Task Force on Diversifying the New York State Economy through Industry-Higher Education Partnerships

FINAL REPORT
SUBMITTED DECEMBER 14, 2009

David A. Paterson, Governor

David J. Skorton, Chair

The Honorable David A. Paterson
Governor of New York
State Capitol
Albany, New York 12224

Dear Governor Paterson:

On behalf of the Task Force on Diversifying the New York State Economy through Industry-Higher Education Partnerships, I herewith submit this Report of Findings and Recommendations.

This report recommends policy and practice changes that, if implemented, will result in improved collaboration between the State's industries, higher education institutions and the venture investment community and a resulting expansion of the innovation economy. As this report outlines, New York possesses many of the raw materials to be a national and international leader in technology commercialization and start-up business creation including tremendous research capacity, innovation-focused companies and an educated workforce. However, despite this potential, New York lags far behind in university-based start-ups, industry-financed research at universities and, most dramatically, overall venture capital investment. The Task Force examines the reasons for this disparity and makes recommendations to improve our competitiveness.

The Task Force made every effort to base recommendations on the best data available. In addition to examining the relevant literature, the Task Force held two public hearings, solicited advice from leaders in the fields of technology transfer, industry, and venture capital and received public comment in written form from State and local officials, educators, researchers, entrepreneurs and investors. At their core, all of these sources lead us to the same conclusion: New York requires a fundamental reorientation toward entrepreneurship, collaboration and commercialization at the government, university and industrial levels.

I know I speak for all members of the Task Force when I say that it has been an honor to participate in this important work. As individuals we look forward to helping to implement these recommendations in the future.

Respectfully submitted,

David J. Skorton
Chair

Daniel Doktori
Executive Director

Enclosure: Report of Findings and Recommendations

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Context for the Report: A Tipping Point

The State of New York possesses many of the fundamentals required to become a universally recognized world-class center of innovation. However, to realize its potential and achieve such a distinction, the State needs to develop an innovation ecosystem that efficiently and effectively unites universities, industry and capital. New York's future prosperity – let alone its ability to grow out of the recent severe economic downturn – requires a fundamental cultural change that consolidates and scales existing efforts toward a statewide vision. Several data points are particularly illuminating:

- New York is home to over **20 major research centers** including several world renowned institutions.
- New York universities rank **second nationally in total research** spending with nearly $4 billion spent annually (California ranks first with $6.5 billion).
- Of that $4 billion spent annually, only **4.6% is sponsored by industry**, ranking New York 22nd among states (North Carolina ranks first with 13.6%, the national average is 5.4%).
- New York attracts **only 4% of the nation's venture capital** investment (California attracts 47%).
- New York's colleges **incubate fewer new companies**, with 35 start-ups launched in 2007 (California schools had 58 and Massachusetts schools, 60).
- New York is home to **fewer fast-growing technology companies**, with 11 of the companies on the Deloitte Technology Fast 500 List (as compared with California's 169 and Massachusetts' 46).

New York can and must do more to convert its tremendous research capacity into direct and sustainable economic impact. Many of the essential elements are in place. On top of the $4 billion in university-based research, New York is home to several world-leading companies focused on research and development. Several nascent communication networks, a trickle of available seed funding, a large venture capital community (which is currently investing outside of New York) and an educated workforce are all primed to build upon the State's academic and industrial research foundation.

Most significantly, New York lacks a statewide culture that prioritizes commercialization activities and promotes university-industry collaboration on a variety of levels. The proposals and recommendations outlined in this report, once implemented, will help reorient that culture. Ultimately, however, nothing can substitute for buy-in at the leadership level – university presidents, industry CEOs, venture capital managing directors, the Governor and the legislative leadership all must take personal responsibility for making New York the international innovation hub it must become.

Overview: Leveraging a Promising Opportunity Set

The Task Force on Diversifying the New York State Economy through Industry-Higher Education Partnerships ("the Task Force") was established by Executive Order No. 19 of Governor David A. Paterson, signed May 13, 2009.

The central question posed to the Task Force was: ***how can New York more effectively harness its substantial university-based innovation assets to drive sustainable economic growth?*** The Task Force pursued this charge along two parallel tracks:

1. Examining research, and commercialization (the conversion of innovations into revenue-generating products) and collaboration between higher education institutions and existing companies; and
2. examining entrepreneurial activity and start-up business creation resulting from university-related research. The fundamental observation of the Task Force was that both tracks are best facilitated through the development of an effective "innovation ecosystem."

That ecosystem consists of:

- **Universities** that raise awareness of entrepreneurship and industry-collaboration opportunities on and off campus; that cultivate areas of world-class expertise; that provide students and faculty with pipelines for commercializing their innovations.
- **Industry** that seeks to leverage open innovation principles and university expertise to stay on the cutting edge; that clearly and frequently communicates expectations and desires for future product and process developments to university partners and invests in long-term relationships with universities.
- **Access to capital** for technology transfer and commercialization; high levels of communication between venture capitalists and university researchers.
- **Business services** for start-up entrepreneurs looking to commercialize their research.
- **Critical mass** in strategic research areas resulting from industry and academic expertise and investment in those areas.
- **Clearly defined government policies** that establish technology priorities in areas of existing strength with growth potential and invest in those priorities; that monitor and publish performance metrics measuring progress toward well-articulated goals in priority areas.
- **Communication networks** that facilitate collaboration between institutions of higher education, industry and the venture capital community.
- **Regular, public reporting of metrics** measuring statewide and university-level performance on innovation capacity, activity and outcomes.

