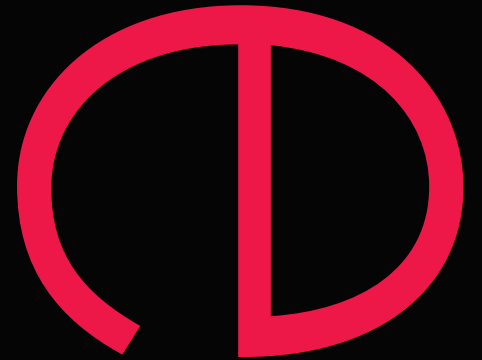


collaboration

Building Bridges II

BREAKING DOWN BARRIERS

**Perspectives from Academia and Industry on Building
a New Jersey Innovation Ecosystem**



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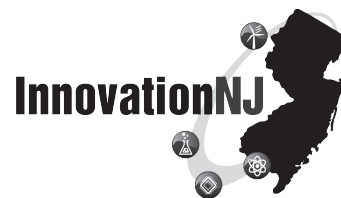
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March 2013



The NJPRO Foundation, in collaboration with the InnovationNJ Coalition, wrote this report. It builds upon prior research conducted by the NJPRO Foundation.

NJPRO and InnovationNJ appreciate the participation from industry and academia in our focus groups. Without our collaboration partners, this report would not have been possible.

The NJPRO Foundation invites you to join the public dialogue on this report after March 2013 at www.njprofoundation.org or www.innovationnj.net

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The NJPRO Foundation
102 West State St
Trenton, NJ 08608

www.njprofoundation.org

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

NJPRO Foundation on BUILDING BRIDGES II: Breaking Down Barriers,
Trenton, NJ: NJPRO Foundation, March 2013

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Executive Summary

Scientific advancement. Growing the economy and creating jobs. Improving the quality of life. These are the rewards that are reaped from “innovation” - the search, development and commercialization of the next great idea, process, product or technology.

While New Jersey has been historically a national and global leader in innovation, from the first U.S. manufacturing facilities on the Passaic Falls, to being the home of the telecommunications and pharmaceutical industries, the state now has greater competition for industrial research and development (R&D) investment. As the early center of the country’s research-based industries, the private sector was able to support New Jersey’s innovation economy with little assistance. These innovator companies had the capital to invest in hiring their own researchers, building their own laboratories, and conducting all their research in-house. In fact, these industries did not just do market driven research but they conducted research for the sake of advancing science. Likewise, there was little competition from other states and emerging economies that did not have the benefit of an embedded industrial base. Thus, there was little need for R&D support from New Jersey’s government or its academic institutions. Consequently, they took a laissez-faire approach to New Jersey’s innovator industries and a chasm grew between industry and the academic communities.

In comparison, over the past 30-40 years, in their crusade to compete for the economic benefits that are generated by industry’s R&D investment, other states’ governments have been aggressively developing their “innovation ecosystems” - the marrying of the R&D efforts and resources of government, academia and industry. Most notably, these states have learned how to leverage their academic resources (i.e., talent, facilities and equipment) to jump-start their innovation economies. They recognized the trends that collaboration between academia and industry could advance their economies, and collaboration between academic institutions could further leverage resources to attract industry partnerships and build their states’ innovation ecosystems. As innovator companies outsource an increasing level of their research and seek to work with the leading experts in their fields, states that are using their academic resources as economic development tools have gained an

advantage in attracting industry investment by being able to meet the varying R&D needs of mature and emerging research-based companies.

Utilizing their academic resources for economic development purposes has proven to be highly successful for competing states in attracting and retaining industry investment, ratcheting up the pressure on New Jersey state government and its academic institutions to meet this challenge and provide a competitive level of support.

This report builds upon the work of NJPRO’s July 2010 report, *Building Bridges Between Academic Institutions, Business and Government to Bring Innovation to the Marketplace* (<http://www.njprofoundation.org/pages/bridges.htm>) That report proposed that New Jersey’s universities and colleges now serve as a cornerstone for the state’s innovation economy to attract increased industry investment and be a catalyst for economic growth.

For this follow-up report, *Building Bridges II: Breaking Down Barriers: Perspectives from Academia and Industry on Building a New Jersey Innovation Ecosystem*, NJPRO partnered with InnovationNJ to conduct a series of eight industry-specific focus groups consisting of industry and academic participants, to discuss how to foster an environment for greater collaboration between industry and academia in New Jersey. Five challenges emerged from the focus group discussions as to what is inhibiting greater industry collaboration with New Jersey academic institutions:

- The need to alleviate the administrative burdens associated with partnering with a New Jersey academic institution.
- The need to improve the coordination of State, industry and academic R&D efforts and resources.
- The need to bridge the clashing cultural differences between industry and academia.
- The need to raise awareness throughout the business community of New Jersey’s academic assets.
- The need to have the State, industry and academia work together to secure increased R&D funding, especially from federal government sources.

To address these five challenges, the focus groups also generated 15 recommendations, each of which will be discussed in this report:

- To encourage greater collaboration, the State, industry and academia should collectively work to reform their IP protocols and investigate the feasibility of a uniform IP agreement for our State colleges and universities.
- Academic institutions should employ Master Agreements to avoid repetitive negotiations and to increase the efficiency of the execution of collaboration agreements.
- The State needs to identify within its institutions of higher education the expertise and resources that could form the basis for Centers of Excellence. Designation of a single center of excellence for a specific research topic would target resources and provide guidance to interested parties searching for a research partner.
- Academia, industry and the State should form consortiums dedicated to producing innovative ideas, products, and services and to attract increased federal funding.
- The State, industry and academia should work together to bring thriving and productive professional conferences to New Jersey.
- In an era of reduced and increasingly competitive government funding, academia, industry and the State must combine their resources and efforts to attract increased federal dollars.
- The State should establish a Council on Innovation to advise the Governor, Legislature and other officials on ways to promote innovation and manage the innovation ecosystem.
- The State and institutions of higher education should review their tenure policies to incentivize and reward tenure-track faculty members for conducting industry research.
- Academia and industry need to work together to design internship/co-op programs that provide maximum benefit to all stakeholders.
- Academia should emphasize the teaching of interpersonal skills and provide basic business training for STEM majors to facilitate the translation of research from the lab into commercialized applications.
- Academia should design user-friendly websites, to make it easier for business to find the resources they are seeking and to facilitate potential collaborations.
- New Jersey should more aggressively promote its academic assets to attract potential collaborators and research dollars.
- Academia, industry and the State should establish a comprehensive resource directory that includes existing research areas, capabilities and talent and publicly available assets and facilities at New Jersey colleges and universities.
- Each college and university should publicly promote its own chief administrator to serve as a one-stop-shop for business to access university information and resources.
- The State, academia and industry should find ways to improve co-ordination of their efforts to secure increased federal funding.

