues of central policy concern.
- b) Experience shows that partnerships involving government are patient, and cooperative research and development among industry, universities and government laboratories can work. They often contribute to national missions in health, energy, the environment and national defense, and to the nation's ability to capitalize on its R&D investments.
- c) Partnerships help bring innovations to the point where private "actors" can bring them to market. Accelerated progress in bringing the benefits of new products, new processes, and new knowledge to the market has positive consequences for economic growth and human welfare.

2. Partnerships offer a means to integrate diverse participants in the U.S. innovation system.

- a) Bringing the benefits of new products, new processes and new knowledge to the market is a key challenge for the innovation system. Partnerships contribute to our ability to facilitate the transfer of scientific knowledge to real products and they present one means to improve the output of the U.S. innovation system. Because modern scientific advances hold tremendous positive prospects for humanity, learning how to best facilitate science-based growth is the central challenge for policymakers as we begin the new century. Early progress in, for example, disease detection, prevention, and treatment has direct consequences in terms of human welfare healthcare costs.
- b) Partnerships provide an institutional structure with financial and policy incentives within which companies, universities, national laboratories and research institutes can cooperate to accelerate the development of promising technologies.
- c) In many cases, no single participant could pursue the development of these technologies effectively. The diversity of the U.S. partnership provides a significant advantage to the innovation process in the United States. At the same time, cooperation among firms, universities and government laboratories is often needed to harness parliamentary expertise and to realize the synergies. Blending the strengths in a case-by-case fashion is one of the greatest strengths of partnerships.

3. Partnerships are diverse in structure, mechanism and goals. This is one of their advantages. Successful partnerships tend to be characterized by industry leadership, public commitments that are limited and defined, clear objectives, and cautionary, effective evaluation processes.

- a) Partnership structures, as diverse as the SBIR program, the Advanced Technology program and SEMATECH, demonstrate that partnerships, if properly structured, can yield positive results commensurate with their objectives and challenges. Flexibility, experimentation and learning are key elements in effective policy for partnerships.
- b) Features common to successful partnerships include industry initiation and leadership of projects, cost sharing, predictable limits to public commitments of resources, clear objectives, and learning through evaluation of measurable outcomes. Effective leadership and cost sharing can help motivate participants in a partnership to act in ways that advance their joint objectives. Agreement on goals and metrics of progress, the development of roadmaps, and regular evaluations help sustain joint effort; taken together, these features contribute to the success of partnerships.
- c) Although partnerships are valuable policy instruments, they are not a panacea; their demonstrated utility does not imply that all partnerships will be suc-

cessful. Indeed, the high-risk/high-payoff nature of innovation research and development assures some disappointments.

4. In terms of both project scale and timing in the innovation process, properly constructed partnerships do not displace private finance.

- a) Entrepreneurs sometimes face challenges in attracting private financing necessary to develop new technologies for the market. While the U.S. venture capital industry is well developed and often plays a key role in the innovation process, it does not provide early stage equity funding for some innovations. In fact, current trends in the venture industry - particularly the increasing deal size - may make certain types of small, early stage financing less likely, despite the overall increase in venture funding.
- b) Partnerships focus on earlier stages of innovation than many venture investments and often concentrate on technologies that pose greater risks for broader returns than a private investor would normally find attractive. Public-private partnerships are a mechanism to provide catalytic funding. They articulate needs, sometimes create early demand, and coordinate the needed expertise. In doing so, they help foster creativity and invention needed to prime the process of innovation. Moreover, a limited scale of most partnerships - compared to private institutional investments - in their sunset provisions tend to insure recourse to private funding or national procurement.
- c) Concerns about crowding out private capital by public funds may be overstated. Properly constructed public-private R&D partnerships can actually elicit crowding in phenomena with public R&D investments, providing the needed signals to attract private R&D investment.

5. The allocation of federal funding among fields of research has shifted sharply in the last decade with important implications for the future advancement of information technology and its contributions to our ability to capitalize on existing and future investments in biomedicine.