Based on our research on industry-higher education partnerships in New York and other states, the working premise of the Task Force is that the that the promotion of an innovation ecosystem will yield increased, diversified and sustainable economic activity throughout the state. Accordingly, each chapter of the Task Force's report corresponds to these elements of thriving innovation ecosystem. Key recommendations include:

UNIVERSITY PRACTICES

- Ensure top-level commitment to entrepreneurship and commercialization activities, empower an on-campus champion to execute senior-level vision and provide a platform for collaborative activity.
- Raise awareness on campus through industry-relevant course curricula, awards for entrepreneurial activity, business plan competitions.
- Achieve world-class expertise through faculty recruitment and retention, industry-friendly activity.
- Provide commercialization pipelines for campus researchers through commercialization and business start-up training programs, entrepreneur-in-residence programs, university-based incubators and alumni networks.
- Align incentives with university goals and pursue intellectual property policies that maximize interaction with business and new enterprise formation.

INDUSTRY PRACTICES

- Flip the model of traditional university-industry research interaction so that companies actively communicate market opportunities to academic researchers who can target their research accordingly.
- Pursue and invest in long-term umbrella agreements with universities for access to a portfolio of intellectual property and a wider range of university-based talent.
- Generate critical mass in priority research areas and promote industry-university research collaboration through the adoption of a research and development tax credit (a state practice related to industry).

ACCESS TO CAPITAL & BUSINESS SERVICES

- Bridge the "valley of death" (the period between proof of concept of a technology and its ability to generate revenue for a company) by providing critical access to capital for university-based start-ups through the creation of a seed fund and the reduction or elimination of capital gains taxes for founding investors.
- Create professional regional hubs for business services including business plan counseling, entrepreneurial mentorship, access to capital, access to incubator space.
- Deliver student-provided business services at local universities in clinical-style settings.

CRITICAL MASS IN STRATEGIC AREAS

- Focus economic development investments in fields where New York can be a world-leader – health care and life sciences, energy, nanotechnology, and agriculture and the food industry.
- Emphasize the teaching of services sciences within science, technology, engineering and mathematics fields, in particular within those fields in which New York has critical mass.

STATE PRACTICES

- Adopt business incubation and talent recruitment/retention as central components of economic development policy.
- Collect and publish data relating to innovation capacity, innovation activity and innovation impact and use that data to drive future policy decisions.

- Create an Innovation Advisory Council consisting of leaders from government, academia, industry and the investment community to advise the Governor and Legislature on opportunities for promoting the New York innovation economy.
- Employ peer review and return on investment – rather than geographic or political considerations – as the primary criteria for funding university-industry investments.

COMMUNICATION NETWORKS

- Establish structured dialogues between industry and higher education institutions to identify current state of university research, pre-competitive industry targets for future products and processes, opportunities for research collaboration.
- Establish an early-adopter network of industry, higher education and government to provide initial markets and product validation for new products emerging out of university-related research.
- Publish an online, open source innovation asset inventory.

METRICS

- Collect and publish an annual innovation report detailing statewide and university-level performance on capacity, activity and impact metrics as defined in this report and refined by the proposed Innovation Advisory Council.
- Monitor and facilitate execution of task force recommendations.
- Collect and publish data on relevant university-industry collaborative activities.

Value Proposition: An Opportunity for New York and New Yorkers

Promotion of industry-higher education partnerships and investment in New York's innovation ecosystem holds opportunities for all New Yorkers. Industry-higher education collaboration will more effectively leverage the billions of dollars of public and private investments that have been made to build one of this country's great research platforms. Collaboration with industry will permit New York-based universities to more effectively compete for the next generation of research faculty. Collaboration with universities will give New York-based industry access to cutting edge research earlier on in the development cycle. A statewide orientation toward entrepreneurism will yield small and medium high-technology business that will provide New Yorkers with access to higher paying jobs, a more vibrant system of higher education, greater resilience to withstand future economic shocks and increased tax revenues to support government programs and services.

Conclusion: the Novelty is the Execution

The report is released in the context of several other recent reports from the Center for an Urban Future, the Business Council of New York State, the Kauffman Foundation for Entrepreneurship, State Assemblyman Joseph Morelle and the consulting firm AT Kearney, all of which include similar and well-considered recommendations. Given this context, this Industry-Higher Education Partnership Task Force report provides an economical accounting of the major opportunities and recommendations for executing upon those opportunities.

This report is a source book as much as it is a set of recommendations. Throughout the report, links to websites of innovative programs and institutions are provided for reference. A working inventory of New York's innovation assets (e.g. government and university programs, angel investor networks etc.) has been developed and will be made available online. This report is about the *how* as much as it is about the *what.*

Achieving the *what* will require consistent, enduring and concentrated effort over years and decades. Throughout the report, attention is paid to defining and measuring success toward articulated goals. This Task Force included leaders from business, academia, government and the investment community. Each of the members of the Task Force is personally committed to executing the recommendations found in this report.

MATRIX OF FINDINGS, RECOMMENDATIONS & IMPLEMENTATION PLANS

The following is an accounting of the individual findings of the Task Force, the resulting recommendations and the implementation plan associated with executing the recommendation. The matrix is organized by chapter, with each chapter corresponding to a different element of the innovation ecosystem. In keeping with the Task Force's focus on execution, each section includes a review of the key metrics associated with *defining success* in accomplishing that particular element of the innovation ecosystem.