This report is intended to serve as a catalyst to get the State, industry and academia to work together to meld their respective R&D assets to build out the State's innovation ecosystem and reassert New Jersey's position as a global leader in innovation.

Building Bridges II

The past few decades have brought significant change to the New Jersey innovation landscape. Until the late 20th century, the State was in the forefront of innovation, scientific advancement, and research and development (R&D). It pioneered such industries as telecommunications, life sciences, food processing, and petrochemicals. Items such as electric light and the phonograph (Edison), Band-Aid (Johnson and Johnson), the transistor (Bell Labs), the color television (RCA), and vaccines for measles, mumps (Merck) and streptomycin (Rutgers University) all were invented or discovered in New Jersey. Forced to find ways to catch up, rival states actively embraced their colleges and universities as engines for economic growth. By conducting sponsored research and providing facilities, equipment and intellectual expertise, these states have leveraged their academic assets to attract and support industry investment. Meanwhile, the emergence of the new global marketplace, offering companies greater choices on where to invest and find talent, has increased competition not only with other U.S. states, but with foreign countries, as well.

This change in the marketplace underscores the need for New Jersey to look closely at its innovation ecosystem. Recent attempts at collaboration by its industries and institutions of higher education have not matched the levels of activity and vigor of those initiated by its rivals. New Jersey has recognized the need to develop a strategy to compete. In December 2010, *The Report of The Governor's Task Force on Higher Education* (http://nj.gov/governor/news/reports/pdf/20101201_high_edu.pdf) urged New Jersey to “develop a structure to foster better collaboration between its businesses and its institutions of higher education.”¹ This strategy must be jointly developed by state, industry and academic partners in order to be successful. This report recommends strategies to increase collaboration between these partners by examining the relationships and collective interests of each party.

Building Bridges I

In July 2010, the New Jersey Policy Research Organization (NJPRO) Foundation issued a report, *Building Bridges Between Academic Institutions, Business and Government to Bring Innovation to the Marketplace*, to examine these issues. That report showed that the State's universities and colleges must serve as the foundation for research and development to support innovation that is needed to drive the growth of New Jersey's high-

technology economy. Leveraging the research capabilities of higher education institutions is necessary to help the State compete with other states and foreign countries that have positioned their schools as engines of growth.

At the same time, the Healthcare Institute of New Jersey also launched a report on medical innovation. Together these reports served to foster a discussion in the state on how to build collaborative efforts. The result was the creation of the Innovation NJ (INJ) coalition, whose goals include increasing private and public sector R&D, retaining and advancing high-paying innovation-related jobs in the state, and increasing the number of Science, Technology, Engineering and Mathematics (STEM)-related graduates from New Jersey colleges and universities.¹¹ INJ is a coalition of more than 90 member businesses, higher education institutions and state government agencies dedicated to promoting policies that foster an innovation environment in New Jersey.

In the fall of 2011, the NJPRO Foundation and INJ embarked upon a study to examine the collaborative environment in New Jersey and to test the findings of NJPRO's *Building Bridges I* report. To that end, *Building Bridges II* seeks to shed light on actions that can assist the progress of industry-academia collaboration by talking directly to the experts in business and academia who initiate and manage collaborations as part of their regular work.

Building Bridges II

Building Bridges II utilized focus groups composed of academic and industry professionals representing eight New Jersey industries with a large R&D presence to test the hypotheses developed in *Building Bridges I*. INJ's Collaboration Committee played a major role in this report by recruiting INJ's members to participate in the focus groups for this study. The collective perspectives from academia and industry on how to bring about effective collaboration and develop New Jersey's innovation ecosystem distinguish this report and differentiate it from *Building Bridges I*.

This report examines specific data regarding what the experts on the ground saw as obstacles or aids to effective collaboration between academia and industry. The focus group participants' comments and insights illuminate courses of action that would accomplish the rebuilding of New Jersey's innovation ecosystem to drive growth and competitiveness for years to come.

METHODOLOGY

Seeking to learn more about the factors that contribute to successful academia-industry partnerships in New Jersey and other states, NJPRO and INJ invited members from various organizations and institutions to take part in focus groups for this study. New Jersey's eight (8) leading innovator industries were targeted for inclusion in this study. Selected on the basis of their experiences with academic and industry collaborations, each group included 10 to 12 industry representatives and academic experts. The targeted industries were: Agriculture/Food Processing, Biotechnology, Chemical, Defense, Energy, Information Technology, Pharmaceuticals and Medical Technology, and Transportation and Logistics.

The higher education institutions represented were: Fairleigh Dickinson University, Monmouth University, Montclair State University, New Jersey Institute of Technology, Princeton University, Rowan University, Rutgers University, Stevens Institute of Technology and University of Medicine and Dentistry of New Jersey.

Moderated by a professional facilitator and lasting a minimum of 90 minutes each, the focus group sessions took place in the John J. Heldrich Center for Workforce Development, located at the Edward J. Bloustein School of Planning and Public Policy at Rutgers University, New Brunswick.

FOUR KEY QUESTIONS FRAMED THE FOCUS GROUP DISCUSSIONS:

- What impediments, if any, are preventing greater collaboration between your industry and higher education in New Jersey?
- What resources, skills and support is each party seeking when searching for either an academic or industry partner?
- Does the State have a role in bringing industry and academia together?
- What recommendations do you have that will encourage greater collaboration between industry and higher education in New Jersey?

GROWING NEW JERSEY'S INNOVATION ECOSYSTEM

Bringing together both sides of the research equation, the focus groups aimed to provide perspectives and "ground truth" on prior research done in *Building Bridges I*. Emerging out of the conversations were common themes related to impediments, challenges, and best practices found in other states. The discussions

brought to light several challenges in New Jersey to cultivating a functional innovation ecosystem. Five common themes arose during the discussions and include:

1. Administrative Burdens
2. Lack of Coordination Between the State, Business and Academia
3. Clashing of Cultural Differences
4. Lack of Dialogue Between Industry and Higher Education
5. Lack of Coordinated Efforts to Secure Funding from Various Sources

As we examine these five challenges, the report reviews the groups' discussions on how to overcome these impediments and presents NJPRO/INJ's recommendations aimed at fostering a world-class innovation ecosystem.