- a) While among the most efficient in the world, the U.S. innovation system has seen considerable adjustment on the transformation of national priorities brought about by the end of the Cold War and, more recently, since the onset of the new war on terror. One impact of these adjustment efforts in the mid-1990s to balance the federal budget has been that the R&D budgets of most federal agencies were reduced in real terms in the 1993 to 1997 period. When individual agencies cut research programs because of their own admission realignments, the collective impact of federal investment research portfolios was not anticipated.
- b) As a result of these changes, financial support for such disciplines as physics, chemistry and engineering has fallen in real terms over several years. The substantial reductions in support of these disciplines are a source of concern

because they underpin the future development of the information technology sector. These reductions did not emerge as the result of a national debate on R&D priorities and the lag effects of these cuts may have unforeseen and long-term consequences.

- c) Meanwhile, in response to new needs, new opportunities and, recently, new threats, there is an expansion in allocation of U.S. federal research investments toward the health and medical sciences sector. This increase in support for medical research is welcome. It is normal that the federal research portfolio should evolve over time in response to new scientific needs and opportunities. However, the real reductions in support that have occurred over a sustained period (1993 – 1999) for disciplines that underpin the information technology sector are cause for concern.
- d) It is equally important to recognize that the information and biotechnology sectors - each very important to the nation's economy, security and well-being - are increasingly interrelated. Advances in one area are often dependent on progress in the other; sectors like the life sciences increasingly rely on parallel advances in information technology for their own advancement. For example, reaping the benefits of sequencing the human genome depends on processing and making sense of enormous amounts of data that in turn is made possible by advances in computing and networking technologies. Arriving on the nation's substantial investments in biomedicine, therefore, requires complementary investments today in the fields of science and engineering supporting information technology.
- e) Investments in the broad portfolio of disciplines with special emphasis on programs to bridge the gap among disciplines are important to the long-term health of the U.S. innovation system.
- f) In many instances, efforts underway in the United States to support disciplines sustaining the technologies of the future do not match the rapid growth in corresponding foreign efforts. Over time, this may negatively affect the relative competitiveness of U.S. firms in the global marketplace and may slow the overall pace of innovation in the United States.

6. The case of the semiconductor industry illustrates that partnerships have contributed directly to furthering the global competitiveness of U.S. industry.

- a) Leading industrialists from the United States and abroad believe that the U.S. experiment with government/industry partnership, i.e. the SEMATECH Consortium, contributed to the resurgence of the U.S. semiconductor industry.
- b) One consequence of this perception of SEMATECH is that many countries around the world are engaged in substantial corporate efforts to support technological advances in their national or regional semiconductor industry. The

relative scope of these cooperative efforts and the level of funding for these programs are substantially greater in other producer countries than in the United States. Over time, these R&D efforts are likely to bear fruit and may alter the technological competitive position of the U.S. industry.

7. Properly constructed, operated and evaluated partnerships can provide an effective means for accelerating the progress of technology from the laboratory to the market.

- a) Public-private partnerships have become an integral and growing part of the U.S. innovation system. The public-private cooperation they engender is and will remain an effective means for the creation, transfer and dissemination of new welfare-enhancing technologies.
- b) Doctrinal views on the appropriateness of government/industry cooperation overlook the reality of its contribution to the development of the United States in the past, understate the contributions of such cooperation in the present, and run the risk of compromising positive contributions in the future.
- c) The committee's endorsement of the role of partnerships in the U.S. innovation system must, however, be put in context. Uncritical enthusiasm for partnerships as panacea is certainly misplaced. On the other hand, blanket disparagement of partnerships as "corporate welfare" is equally misplaced, not least because it overlooks the pragmatic approaches to technology development throughout U.S. history and the need to continue constructive experiments today.