UNIVERSITY PRACTICES

Defining Success

- *Quality faculty*
- *University-industry master agreements*
- *Industry-relevant and entrepreneurial programming*
- *"Deal flow" as a measure of university engagement with business as opposed to licensing income* (master agreements with partner companies, industry-sponsored research, joint invention disclosures, joint patent filings, product licenses, Federal SBIR and STTR grants won, university start-ups and company spin-outs based on university-related research)
- *Ratio of start-ups created to total research funding*
- *Percentage of university-incubated start-ups successfully raising next round of funding*

FINDING	RECOMMENDATION	IMPLEMENTATION
To promote entrepreneurial activity and interaction with businesses of all sizes, universities need **commitment at the highest levels, an empowered champion and a platform** from which to articulate and launch their efforts.	Colleges should **adopt best practices as articulated** in report for achieving interaction with existing businesses and maximization of entrepreneurial activity on campus	Individual colleges to adopt practices. State to measure university outputs.
Students, faculty and staff **respond to incentives** provided at the university level which impact their willingness and interest in pursuing collaboration with industry.	Colleges should provide awards, business plan competitions to raise awareness of entrepreneurial activities; **Policies on leave and shared royalties** should be shaped to promote faculty entrepreneurial activity.	Colleges to implement own policies; State to measure university outputs.

FINDING	RECOMMENDATION	IMPLEMENTATION
Generally, New York's institutions of higher education have been more focused on **maximizing licensing revenue instead of interactions** with industry partners.	Colleges should **seek long-term relationships governed by general umbrella agreements** with partner companies; Colleges should emphasize deal flow where possible over licensing income.	State metrics to measure university-related business incubation, deal flow at universities, and de-emphasize licensing income State, colleges and companies to celebrate entrepreneurial success stories. NYSTAR, in collaboration with the Syracuse Science and Technology Law Center, to develop templates for typical intellectual property arrangements between industry and universities.

INDUSTRY PRACTICES

Defining Success

- *Industry-sponsored research at universities*
- *Master agreements between universities and businesses*
- *Deal flow with universities*
- *Number of fast-growing high technology ('Gazelle') companies and jobs based in New York*
- *Research & development tax credit utilization*

FINDING	RECOMMENDATION	IMPLEMENTATION
Companies often passively react to research developments instead of participating collaboratively with faculty researchers in the development of research targets.	Companies should seek to **convey pre-competitive research and technology needs** and business opportunities, thereby **'flipping the model'** and enabling university-based researchers to react more directly to market forces.	Shared responsibility between all participants. Administrators of communication networks and companies themselves to take responsibility for organizing clusters.

FINDING	RECOMMENDATION	IMPLEMENTATION
Increasing numbers of companies are turning to '**open-innovation' business models** which require leveraging of university-based research.	Companies should seek to establish enduring relationships with universities beyond individual research partnerships so as to **maximize mutual understanding and effective collaboration**	Companies and colleges to pursue appropriate policies
NY-based industry invests heavily in R&D, although not all in NYS. Industry R&D investments are **crucial to development of critical mass** in strategic research areas.	State should adopt an **R&D tax credit**	Include in Empire State Development budget proposal for FY 2010-11.

ACCESS TO CAPITAL AND BUSINESS SERVICES

Defining Success:

- *Number of university-based start-ups*
- *Number and percentage of university-based start-ups proceeding to next funding round*
- *Number and investment level of angel investors*
- *Total venture investment in NYS*
- *Number of companies assisted by business service providers*
- *Company success in achieving next funding round*

FINDING	RECOMMENDATION	IMPLEMENTATION
Lack of available funding in "**valley of death**" between technology maturity and company revenues is a structural problem occurring in New York State as elsewhere. New York has particularly low available capital for early-stage companies as compared to peer states.	Create a **seed fund** for pre-revenue start-up companies.	Executive and Legislature to implement as budget conditions allow.

FINDING	RECOMMENDATION	IMPLEMENTATION
Professional investors at the angel and venture capital levels are **the crucial source of investment** for university-based start-ups.	Reduce or **eliminate capital gains taxes** for founding investors.	Executive and Legislature to implement as budget conditions allow.
Professional **investors are not sufficiently aware** of investment opportunities arising out of New York's universities.	**Increase exposure of investment opportunities to Angel Investors and Venture Capitalists** through outreach and inclusion in relevant summits, advisory boards and campus activity	Shared responsibility between colleges, government, convening bodies, investment community
Successful innovation ecosystems are characterized by frequent interaction and close cooperation between higher **education institutions, companies and venture capital providers**.	**Promote university collaboration with investor community** through communication networks, inclusion on economic development boards, etc.	Ongoing; shared responsibility between companies, colleges and government
The regional hub provides a good model for provision of professional business services	Adopt **High Tech Rochester model** (one-stop-shop) for regional business assistance organizations.	NYSTAR to work with Regional Technology Development Centers and other service providers to adopt best practices as appropriate.
Academic credit-for-service model is a good model for provision of academic business services	Adopt the Syracuse **Technology Commercialization Clinic Network (TCCN) model** throughout the state	Individual colleges and universities to adopt own policies.

STATE POLICIES

Defining Success

- *Statewide Innovation capacity*
- *Statewide Innovation activity*
- *Statewide Innovation impact*

FINDING	RECOMMENDATION	IMPLEMENTATION
The state lacks a fully functioning **innovation ecosystem**.	The Governor should establish an **Innovation Advisory Council** made up of leaders from academia, industry, government and the professional investment community to provide policy advice and implementation support.	Governor to create Advisory Council with input from legislature. Governor to assign staff member to work with council.
State economic development policies have prioritized attraction and retention of larger businesses with **less emphasis on new business creation** and promotion of entrepreneurial activity.	The State should adopt **new business creation and talent retention and recruitment as additional** elements of economic development policy.	State and local economic development agencies including ESD, NYSTAR and NYSERDA to reflect prioritization in programming.
New York **is not recognized as an innovation hub** or an entrepreneur-friendly environment.	Economic Development agencies should **actively market New York State as a hub of innovation** and an inviting platform for successful entrepreneurship.	ESD marketing department to include innovation and entrepreneurial activity as central to outreach campaign. Governor, legislature, institutions of higher education to recognize achievement in entrepreneurship.
Economic development policies driven by **geographic and political concerns have yielded uneven results** and an unpredictable business environment.	**Data collection and publication of performance should be central** to the mission of economic development agencies and future funding decisions should respond to demonstrated success on pre-identified metrics. **Commercial applications should be a central element** of state-funded research efforts.	Economic Development agencies ESD, NYSTAR and NYSERDA to collect and publish relevant data; State-funded research programs to prioritize applied science and translational research.