THE NEED FOR AN INNOVATION ECOSYSTEM

The case for building an effective innovation ecosystem is made in the National Science Foundation's report, *What is an Innovation Ecosystem?* which calls innovation the "fundamental source of significant wealth generation within an economy." In the report, written by Deborah J. Jackson, innovation ecosystem is defined as a model of "the economic dynamics of the complex relationships that are formed between actors or entities whose functional goal is to enable technology development and innovation."ⁱⁱⁱ These actors, she says, include both the material resources (funds, equipment and facilities) and human capital (students, faculty, staff, industry researchers and industry representatives) that make up the institutional entities (colleges/universities, industry, funding sources and government) participating in the ecosystem.

Given the higher growth potential that high-tech industries typically offer, Jackson says that a state government has a "strong incentive" to play a role in developing and nurturing innovation ecosystems that spur job creation and economic growth. The challenge, however, is "figuring out how to turn the breakthroughs of R&D efforts into products that lead to profits." As Jackson points out, the difficulty in achieving success is getting two "distinct but largely separated" economies that comprise an ecosystem and operate on different reward systems, to coexist.

The recent reorganization of the State's higher education institutions demonstrates that New Jersey is committed to meeting this challenge.

“...One consequence of the higher education restructuring legislation is an expanded Division of Biomedical Sciences at Rutgers that will combine the tremendous life sciences strengths already present in our university...Putting all of this together under one roof – from basic research at the bench to clinical care at the bedside – creates a New Jersey powerhouse in the life sciences research. Simple addition of our current research programs pushes the new Rutgers well above \$600 million in externally funded research annually, placing us among the top twenty universities in the nation...”^{iv}

PRESIDENT ROBERT L. BARCHI
20TH PRESIDENT OF RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

These actions start to leverage and unite our independent research and development assets into one comprehensive innovation ecosystem. Actions such as the reorganization of the State’s research universities will help to enhance educational opportunities, attract top faculty and students, attract increased federal research funds and strengthen partnerships between the higher education and business communities. Most importantly, increased collaboration serves as a catalyst for new companies, job creation and economic prosperity.

Challenge 1

Administrative Burdens

OVERVIEW: Administrative challenges are common in academia-industry collaborations. Dominant concerns among focus group participants is determining who owns the intellectual property (IP) rights and streamlining the contract process. The aim, therefore, is to make the collaboration process easier, faster and more cooperative.

The National Research Council of the National Academies 2003 report, *Government-Industry Partnerships for the Development of New Technologies Summary Report*, noted that contracts used by successful partnerships are spelled out in great detail – from the goals and metrics of progress, to the development of roadmaps to regular evaluations.^v IP reform and the use of Master Agreements are ways to ease administrative burdens that are impeding greater collaboration, and building a healthier innovation ecosystem.

RECOMMENDATION 1

To encourage greater collaboration, the State, industry and academia should collectively work to reform their IP protocols and investigate the feasibility of a uniform IP agreement for our State colleges and universities.

DISCUSSION/FINDINGS

Easing Administrative Burden Relating to Intellectual Property (IP) Agreements

According to the focus groups, industries commonly tell academic researchers who are fellow collaborators: “I’m not going to tell you the secrets of my company before they are patented.” As *Building Bridges I* pointed out, private industry must keep its own R&D efforts confidential to preserve trade secrets and maintain a competitive edge. *The Report of the Governor’s Task Force on Higher Education* echoed this point, noting, “Achieving greater collaboration in research must be balanced with respect for the laws of intellectual property.”^{vi}

The contrasting goals of profit-driven companies and science-driven universities, however, cause constant IP ownership concerns for both parties, according to a participant from industry in the Chemicals focus group. Striving to release a product before their competitors, or to maximize their investment in a collaborative project, companies want quick returns. Unaccustomed to thinking as businesses do, schools are perceived as slow to

meet the deadlines of business to commercialize scientific discoveries. Another industry participant from the Chemicals focus group stated:

“One of the ways for a university to get a relationship with (our company) is to agree to our terms of IP ownership, which essentially means we will give you money to fund your collaborative research, but we own everything. We are not shy about it. Our chief technology officer firmly believes that is the right way to go, because the university is in the business of producing technology and the scientists of tomorrow. (Our company) is in the business of making money.”

Participating in college internship programs also raises IP issues for companies, according to the focus groups. As long as students are working for the company, “they are employees..., even if maybe they *are* called interns,” a participant from industry argued. “And as a consequence, the IP that they develop in that 10 weeks... belongs to the company.”

University professors, however, object to corporate IP concerns taking precedence over academic priorities: “We can’t have students have their dissertations blocked because the company decides it is intellectual property,” one participant from academia told the Information Technology group.

To expedite and increase the ease with which collaborations can be facilitated, IP reform is imperative. Group participants gave examples of how they have used alternative agreements to manage IP issues. For instance, a participant from academia in the Biotechnology group said that by using cash-in-advance agreements, his institution of higher education can “give up as much (IP) as we can” to the industrial partner while setting up “a collaborative environment.” In general, universities that have a flexible view of their role are easier to work with, the industry representatives in the groups suggested. For example, a participant from industry in the Biotechnology group urged collaborating universities to think of themselves as contract research organizations (CRO) that provide outsourced contract support services to a company. “One of the first things (a CRO) will tell you is that the IP that we have today remains with us,” the participant said. “Everything that we develop in our work with you will be your idea. The company then says, ‘Yeah, I can do that.’”

Given the prominence of IP concerns in industry-academia collaborations, IP reform should be viewed as a priority.

RECOMMENDATION 2

Master Contract Agreements should be developed and utilized to avoid repetitive negotiations and to increase the efficiency of the execution of collaboration agreements.

DISCUSSION/FINDINGS

Easing Administrative Burdens Via Master Contract Agreements

In addition to determining IP rights, negotiating virtually identical contract terms, particularly between long-time partners, is an undue burden that places the state at a competitive disadvantage when industry goes in search of an academic research partner. The focus groups said that repetitively re-negotiating the same terms over a series of transactions made collaboration difficult and costly. This shared complaint led to the suggestion of increasing the use of Master Agreements to streamline the contracting process and decrease its cost. In Master Agreements, the parties agree to the basic terms that will govern future transactions, only needing to add the specific details of the latest agreement. As an industry representative told the Pharmaceutical focus group: “Every time we have a new trial, we do a one-page amendment and we quickly start the trial a few days later (because we have a Master Agreement in place).” By shortening contract negotiation time for clinical trial agreements, investigators are able to open the study and begin recruiting research participants to achieve enrollment projections more quickly.

Like IP reform, Master Contract Agreements can ease administrative burdens that accompany the formation of partnerships, expediting collaborations.