Conclusions

Innovation is the key to driving New Jersey's economy to a place where it can compete with other states and other nations. It has been recognized as one of the critical factors to turning around other state economies. New Jersey's high-tech economy, with the importance of pharmaceuticals and telecommunications, is even more reliant on innovation. And innovation may be one of the methods to spur growth and emerge from the current recession more quickly than other states.

Fortunately, New Jersey has many resources to position the State as a leader in research and development and innovation. Yet, there has not been a focus in recent years on collaboration between our academic and industry assets—'Building Bridges'. In order to fully position our State as a competitive driver in the new economy, New Jersey needs to take steps today to build the future innovation of tomorrow. The State can not take for granted its life sciences or technology companies, but instead needs to proactively plan to maintain existing fields while recruiting new growth opportunities.

State government needs to take the lead to prioritize innovation, better guide the resources we currently have and create new ones to foster it. The State needs to capitalize on innovation's economic growth potential.

If this is done right and the recommendations of *Building Bridges* are enacted, New Jersey will be ready to pounce on new opportunities before other states once the recession is over. New Jersey can become an innovation leader and economic powerhouse for generations to come.

ENDNOTES:

1. National Research Council of the National Academies, "Government-Industrial Partnerships for the Development of New Technologies Summary Report" 2003
2. http://sciencedems.house.gov/Media/File/Reports/natacad_compete_exsum_6feb06.pdf
3. Interview with former Pharmaceutical executive now active in collaborative efforts in NJ.
4. Source: Interviews with individuals from Johns Hopkins and MIT Technology Transfer Offices.
5. Industrial Liaison Programs are initiatives at some academic institutions. The programs are designed to effectively manage relationships between academic researchers and corporations. Staff in these ILP programs possess the business acumen to assess what problems the corporations are looking to solve and can identify research at the university that is trying to solve that problem.
6. Source: BEST website <http://best.rutgers.edu/>
7. Source: PRISM Website <http://www.princeton.edu/prism/info/>
8. Source: interview with former member of MIT Technology Transfer Office
9. Source: http://www.rwjms.umdnj.edu/education/gsbs/prospective/ms_cts.html
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11. Vivek Wadhwa and Robert E. Litan - Turning Research into Inventions and Jobs (Business Week Sept 2009)
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13. Source: Michel Bitritto, Director, Business Accelerator New Jersey Meadowlands Commission.
14. Source: Interview with UCOP staff.
15. Source: Technology Transfer at the University of California, William Tucker, Executive Director, Innovation Alliances and Services UC Office of the President.
16. Source: Interview with Johns Hopkins staff.
17. Source: http://web.mit.edu/tlo/www/about/our_mission.html and interviews with MIT staff.
18. Source: <http://www.jumpstartinc.org>.
19. USTAR Update 2009 p4 www.innovationutah.com
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21. Source: Government-industry partnerships for the development of new technologies summary report, National Research Council of the National academies (2003).

For complete report and appendices please visit
www.njprofoundation.org



ABOUT THE NEW JERSEY POLICY RESEARCH ORGANIZATION

The New Jersey Policy Research Organization (NJPRO) is an independent affiliate of the New Jersey Business & Industry Association. NJPRO is New Jersey's leading policy organization conducting innovative, timely and practical research on issues of importance to New Jersey employers.

Working with diverse interests, NJPRO sponsors and supports research in New Jersey through both public and private policy research institutes, universities, colleges and individuals.

NJPRO produces many research reports, including the Facts for Discussion series which focus on one topic and presents the facts and policy implications. Recent Facts for Discussion topics include New Jersey's workers compensation system, the cost of healthcare, and energy costs. In addition, NJPRO's annual business research compilation, Bright Ideas for Business, recognizes the best business research being conducted at State colleges and universities.

This report is built off of our previous report Economic Policies and Solutions which was an in-depth examination of how to make New Jersey a better place for business.

The authors alone bear responsibility for any factual errors. The recommendations in this report are those of the NJPRO Foundation and do not necessarily represent the views of our funders or those who reviewed drafts of this report.



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