FINDING	RECOMMENDATION	IMPLEMENTATION
Matching programs where NYS matches federal research grants have been successful.	Future matching programs should prioritize **joint industry-university applications** and SBIR/STTR grants in particular.	Agencies offering matching funds to reflect priorities moving forward.
Particular state-supported initiatives, such as high-powered computing, faculty recruitment and retention grants and centers of advanced technology have **created a strong innovation infrastructure** in New York State.	New York should **continue to support selected strategic academic-industry partnerships** in targeted innovation economy technologies via capital investment, research and development investment, or tax incentives and credits.	Executive and Legislature to implement as budget conditions allow.

CRITICAL MASS IN STRATEGIC AREAS

Defining Success:

- *University and Industry research expenditures in strategic areas: health care/life sciences, energy, nanotechnology, agriculture, service sector*
- *University and industry invention disclosures and patents, in strategic areas*
- *Jobs, wages, sales and exports in strategic areas*
- *Start-ups and expansions in strategic areas*
- *Cluster development in strategic areas*

FINDING	RECOMMENDATION	IMPLEMENTATION
New York has strength with growth potential in the areas of **health care/life sciences, energy, nanotechnology and agriculture and the food industry**, all of which benefit from university-industry collaboration.	State should **focus economic development efforts in strategic areas**, with explicit focus on translational science and commercialization in these fields.	Shared responsibility between government, industry, academia to target efforts in these fields. Innovation Advisory Council and annual metrics collection to monitor progress.

FINDING	RECOMMENDATION	IMPLEMENTATION
The **service sector is the fastest growing** economic sector. Opportunity exists for New York to be a leader in STEM-related services sciences.	NYS institutions of higher education should **develop services science curricula** associated with strategic research areas.	Several universities throughout the State have indicated interest in participation. Others to join to develop base curricula and regional specializations.
There is **shortage of nuclear engineers** and other workers associated with nuclear energy production. New York is home to six nuclear reactors.	NYS colleges should work with power plant operators to **develop nuclear-related education programs**.	SUNY campuses in North Country to take lead; other engineering schools throughout the state encouraged to participate.
State-convened consortia focused on subsets within areas of critical mass **have shown promise** in the Energy sector.	**Promote collaborative programming** similar to the Battery and Smart Grid consortia within the agriculture and food industries (e.g. reuse of organic waste streams from dairy farms and food processors)	State Department of Agriculture and Markets, to identify specific opportunities for collaboration and convene appropriate participants
Local foods movement a boon to in-state farmers	New York colleges and companies should **adopt policies to maximize patronage** of local farmers.	Individual companies, colleges to adopt own policies.