Challenge 2

Lack of Coordination between New Jersey, Business and Academia

OVERVIEW: The three legs of the New Jersey innovation ecosystem – industry, academia and State government – often act without awareness of one another’s activities. There is no unified vision for an innovation infrastructure; pockets of partnerships exist around the State, but they are ad hoc. The focus groups showed that the three partners must form a cohesive strategy that would help New Jersey capitalize on innovation’s economic growth potential by promoting academic partnerships with private industry, encouraging innovation in our technology-driven economy, and increasing R&D funding at State colleges and universities. Without a cohesive plan, the likelihood is increased that a major New Jersey business could decide to expand into one of the rival states, aggressively pursuing an academia-business collaboration; such a setback would translate into a lost opportunity for New Jersey to gain revenue from new jobs and business expansion. It also could damage the ability of its colleges and universities to attract top research talent and dollars, and cause its businesses to fall behind other states in creating new products. This section advances the idea of marshalling the combined forces of industry, academia and the State government to establish labeled Centers of Excellence, set up industry consortiums and conferences, investigate ways to procure federal money and appoint a Council on Innovation. Additionally, working together the entities can focus expertise housed at specific institutions and resources to build a brand that will attract future industry collaboration.

RECOMMENDATION 3

The State needs to identify within its institutions of higher education the expertise and resources that could form the basis for Centers of Excellence. Designation of a single Center of Excellence for a specific research topic would focus on commercial sector progress, target resources and provide guidance to interested parties searching for a research partner. Additionally, the State should examine successful models in other states.

DISCUSSION/FINDINGS

Facilitating the Interface of New Jersey Industry, Academia and State Partners via Centers for Excellence

Although New Jersey has excellent resources, such as the Cancer Institute of New Jersey (CINJ) – one of 41 U.S. cancer treatment and research institutions designated by the National Cancer Institute, the State lacks designated “Centers of Excellence.” Often located at colleges or universities, Centers of Excellence are State-labeled, authoritative sources for research, training and other work in a particular field. These facilities generally feature collaborations between the State, academia, industry, private venture capital companies and other private and public-sector parties. By being specifically labeled by the state as a Center of Excellence, resources are focused and designated to achieve collaboration in a certain area. Two of New Jersey’s neighboring states, New York and Pennsylvania, currently utilize this model and consequently have a competitive advantage in the region to attract investment. Established to encourage rapid commercialization of scientific breakthroughs, New York’s Centers of Excellence specialize in nanoelectronics, bioinformatics, photonics, environmental systems, wireless applications, and information technology, which directly compete with New Jersey’s core industries.

New Jersey has the potential to quickly deploy this model and capitalize on the outstanding talent and infrastructure currently in place. Two examples of academic partners that could be targeted are:

The Cancer Institute of New Jersey (CINJ) includes 15 hospitals across the State that provide cancer care to more than one-third of New Jersey cancer patients. In addition to being one of 41 National Cancer Institute-designated research facilities in the country, each hospital within the CINJ network offers patients access to the latest cancer therapies and state-of-the-art cancer care. CINJ is the first and only multidisciplinary, medical school-based clinical cancer center in the State.^{vii}

The Center for Advanced Food Technology (CAFT), a division of the Department of Food Science at Rutgers University, serves the food and affiliated industries through its research, training, education, extension and economic development activities. CAFT interfaces with industry and government to develop research on food quality, safety and health. Utilizing a manufacturing center, it has the ability to develop and make products for companies.

An industry representative from the Agriculture/Food Processing focus group recalled how the Rutgers Department of Food Science helped his friend, an aspiring bread-maker from Italy, transform his business plans into a viable New Jersey business. Planning to move to New Jersey and launch a bread-making plant here, the man was able to get help from the Department of Food Science in developing a bread recipe. Thanks to the mentoring he received (he also received funding by locating the business in a State business incubator), he eventually was able to open a bread-making plant in Southern New Jersey.

Facilities such as The Cancer Institute of New Jersey and Rutgers' Center for Advanced Food Technology are examples of how academia, industry and the State can work together to amass resources to facilitate future breakthroughs. As a participant from academia in the Transportation and Logistics focus group said, centers provide "a great avenue" for starting collaboration, especially given the current constraints on the State's higher education institutions. The State, industry and academia should work together to identify Centers of Excellence to focus resources for future collaboration in specific areas.

RECOMMENDATION 4

Academia, industry and the State should form consortiums dedicated to producing innovative ideas, products, services and to attracting increased federal funding.

DISCUSSION/FINDINGS

Facilitating the Interface of New Jersey Industry, Academia and State Partners via Industry Consortiums

In addition to Centers of Excellence, industry consortiums allow for the pooling of resources to advance a specific industry. Consortiums differ from Centers of Excellence in that they can be created by industry or other groups independent of or in partnership with an academic institution. The focus groups pointed out that while New Jersey has a number of consortiums, their focus tends to be generalized, rather than industry specific or R&D driven.

New Jersey is being surpassed by other states by not developing innovative groups to support industry. New Jersey would benefit by studying models from other regions which team up their Center of Excellence with their consortiums. For example, SEMATECH (standing for Semiconductor Manufacturing Technology), is an

R&D consortium for the U.S. Semiconductor industry. SEMATECH partners with SUNY Albany's College of Nanoscale Science and Engineering, involving government, academic and industry partners. Together they are coordinating next generation research to continue U.S. innovation in semiconductor research. Including chipmakers, universities, government partners, equipment and material suppliers and research institutes, SEMATECH received \$500 million in federal funding support over five years.

RECOMMENDATION 5

The State, industry and academia should work together to bring thriving and productive professional conferences to New Jersey.

DISCUSSION/FINDINGS

Facilitating the Interface of New Jersey Industry, Academia and State Partners via Industry Conferences

In recent years, economic conditions, downsizing of resources and minimized information sharing has constricted the ability of academic and industry professionals to interact. Travel restrictions, because of the economic downturn, have limited conference attendance, where in the past, successful relationship building occurred. The lack of this information exchange has stunted collaborative efforts. Several frustrations were expressed by focus group participants. An industry participant in the Information Technology focus group lamented the absence of relationship building, observing that the question that initially precedes one party's inviting another to explore a collaboration is: "Do we have a relationship?" Participants also have been disappointed by overly broad conference topics and redundant research presentations. While conferences used to be places where new and exciting information was heard and partnerships were formed, industry representatives feel as if "everyone takes the paper they did the previous year, and reworks it, then resubmits it." As we look to build a world-class innovation ecosystem, the State should work to recruit more professional conferences to showcase New Jersey's research assets and provide New Jersey researchers with greater networking opportunities.

RECOMMENDATION 6

In an era of reduced and increasingly competitive government funding, academia, industry and the State must combine their resources and efforts to attract increased federal dollars.