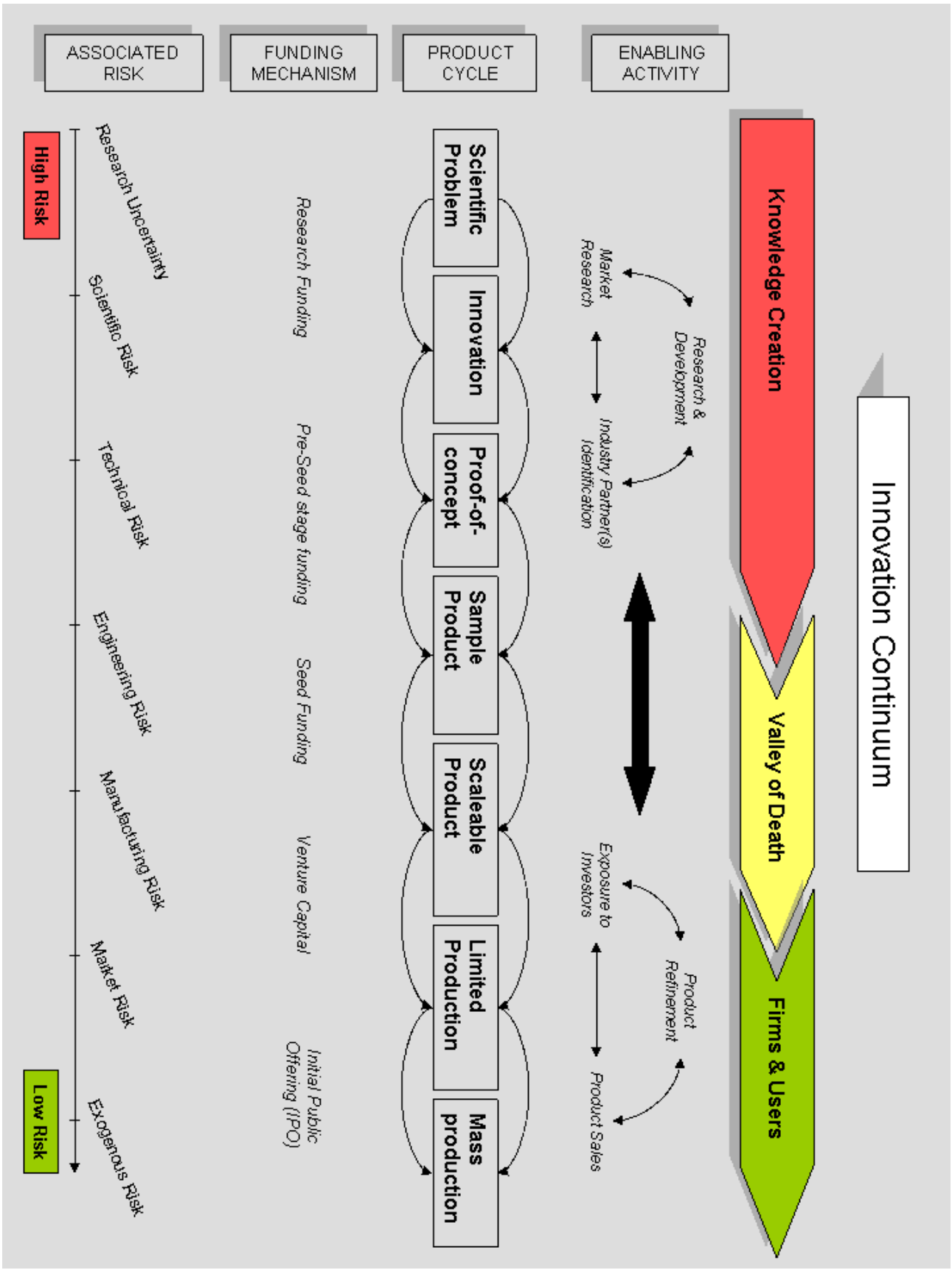
COMMUNICATION NETWORKS

Defining Success:

- *Active networks in place; number of participants*
- *Growth of network participation*
- *Network outputs and outcomes*

FINDING	RECOMMENDATION	IMPLEMENTATION
Communication between industry and universities occur **ad hoc**.	"**Structured dialogues**" should facilitate identification of the current state of research, the industry demand and opportunities for products/processes and a road map to achieve synthesis.	Shared responsibility between all participants in networks.

FINDING	RECOMMENDATION	IMPLEMENTATION
Internet access is the single most important input to promoting communication between elements of an innovation ecosystem.	The State should continue to pursue **universal broadband** internet access while expanding broadband speeds that serve collaborative and networking opportunities.	Executive Order 22 to be pursued by Executive Chamber staff and agencies.
There is a need for entrepreneurs and emerging companies to find "**early adopters"** who can validate their products.	Develop a mechanism for **identifying entities willing to consider testing and validation** of products for which they have a need or interest.	Continue current NYSERDA demonstration and deployment programs for energy products. NYSTAR to assemble a small group of business, university and governmental organizations willing to create a process and mechanism for early adoption/validation of other products.
There is a need for a **single-source of information** on government, university, industry and financial programming and available assets.	Create an **innovation inventory for New York** State and publish it as an open source wiki to be continuously updated.	Knowledge For New York team to implement and host on the knowledge4NY website in anticipation of full-fledged industry portal website currently being designed. Universities, industry and investor community to provide data.
High-level buy-in crucial to successful partnerships; multi-region business organizations and others have the power to convene statewide CEOs and college presidents.	The Partnership for New York City, the Metropolitan Development Association, the Business Council of New York State and the New York Academy of Sciencess should all take the lead in **convening high-level groups on targeted topics.**	The Partnership for New York City, the Metropolitan Development Association, the Business Council of New York State and the New York Academy of Sciencess have all committed to playing a convener role.
Effective networks can proceed virtually, but **require meeting space** at times. Companies, colleges, government have significant available space.	Companies, colleges and government should **make an effort to provide meeting space at little or no charge** for university-industry meetings.	Companies, colleges to adopt appropriate policies. Government to provide space as needed.


Innovation Continuum
Knowledge Creation
Valley of Death
Firms & Users
ENABLING ACTIVITY
Market Research
Research & Development
Industry Partner(s) Identification
Exposure to Investors
Product Refinement
Product Sales
PRODUCT CYCLE
Scientific Problem
Innovation
Proof-of-concept
Sample Product
Scaleable Product
Limited Production
Mass production
FUNDING MECHANISM
Research Funding
Pre-Seed stage funding
Seed Funding
Venture Capital
Initial Public Offering (IPO)
ASSOCIATED RISK
High Risk
Low Risk
Research Uncertainty
Scientific Risk
Technical Risk
Engineering Risk
Manufacturing Risk
Market Risk
Exogenous Risk

INTRODUCTION

The Challenge

For decades following the decline of large-scale industrial manufacturing in the State, New York relied heavily on a single economic sector – financial services – to fuel its prosperity. In 2008 and 2009, New York confronted the harsh reality of that dependence as the nation entered its most serious economic downturn since the Great Depression with Wall Street as its point of departure. The experience has forced policymakers and citizens to recognize that New York needs a more diverse economic foundation upon which to build its future.

To build that future, New York will have to harness its existing strengths, among which are its institutions of higher education. New York is home to over 300 colleges and universities including two Ivy League institutions, eight members of the Association of American Universities, over 20 major research universities and several world-class independent research institutions. These institutions account for more than $4 billion in research and development spending – second only to California's more than $6 billion – and the education of over 1 million students each year.[1] Approximately 32% of New York State residents hold Bachelors or more advanced degrees, among the highest in the nation.[2]

New York's leading companies invest heavily in research and development as well. The top 5 patent holders among NY-based companies account for a collective $11 billion in annual research and development spending worldwide.[3] As these and other companies adopt open-innovation practices which depend on collaboration and seek a competitive advantage through cutting-edge technology, New York's higher education institutions offer an increasingly attractive business opportunity.

Together, these research institutions and innovation-focused companies, their combined spending on research and development and an educated workforce amount to a powerful opportunity set, of which New York has failed to take full advantage. In 2007 New York attracted only 4% of the nation's venture capital investment while California boasted a standard-setting 47% and neighboring Massachusetts garnered 12%.[4] New York also compares unfavorably in university- and nonprofit research center-based business start-ups, with 35 start-ups seeded in 2007 compared with California's 58 and Massachusetts' 60.[5] Fewer new ventures have yielded fewer fast-growing companies. Of the companies included on the Deloitte Technology Fast 500 List, New York is home to 11 as opposed to California's 169 and Massachusetts' 46. New York can do more. New York must do more. This Task Force report seeks to identify how.

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[1] "Almanac of Higher Education 2009-10." *The Chronicle of Higher Education* 56.1 (2009):42. Print.
[2] New York is ranked 8th after MA (38%), CT, MD, CO (35%), NJ, VA (34%) in Ibid: 42, 40, 39, 55, 59, and 56. Print.
[3] See 2008 Annual reports of IBM, GE, Kodak, Xerox, Corning
[4] Albers, Judith J. and Mazzullo, Theresa. *Venture Capital and Seed Activity in NYS: Perception, Reality, and Unrealized Potential.* Rochester: Excell Partners, Inc. Print. P.6
[5] Tiecklemann, Robert, et al. *U.S. Licensing Activity Survey: FY2007.* The Association of University Technology Managers. 2008. Print. P. 44-47

The Question

How can New York more effectively harness its substantial university-based innovation assets to drive sustainable economic growth?

The Approach

In order to tackle that central question, this report examines two separate, but related challenges:

1. How can New York significantly enhance research, commercialization, training and education collaboration between higher education institutions and existing companies?
2. How can New York increase new company creation founded upon university-related research?

Both goals can be achieved through what is commonly referred to as an effective "innovation ecosystem." This Task Force strongly asserts that such an ecosystem can be neither created nor maintained exclusively through government action. Instead, government, academia, industry and the investment community share responsibility for its creation with each element playing its own unique but complementary role. These roles can include:

State & Local Governments

- Collecting and publishing relevant data on state-wide performance; tying economic development decisions to results
- Creating and maintaining mechanisms for information sharing and networking among ecosystem participants
- Encouraging private investment
- Clearly assigning responsibility for policies and programs directed toward university- and industry-based entrepreneurs
- Identifying areas of existing strength and potential growth and targeting investments accordingly, with an emphasis on translation and commercialization
- Investing in game-changing infrastructure beyond the capacity of any single institution

Institutions of Higher Education

- Promoting academic excellence through high-quality education, research, and recruitment and retention of students and faculty
- Establishing culture, curricula and programming that develop student and faculty entrepreneurial skills on campus and in the surrounding community
- Actively seeking industry partners with which to collaborate on research and education programming; showcasing faculty and student achievement and opportunities for investment by companies and professional investors
- Adopting clearly articulated university policies and practices in support of commercialization and entrepreneurial activities by students and faculty
- Promoting formal and informal linkages between faculty and industry in related fields
- Seeking long-term umbrella agreements on intellectual property to promote durable research partnerships with industry

Industry

- Actively seeking research collaborators in higher education institutions
- Articulating and sharing expectations and goals for future product and process development
- Investing resources in research and education partnerships with higher education institutions, as well as beta testing and demonstration projects for university-related research
- Contributing to funding of start-up enterprises based on university-related innovations
- Participating in forums designed to promote interaction with university-related entities
- Seeking long-term umbrella agreements on intellectual property to promote durable research partnerships with institutions of higher education

Investors and Capital Providers

- Participating in forums designed to showcase university-based research and articulate new research targets
- Clearly articulating investment criteria and methods by which proposals are evaluated
- Actively participating in the innovation ecosystem centered upon industry-university collaboration

Above all, to thrive in the global innovation economy, New York will need to undergo a cultural shift. Leveraging New York's higher education base offers the most cost effective and best opportunity to diversify and grow the State economy, but it will not occur without a fundamental reorientation toward entrepreneurship, commercialization and collaboration. New York already hosts many of the most important elements of a thriving innovation economy, but requires a variety of actions to pull these elements together into an integrated whole. These tactics are the basis of this report and are organized into the following sections:

- *University Practices:* The report identifies best practices and guiding principles for universities seeking to partner more effectively with industry and promote entrepreneurial activity on campus.

- *Industry Practices:* The report outlines current performance in the innovation space and methods to promote collaboration with higher education institutions.

- *Access to Capital and Business Services:* The report examines the funding pipeline from idea to revenue-generating enterprise and identifies opportunities to bridge the so-called "valley of death." It stresses the need to engage leaders in the investment community (e.g. private equity, angel investors, venture capital) as full partners in the innovation ecosystem. With regard to business services, the report examines how aspiring entrepreneurs can take advantage of professional and on-campus opportunities to equip themselves with financial due diligence, develop business plans, identify markets and applications and secure needed capital.

- *State Practices:* The report outlines a variety of steps New York State government can take to promote university-industry collaboration and technology commercialization that will brand New York as a business and entrepreneur-friendly innovation hub.

- *Critical Mass in Strategic Areas:* The report identifies research areas where New York State has existing strength and potential for continued growth including health care and life sciences, energy, nanotechnology, agriculture and services within these fields.

- *Communication Networks:* University-industry collaboration requires efficient channels through which such collaboration can be initiated and maintained. The report identifies a variety of methods and best practices.

- *Metrics:* This report asserts the primary importance of measuring performance and basing future funding and other decisions on the results of those measurements. Accompanying each of the relevant sections include recommendations on "defining success." The Task Force recommends a series of metrics which should be collected on an annual basis. These metrics indicate the State's innovation capacity, activity and impact and benchmark New York State against top performers such as California and Massachusetts.