DISCUSSION/FINDINGS**Facilitating the Interface of New Jersey Industry, Academia and State Partners via Procuring Federal Money**

The federal government's value in assisting innovative New Jersey collaborations cannot be overestimated. As a participant from academia in the Defense group put it: "The government's all about requirements and standards. If you get in early, then it is a lot quicker (to obtain available funding)." The federal government has to be included in any plan to increase New Jersey innovation.

As *Building Bridges I* pointed out, entrepreneurs active in the earliest stage start-ups in New Jersey usually have few funding options outside of federal Small Business Innovation Research (SBIR) and Advanced Technology Program (ATP) grants. SBIR encourages domestic small businesses to engage in Federal Research/Research and Development that has the potential for commercialization. Some states actually match SBIR funds dollar for dollar. ATP helps industry invest in longer-term, high risk research with payoffs beyond private profit. By sharing the cost with companies, ATP accelerates the development of early-stage, innovative technologies.^{viii}

In addition to start-up funding, there needs to be a focus on joint partnerships to attract federal research dollars. As many grant applications now ask for supporting partners, businesses and academic institutions in New Jersey can benefit from working together. Leveraging combined resources increases the odds for a grant application to be approved.

RECOMMENDATION 7

The State should establish a Council on Innovation to advise the Governor, Legislature and other officials on ways to promote innovation and manage the innovation ecosystem.

DISCUSSION/FINDINGS**Facilitating the Interface of New Jersey Industry, Academia and State Partners via Creating a Council on Innovation**

A state-sanctioned Council on Innovation can collectively engage members of academia, industry and the State government to develop and maintain an innovation ecosystem. Working together, they can propose policies that promote innovation, ensure that laws and regulations are consistent with the latest science and technology and do not pose obstacles to innovation progress. The Council will also help to identify emerging trends and technologies in business models.

Other states have already begun establishing state sanctioned Councils on Innovation. To remain competitive, New Jersey would benefit from studying and developing a Council on Innovation that is modeled on successful councils in other states. An example includes the Illinois Innovaton Council:

Illinois Innovation Council

In February 2011, Illinois Governor Pat Quinn created the Illinois Innovation Council to, "identify and advance strategies that accelerate innovation, economic growth, and job creation." Its duties are to promote the role and importance of innovation in economic development and quality of life; partner with academic, business and governments to improve support for innovation and align public and private resources; and attract innovation driven enterprises and individuals to Illinois in order to expand existing industry clusters and develop new ones. Additionally, it develops policies to cultivate and retain entrepreneurs, innovative researchers, and other enterprises; recommends criteria to measure, index, and communicate Illinois performance as a global source for innovation; and establishes grant or investment programs to support innovators from research institutions and entrepreneurs.^{ix}

An initiative of the Illinois Innovation Council is the Illinois Innovation Network (IIN), a common platform through which startups, innovation-driven enterprises, service providers, research institutions, colleges, universities and community leaders connect, share ideas, and market tools and resources to accelerate the growth of businesses and industries in the Midwest.

Councils of Innovation can influence the next generation of technology innovation in a state, in addition to encouraging and promoting the latest technological advances.

Challenge 3

Clashing Cultural Differences

OVERVIEW: Clashing cultural differences are inevitable in academia-industry collaborations. Academia pursues knowledge; industry, profit. As previously discussed, Deborah J. Jackson noted that two distinct economies comprise an innovation ecosystem, each driven by its own reward system. Thus, for the academic, it may be enough for a research effort to generate a scholarly paper that meets a university's tenure requirements. For a business, the goal is to commercialize a scientific breakthrough into saleable products. Complicating the connection between these groups, Jackson points out, is that the resources invested in the research must be derived from the commercial sector and government. As the focus group discussions demonstrated, these cultural differences were apparent as participants expressed their points of view.

RECOMMENDATION 8

For conducting industry research the State and institutions of higher education should review their tenure policies to incentivize and reward tenure-track faculty members in ways that are more in line with their peer institutions around the country.

DISCUSSION/FINDINGS

Bridging Cultural Differences Between Business and Academia via Tenure Reform

It was clear from the discussions that tenure policies at institutions of higher education create a divide between academia and business collaborations, as each party has its own timelines, priorities and incentives. For tenure-track faculty, it's publish or perish, leaving little time or incentive to engage in sponsored research until tenure has been achieved. Focus group participants claimed that tenure-track faculty members at some New Jersey colleges and universities avoid collaborating with industry because doing so brings no credit toward tenure. Tenure policies at institutions of higher education should be changed to provide credit for tenure-track faculty members who participate in industrial collaboration.

Support for the groups' argument that the tenure concept obstructs collaboration is found in *The Report of the Governor's Task Force on Higher Education*, which stated

that several state policies hinder the ability of New Jersey's colleges and universities to compete for the best students and faculty with institutions in other states and in other countries. These policies include establishing a five-year period within which to achieve tenure under the State and County College Tenure Act. As the report points out, this short timeframe can make it difficult for emerging faculty members to establish the credentials needed to achieve tenure at the state colleges and at the county colleges. The statutory five-year time period is two years shorter than the national standard of seven years. Rutgers University, New Jersey Institute of Technology, and the University of Medicine and Dentistry of New Jersey, which are not subject to this law, have policies that grant tenure within seven years.^x It is essential, regardless of tenure timeframes, that institutions encourage collaboration. *The Governor's Task Force on Higher Education* recommended that policies hindering the competitiveness of New Jersey's colleges and universities be eliminated, although that recommendation did not specifically mention policies governing tenure.

A participant from industry in the IT group urged the establishing of "metrics" that would enable a professor's participation in an industrial collaboration to meet a university's tenure requirement regarding research. Over time, this participant argued, "if it becomes the norm that the tenure committee evaluates the impact of the industrial collaboration, then it will become real, because behavior is driven by metrics."

Sustaining the innovation ecosystem requires that relationship building with faculty begin at an early stage in order to cultivate long lasting collaborative partnerships.

RECOMMENDATION 9

Academia and industry need to work together to design internship/co-op programs that provide maximum benefit to all stakeholders.

DISCUSSION/FINDINGS

Bridging Cultural Differences Between Business and Academia via Internships/Co-ops

Similar to how tenure policies impede relationship building, student internships/co-op programs can be adversely impacted by the cultural differences that exist between the calendars and timelines of academia or business. Students must often choose between classes, lab work and internship/co-op programs, when they should, in fact, be gaining experience from all three.

While it is important that students fulfill their on-campus requirements, internships/co-op programs allow students to gain real-world experience and allow businesses to evaluate and recruit potential employees.

For instance, semester-based placement, examinations and course timetables at the student's university/college can clash with his or her internship work schedule, since the commercial world typically adheres to a fiscal year, calendar year, or project schedule. A student's internship may end before the project on which he or she is working is completed.

The focus groups readily acknowledged the important role that internships/co-ops play in preparing today's students to be tomorrow's innovation leaders, calling for the establishment of more of these programs at New Jersey colleges and universities. The focus groups emphasized, however, that internships/co-ops work best when blended with academic instruction. Combining an academic education with an internship produces well-rounded students who have both the technological knowledge and the communication and social skills needed to work in business, the group members said. It would be a mistake, one participant from a focus group declared, to give a student credit for an internship in place of a lab: "They need both (experiences)," the speaker said.

The focus groups cited Drexel University's 6-month internship co-op as a model for New Jersey's higher education institutions to follow copy. On the job eight hours a day, five days a week, entrusted with projects "vital to the day-to-day functioning of the workplace,"^{xi} Drexel co-op students sample up to three different positions within their chosen field of study. They can choose from more than 1,200 co-op employers in 41 states and 45 international locations, or conduct an independent search. The average six-month co-op salary is \$15,808. Before graduation, the student can sample up to three different positions in his or her field of study.

The focus groups concluded that designing internships/co-ops capable of bridging cultural differences between academia and business requires academia to become more flexible to meeting the needs of business while maintaining academic standards. To that end, academia and industry should explore ways to design internships/co-ops that best serve the needs of academia and industry, as well as the student.

RECOMMENDATION 10

Academia should emphasize the teaching of interpersonal skills and provide basic business training for STEM majors to facilitate the translation of research from the lab into commercialized applications.

DISCUSSION/FINDINGS

Bridging Cultural Differences Between Business and Academia via Business and Interpersonal Skills

Many high-paying STEM jobs go unfilled as candidates lack the necessary technical skills, training or post-secondary degrees. As New Jersey competes globally, this skills gap is alarming. As academics and policymakers work to ensure that New Jersey has a steady pipeline of talent to support our high-tech, research intensive economy, it is imperative that our students have the technical and the scientific skills they need to compete in the global marketplace. More students need to be exposed to, and trained in, math and science to provide the workforce that New Jersey's innovator companies require. Another key step in developing the pipeline of talent to support the innovation ecosystem in addition to technical training, is the teaching of interpersonal skills. Students need to effectively interact as part of a team or within a business group. To paraphrase the focus group participants: It isn't enough for students to be good scientists; they must be proficient in interacting with people, as well.

An industry participant from the Chemicals group said that frequently "it is very difficult" to get technologically-savvy students "to interact well with different groups," thrusting attention on the need to help students develop these business and interpersonal skills. These skills also are at the heart of relationship-building, a preliminary phase in forming partnerships. For this reason, an industry participant from the Chemicals group said his organization often prefers to collaborate with universities respected for their ability to develop business and interpersonal skills, even though these institutions of higher education tend not to be strongly science-focused.

In *Building Bridges I* it was recommended that universities reconfigure their curricula to give science-based majors basic training in business skills to be able to translate their scientific research into commercialized applications. During discussions with the focus groups, this recommendation was reaffirmed that students in the sciences need business skills to take their research from the lab to the marketplace.

What They Said

Our focus groups showed that potential collaborations between New Jersey's institutions of higher education and industry often end in frustration and disappointment, partly because universities and colleges fail to think sufficiently like commercial enterprises. Here is some of the focus group input on this and related issues.

On the State's continued support of New Jersey's network of business incubators

A participant from academia: "We have 90 companies in our technology business incubator, I guess maybe half of them are IT ... The incubator has tremendous advantage because we are able to coach them and entice our faculty members so we go after federal funds as opposed to sort of relying on family investment or venture capital investment to get it going. ... Reestablishing the state's incubator is a very important element for this conversation."

A participant from industry: "It is important in this economy to provide state funding to small entities like start-ups, but in particular incubators. Bring back funding for incubation with a strategy and a roadmap that allows the state to build the confidence of the citizenry that the money they are committing will have a long term impact, even in a short term economy."

On the clash of cultures

A participant from academia: "I keep telling the industry that they will get deliverables in December or May. It is impossible to get you something in October or March. It is just not going to happen."

A participant from academia: If a student spends part of his college education in an internship in industry, his or her contribution "has to start in September and end in December, or start in January and end in May. And that is how students see the world. They get a grade for this."

A participant from industry: "The folks that I represent are very hands-on. They want results, and (have) limited experience with academia."

A participant from academia: A communication plan must be created partly to accommodate companies that want to "micromanage" academic projects. "How often do you want to interface? It's setting that upfront."

On academia's slow pace in commercializing research

A participant from industry: "Often, things that academia is advertising are not ready to go into our products; and so, because of the timeframes we work within, we struggle to see the financial sense of committing to a development program where the university may want to just get it out and licensed, rather than develop it and put it into our products."

A participant from industry: "We do look at universities, but so much of what we see coming from universities is very preliminary; it's not ready to go into the field, and so far we have not been willing to pay to develop that technology to get it ready for the field."

A participant from academia: "Most of the papers that I have written would probably put my industry partners to sleep."

On the prominence of the profit motive in industry research

A participant from industry: The primary motivation for doing industrial research "used to be pure science. Now we are certainly more driven by the customers. ... It is not Edisonian product research, but it is certainly industrial research, as opposed to academic research inside an industrial entity."

A participant from industry: The breakthroughs in the past several decades which have most benefited the economy stemmed from "very large scale corporate research and development." As a result, "we have walked ourselves into these stereotypes about what the university should and shouldn't do and what the industry should and shouldn't do."

A participant from industry: "Academia is centered around the success or failure of individual faculty ... so they are not necessarily rewarded to have very broad holistic views... They tend to be very specialized."

A participant from industry: The company's year-long efforts to use faculty members in a project "was an absolute failure ... it did not work because (of) the motivations of the faculty members. ... the money was not there and ... it was not worth their time because they could be doing other things. (We) went on to hire professional industry staff ... because they are devoted to ... solving real world industry problems and everyone gets a paycheck. They don't need to be teaching classes or any of that."

Challenge 4

Raising Awareness of New Jersey's Academic Assets to the Business Community

OVERVIEW: The foundation of a successful, functioning innovation ecosystem is communication and transparency. Without them, none of the parties can cultivate a relationship or share their work or vision. As was demonstrated in *Building Bridges I*, research and resources at universities have little visibility, both inside and outside their respective organizations.

The focus groups re-affirmed that the lack of transparency of activities is one of the most significant challenges universities and companies face when it comes to initiating a partnership. A university's pharmaceutical expert may not know that the school's recent research ties in with a specific problem that is confounding a segment of New Jersey's life sciences industry. The chemicals industry may be looking for the next best chemical compound, but has no idea how to tap the expertise of university chemists. According to the focus groups, universities do an inadequate job of touting the knowledge and skills of their brightest stars, which make it difficult to develop collaborative relationships.