The Goal

This report is targeted at State policymakers, university leadership, company R&D executives and CEOs, aspiring entrepreneurs and interested constituents. The report is a source book as much as it is a collection of recommendations, with best practices and relevant links to websites highlighted throughout. The report is released in the context of several other related reports from the Center for an Urban Future, the Business Council of New York State, the Kauffman Foundation for Entrepreneurship, State Assemblyman Joseph Morelle and the consulting firm AT Kearney, all of which include similar recommendations. Given this context, the Industry-Higher Education Partnership Task Force does not seek novelty in its recommendations, but instead highlights the economic benefit of the major opportunities and provides recommendations on how to execute those opportunities. This report is about the *how* as much as it is about the *what.*

A note on the scope of this report: This report is focused on research universities and technology commercialization. An effective innovation ecosystem includes a variety of education institutions working together to produce the relevant research and to train and educate the workforce and management. The Task Force received very well-considered testimony and written submissions from many of New York's non-research oriented colleges, in particular its community colleges which have a vast experience partnering effectively with industry in New York State. However, this Task Force report does not identify recommendations or best practices related to these vital institutions. Further, while this report examines those conditions and policies which help promote the establishment and nurturing of

new businesses, it does not examine larger issues related to the New York State business climate (e.g. energy costs, tax and regulatory burdens). While recognizing that these business climate issues are of crucial importance to promoting an innovation economy in the State – particularly the retention of new business incubated here – these issues were deemed out of scope for the university-industry collaboration focus of this Task Force. Finally, the Task Force received a variety of proposals related to funding individual programs, centers and the like. This report makes no recommendation on such investment decisions, nor does it recommend specific legislation. Instead, it articulates broad opportunities – some of which require investment or legislation to actualize and others which do not – and best practices which offer models for replication.

VISION STATEMENT

In the 21st century, economic growth in the United States stems from innovation. The most prosperous state economies not only generate the best ideas, but bring those ideas to market efficiently and most effectively.

At the heart of this growth is robust, frequent and seamless collaboration between industry and institutions of higher education. These collaborations and the resulting prosperity which they promote favor no geography and honor no history. In the context of truly global competition, university-industry collaboration exists where individual talent can readily identify relevant assets, government investments are based on performance and potential, and campus and company cultures promote partnership with each other.

The elements that make up an innovation ecosystem – the technology-dependent industries, the knowledge-creating universities, the individuals seeking opportunity – require a future in which inventors and investors find each other with ease and collaborate free from artificial hurdles. For future growth, New York State will build upon its status as a leader in idea creation, and establish effective commercialization pipelines to convert those ideas into a more powerful, resilient economy.

In that future, New York State government will identify and invest in excellence, wherever that excellence is to be found within the State. That government will create targeted programs that maximize existing assets through incentives that reward innovative collaboration. It will collect and publish data that reflect best practices and ensure policy decisions flow from that data. It will promote an environment where risk-takers and entrepreneurs can thrive.

In that future, New York's universities and research institutions will educate their campus communities on navigating the waters of business-creation. They will recognize and reward faculty, staff and students who work with industry to transfer technology and commercialize intellectual property. They will provide platforms from which research-based achievements can seek and find pathways to real-world applications.

In that future, New York companies will work with New York's colleges, universities and research laboratories to anticipate and pursue market opportunities and innovate beyond the reaches of current imagination. Scientists, engineers, innovators, entrepreneurs, established industries and their suppliers, venture capitalists and angel investors, technology transfer officers and patent lawyers will find each other with ease and together shepherd new developments toward enduring dividends. Industry will collaborate with financial capital leaders to communicate emerging topics of interest and market-generated challenges to their academic partners.

That future is within reach. With better communication, greater transparency of opportunities and aims, enhanced collaboration, more data-driven decision-making and a culture of competitive creation, that future can be now. The reward will be new products and processes which enrich the lives of New Yorkers and facilitate the opportunity for New Yorkers to lead the world in delivering a more prosperous future at home and abroad.

UNIVERSITY PRACTICES

"Universities have become 'bait' to be dangled in front of industry, with drawing power greater than low taxes or cheap labor." – Clark Kerr, twelfth president of the University of California

Key Points

- To promote entrepreneurial activity and interaction with businesses of all sizes, universities need commitment at the highest levels, an empowered champion and a platform from which to articulate and launch their efforts.
- New York universities are not living up to their potential as incubators of new companies.
- Students, faculty and staff respond to incentives provided at the university level which have an impact on their willingness and interest in pursuing collaboration with industry.
- Generally, New York's institutions of higher education have been more focused on maximizing licensing revenue than on collaboration with industry partners.

Key Recommendations

- Universities should adopt best practices in raising awareness, achieving critical mass and establishing commercialization pipelines to promote student, faculty and staff entrepreneurship and collaboration with industry.
- Universities should strive to adopt flexible intellectual policy operating procedures that will allow for frequent and enduring partnerships with industry.

Defining Success

- Quality faculty
- University-industry master agreements
- Industry-relevant and entrepreneurial programming
- "Deal flow" as a measure of university engagement with business as opposed to licensing income
- Ratio of start-ups created to total research funding
- Percentage of university-incubated start-ups successfully raising next round of funding

Culture Change

If New York State is to maximize its economic potential through industry-university collaboration, the practices and attitudes adopted by its institution of higher education – both public and private – will be of paramount importance. The statewide cultural change deemed crucial by this Task Force starts at the colleges and universities, which are small-scale innovation ecosystems unto themselves. When pursued in an environment of prudent and transparent conflict of interest policies, commercialization activities allow for university-based research to benefit the broader community.