More aggressive marketing of academic resources would help break this communication logjam. To enhance communication and marketing, this section proposes that higher education institutions make their websites more user friendly, that universities and colleges conduct a public outreach campaign to promote their top talent and assets that they develop a resource guide to help facilitate collaborative projects, and that the three legs of the innovation ecosystem join forces to establish a database of university research and development efforts.

RECOMMENDATION 11

Academia should design user-friendly websites, to make it easier for businesses to find the resources they are seeking and to facilitate potential collaborations.

DISCUSSION/FINDINGS

Enhancing Communication and Marketing via User-Friendly Websites

It is important that college and university websites be easy to navigate to successfully guide potential collaborators to a specific researcher or resource. In the focus

groups, participants from industry complained that they often were unable to find even basic contact information for a field expert on the websites of the state's colleges and universities. Even an academic in the energy group confirmed, "You can spend months going in circles." A user-friendly website would give visitors from industry fast, easy access to essential information and provide guidance on how to collaborate with the institution.

RECOMMENDATION 12

New Jersey should more aggressively promote its academic assets to attract potential collaborators and research dollars.

DISCUSSION/FINDINGS

Promoting New Jersey's Academic Assets

New Jersey should be more aggressive in promoting the assets of its higher education institutions as centers for collaboration and innovation. The declaration by a participant from industry in the Chemicals group that no New Jersey universities were on his "radar screen" should be viewed as a call to action by the state to tout its many excellent academic assets.

As *Building Bridges I* pointed out, the State has a vested interest in promoting business and higher education collaboration because it will help grow the economy. The State needs to take advantage of the valuable research dollars that are available and make sure that New Jersey gets its fair share. Increased research investment will generate high paying jobs and more tax revenue.

The focus groups offered multiple suggestions on ways to promote New Jersey's academic assets. An industry participant in the Biotechnology focus group suggested that faculty members participate in more public forums to present their research as a way to attract companies to New Jersey. As he stated, "Word gets out and you have companies coming." A participant from academia in the Agriculture/Food Processing group recommended using Internet-based promotional strategies to highlight work by New Jersey scholars that would attract potential industrial partners. An outreach, this speaker said, could be built around a question such as, "Did you know our school has the world's leading microbiology expert on Listeria?" Another participant in the Biotechnology group suggested traveling outside the State to promote why industries based elsewhere should collaborate with New Jersey higher education institutions. Another participant wanted the outreach to target New Jersey high schools, to motivate young scientists to pursue studies that could lead to eventual collaborations with industry.

RECOMMENDATION 13

Academia, industry and the State should establish a comprehensive resource directory that includes existing research areas, capabilities and talent, and publicly available assets and facilities at New Jersey colleges and universities.

RECOMMENDATION 14

Each college and university should publicly promote its own chief administrator (i.e., Associate Provost for Research, Vice President for Research, Director of Research and Sponsored Programs, etc.) to serve as a one-stop-shop for business to access university information and resources.

DISCUSSION/FINDINGS**Develop Resource Tools to Guide Users Through Colleges' and Universities' Infrastructure**

In order to facilitate the relationship building that is the underpinning of an innovation ecosystem, centralized sources of academic resources should be employed to make it easier for the business community to engage an academic partner. The present lack of dialogue between the three legs of the New Jersey innovation ecosystem results in minimal visibility of the resources that are available to potential collaborators. Businesses need a centralized point of contact within each college and university to handle their research requirements. A publicly accessible resource directory should include all of New Jersey's college and university chief administrators in charge of business outreach and research.

A comprehensive resource directory would include existing research areas, capabilities and talent and publicly available assets and facilities at New Jersey colleges and universities. This guide would serve as a roadmap for businesses to identify what each college and university has to offer. "NJ's industry doesn't know what academia is doing," one participant from academia in the Biotechnology group pointed out. However, as a participant from academia in the Defense group noted, "Even people who are working within areas of the university that are not so far apart ... don't know what (the others) are doing"

State government could utilize this tool for business outreach and retention. As business attraction efforts become more competitive among states, this is an easy way to promote available assets and encourage businesses to locate in New Jersey.

Furthermore, a designated administrator at each college and university would provide a one-stop-shop for business to access university information and resources. In addition, the administrator could serve as the liaison for researchers to interface with the business community.

Moving the innovation ecosystem forward, this directory would allow the information exchange to occur more rapidly and lead to greater collaboration opportunities that could benefit the state and economy.

Suggestion Box

The focus groups offered numerous suggestions for boosting entrepreneurship in higher education. Some of the more thought-provoking ideas:

- Assign specially appointed "industry mentors" and grant-writing experts to help guide colleges and universities in their efforts to commercialize scholarly discoveries. "The reality is very few faculty want to work with industry," claimed one speaker.
- Partner faculty members with a business advisor who can provide guidance and help in applying research directly to industrial practice. "Academics are very naive as to how we actually get our technology translated ... we don't really know what's going on," said a representative from higher education. The speaker said that the business advisor, a venture-capitalist with corporate connections, gave the university a modest amount of seed funding and other assistance "to at least bring us to a point where we have the ... data to actually get a company excited."
- Have the State release unique and unused data-sets to the public so industry and academia can mine its collaboration potential.
- Make a greater outreach to high schools to motivate students to pursue studies that would lead them into collaboration with industry.
- Establish a way to reward faculty for creating industry-friendly patents. "Communication with faculty is a necessity to develop patents that might make companies interested," a participant said.

Continued on page 17

Challenge 5

Lack of Coordinated Efforts to Secure Funding from Various Sources

OVERVIEW: There are two major issues related to funding. First, as previously recognized by Deborah Jackson, there is a weak coupling of the two economies that form the innovation ecosystem “because the resources invested in the research economy must be derived from the commercial sector.” Operating on two different philosophies - science for science sake and science for profit, the two parties often clash.

The second issue is how to attract federal dollars. In a well coordinated effective innovation ecosystem all parties work in unison to procure federal grants. New Jersey needs to improve its coordination and ranking of university R&D funding from the federal government.

RECOMMENDATION 15

The State, academia and industry should find ways to improve coordination of their efforts to secure increased federal funding.

DISCUSSION/FINDINGS

Coordinating the Securing of Various Sources of Funding via Improved Communication

At a time of generally decreased public funding, it is important that all three parties of the innovation ecosystem band together in pursuit of increased federal funding. Since the State has not ranked in the top ten for National Institutes for Health, National Science Foundation, Centers for Disease Control, Department of Defense, Department of Energy and others, which provide millions in funding, it is critical to pool our research efforts in submitting grant applications that can attract large investments. A recent effort by the state to strengthen our public research universities and position them to better compete for federal dollars acknowledges that there is room for improvement. This participant from the Chemicals group made an eloquent case for industry, academia and the State pooling efforts to procure federal funding:

“What problem can we solve that’s in the best interest to both of us that we have the resources to solve, and what do we need? ... and what do we need in terms of funding and going together to do that? ... We have failed in some instances to attract government funding because

we’re not broad enough. But we are starting to look at specific partnerships where we can say, ... oh, wow, if we work together we now cover all the bases so (when) we put the proposal in for millions of dollars of government funding, we’re more attractive and have a better chance of success.”

The collaboration for federal dollars allows for relationship building outside of the client-provider arrangement, allowing for a peer-to-peer dynamic to occur.

The innovation ecosystem requires new ideas to be developed and exploration to occur. However, that is not without cost and there are several dynamics to the funding equation. The research relationship can be peer-to-peer (academic and business research team funded by government grant), client-provider (business hires academic research team), or noncollaborative (an entity does its own research with its own funding). In a collaboration between academia and industry, depending on the type of relationship, money issues can spark contention. A business may resent being seen chiefly as a university’s personal banking machine; as one participant from the focus groups indicated, “We don’t want you to just come to us for money.” This was met by equal frustration from an academic: “Even though you funded the project, it doesn’t mean that you own me.” Partnering together for federal funding can not only increase dollars brought to New Jersey, but can also improve a peer-to-peer relationship between academia and business researchers.

For instance, according to a recent study by the National Center for Science and Engineering Statistics at the National Science Foundation, (InfoBrief, September 2012), New Jersey ranked second among the states in R&D performed and paid for by companies in 2008, at \$17.331 billion, with pharmaceuticals accounting for 73% of this business R&D. Yet, according to statistics compiled by Research America, in 2011 New Jersey ranked 22nd in combined NIH, CDC and NSF funding. This disparity clearly illustrates the disconnect between New Jersey’s institutions of higher education and the State’s leading research-based industries and why New Jersey companies partner with schools outside of New Jersey who have made the investment to support industry.

Conclusion

The search for the next great idea, process, product or technology is increasingly becoming a collective effort requiring government, industry and academia to pool their resources and work together. In return, all these stakeholders stand to benefit from their contributions. Industries get to profit from their latest invention; colleges and universities receive support to advance and license their research; and the State realizes increased economic activity and job creation. However, to reap these benefits, all three parties must unite to build and maintain a thorough and functional innovation ecosystem in which R&D can thrive.

New Jersey has all the pieces to have a world-class innovation ecosystem: strong research-based industries, outstanding academic institutions, a supportive state government, accessibility to capital, and a highly-educated workforce. The challenge is taking these disparate pieces and putting the innovation ecosystem puzzle together. It is promising that the participants in the focus groups, industry and academic alike, were able to agree on the shortcomings in New Jersey's innovation ecosystem and recognize the imperative to improve the system in order to be competitive with other states that have more fully developed their innovation ecosystems, particularly in leveraging their academic resources as economic development tools. These academic-based economic development tools can take many forms, all of which provide value. For the mature company, it can be tapping the intellectual expertise of a world-renown researcher to conduct sponsored research. For a start-up company, it can be an incubator that provides laboratory space and business mentoring. For others, it can be renting a piece of sophisticated equipment they could not afford to purchase to advance their research. But without these resources in-state, industry R&D can stall or business can look to collaborate with out-of-state academic institutions.

Many of the recommendations contained in this report do not require a large investment by our universities and colleges, but rather the commitment and leadership to change their cultures and imbue a sense of entrepreneurship in our higher education system. Streamlining administrative burdens, bridging the cultural differences between academia and industry, and improving communications and outreach to the business community are initiatives that New Jersey's universities and colleges can easily undertake, either individually or on a system-wide scale.

The broader recommendations – coordinating efforts and resources to establish New Jersey as the home of specific expertise (i.e., Centers of Excellence, developing industry consortiums) and maximizing New Jersey's share of federal grant dollars – need the support of the State as a full partner and promoter as all three members of New Jersey's innovation ecosystem strive to optimize the State's R&D assets to attract new public and private investment.

Research and development is a highly competitive area that produces an economic multiplier that all states and countries yearn for. Where once New Jersey was the uncontested leader, we now find ourselves in a national and worldwide fight for R&D investment. And as we see, companies are more than willing to invest in states that have high taxes and difficult-to-manage regulatory schemes because they have world-class academic institutions that provide a level of R&D support that outweighs the negative factors.

However, due to our long history as a global leader in R&D, New Jersey has built up a reservoir of resources to compete on the world stage, as long as the state can adapt to the new rules of the game. That means a new paradigm in which industry, academia and the State are partners in a fully functioning innovation ecosystem.

Suggestion Box

Continued from page 15

- Have universities become more conversant in business, specifically in writing business plans and dealing with different types of contracts to handle collaborative offers that don't involve grants. "I had to have a small business plan on how I would incorporate small businesses into the contracts that I had," recalled one speaker from academia. "The university kind of looked at me like...are you nuts? We don't have a small business plan. ... We had won the contract and then all the sudden we had 30 days to produce a small business plan. Fortunately, I came from industry, where I have heard it all, so I was able to work with our lawyers."
- Study how universities in Europe are encouraged to do "service work" for an industry through resource centers, a concept that is neither strictly tied to the funding-driven model for academia, nor well-promoted in the United States.
- Give faculty members greater incentives to align their academic goals with those of industry. Faculty promotions, one speaker said, currently are based on "the amount of funding they get from the National Science Foundation or the National Institutes of Health," not on work with industry.
- Think ahead. As one speaker said: "Get New Jersey universities to think in terms of preparing our students to be tomorrow's scientists, so (they can deliver) what the industries are looking for, what are the companies looking for?"

Endnotes

- i The New Jersey Higher Education Task Force, “The report of the governor’s task force on higher education,” December 2010
- ii InnovationNJ website. Available: <http://innovationnj.net/>
- iii Deborah J. Jackson, “What is an Innovation Ecosystem?” National Science Foundation, Arlington, Va. Available: http://www.erc-assoc.org/docs/innovation_ecosystem.pdf
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- vi The New Jersey Higher Education Task Force, “The report of the governor’s task force on higher education,” December 2010
- vii CINJ website. Available: <http://www.cinj.org/>
- viii www.atp.nist.gov/
- ix www.illinoisinnovation.com
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- xi Drexel University Co-op website. Available: www.drexel.edu/undergrad/coop/

collaborate

ecosystem

innovation

industry

BUILD TOOLS

academia

research



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NJPRO Foundation
102 West State Street
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