The university practices and attitudes that define the industry-oriented campus culture are of vital importance to both of the Task Force's focus areas: promoting entrepreneurship and strengthening ties between higher education institutions and existing companies. That culture can change quickly, as exemplified by the rapid development of technology-transfer programs at the

seemingly unlikely location of the University of Utah which incubated 18 start-ups in 2007 off a base of approximately $275 million in research expenditures – among the highest ratios of start-ups created to research spending in the country.[6] By comparison, the nation's top start-up performer, MIT, generated 24 start-ups off of a research base of over $1.2 billion.[7] Clearly, start-up generation is more a function of campus priorities than of research expenditures.

The Task Force articulated three factors that enable a campus to successfully incubate new enterprises and collaborate with existing companies.

1. *Top-level commitment*: Ultimately, there is no substitute for buy-in at the highest level of university leadership. With responsibility for setting strategic goals and university-wide targets, the president, provost or department head can galvanize the entire university community. Incentives matter, and on a campus, few incentives are as powerful as presidential priorities in eliciting a response.
2. *On-campus, empowered champion:* To execute senior-level priorities, a single individual must be empowered to help shape course curricula; organize education and training programs for faculty and students interested in starting their own businesses or partnering with existing businesses; articulate strategies to showcase university-based opportunities to industry; and identify targets for strategic partnerships. At schools where such activity is currently underway, these individuals hold positions such as Vice President of Economic Development or Vice Provost for Entrepreneurship. The title is far less important than the clearly defined responsibility.
3. *Enabling Platform:* In order to execute the vision most effectively, the empowered champion and the committed president require a rallying point such as a center, at which members from diverse constituencies can meet and organize in order to achieve the articulated goals.

Raising Awareness

At any given time, New York is home to over one million students and tens of thousands of faculty, making up a significant and influential proportion of the State's overall population. Viewed as one million potential entrepreneurs, the opportunities associated with the campus-based population are boundless. The Task Force highlights several methods for raising awareness on-campus:

Introduce market-relevant and entrepreneur-oriented course curricula

At Rensselaer Polytechnic Institute (RPI), a Vice Provost for Entrepreneurship is empowered not only to help shape new courses, but perhaps more importantly, infuse existing courses with an entrepreneurial approach. In 2009, the Polytechnic Institute of NYU (NYU-Poly) introduced the Innovation and Technology Forum, a required course for all entering freshmen that focuses on invention, innovation and entrepreneurship with the goal of stimulating creative thinking in mathematics, science, and engineering. Such courses immediately orient students to think in terms of real world, creative applications as opposed to book-based theories more typical of traditional education models.

[6] Tiecklemann, Robert, et al. *U.S. Licensing Activity Survey: FY2007*. The Association of University Technology Managers. 2008. Print. P. 44-47.
[7] Ibid.

Awards for entrepreneurial activity or industry-collaboration

Colleges and universities reward that which they cherish. Awards and official recognition are strong indicators of campus priorities and, as such, an incentive for further activity in a given area. At RPI, the William F. Glaser '53 Entrepreneur of the Year Award recognizes an outstanding entrepreneur anywhere in the world. Other colleges recognize achievement within the campus community to similar positive effect.

Business Plan and Entrepreneur Competitions

Business plan competitions are a popular approach both on and off campus. Such competitions can galvanize members of the student body to participate and capture the imagination of the entire campus community. Signature competition programs such as the Massachusetts Institute of Technology (MIT) $100,000 Entrepreneurship Competition have been replicated throughout the country.

Achieving Critical Mass

Focused area of expertise

Businesses seeking to partner with universities for training, education or research and development evaluate a variety of factors in identifying an appropriate partner. Chief among these considerations is excellence in a given area: companies seek to partner with the best. Schools which have national and international reputations for quality in particular areas of study are the most successful at attracting interest from industry. Access to sufficient resources such as electronic journals and databases and up-to-date laboratory equipment are crucial inputs for establishing world-class programs and attracting industry partners.

Quality faculty recruitment

There is no substitute for talented faculty in the promotion of entrepreneurship on campus and the maximization of industry ties. While most of the relevant literature focuses primarily on interactions between institutions, industry-university partnerships ultimately rely upon relationships between individuals. Companies seek to partner with individual faculty members who have expertise in a research area of mutual interest and a desire to collaborate. In most cases the company's loyalty and enduring interest is tied to the individual researcher, not the institution, except in cases where geographic considerations are paramount.

Several of the responses that the Task Force received cited the NYSTAR Faculty Development Program (FDP) which provides supplemental funding to institutions of higher education to recruit top-flight faculty. Over the nine years it has been in operation, the program has invested $16.9 million to recruit and retain 52 faculty who have since generated $219 million in documented economic impact.[8]

In addition, faculty of the highest caliber has an important tone-setting and reputation-building effect which extends beyond the individual researcher and even beyond the researcher's department, and faculty recruitment and retention is therefore a justified and wise use of State funds. For example, at Columbia University, the eight faculty members recruited through the FDP program over the past six years (at a cost of $750,000 per award), garnered $60 million in research funding over the same period (a 10:1 return), while the eight FDP awardees at SUNY

[8] Data as provided by NYSTAR

EXCELLENCE IN COLLABORATION: *HIGH POWERED COMPUTING*

Successful university-industry follows state investment in game changing infrastructure.

The Asset:

- Two supercomputers [~200 Teraflops combined] at Rensselaer Polytechnic Institute and SUNY Stony Brook/Brookhaven National Laboratory
- Services provided by High Performance Computing Consortium (HPC^2), a consortium of experts led by RPI, SUNY Stony Brook, SUNY Buffalo and NYSERNet.

Supercomputer terminals at RPI

The Collaboration:

- The HPC Allocation Program provides computing time and basic assistance to businesses and experienced researchers to enable simulation-based research. The HPC Assistance Program helps non-computational scientists to use these supercomputing resources to their fullest.
- RPI and Stony Brook supercomputers have nearly **500** active researchers and product developers from companies and research universities across New York State.

The Results:

- World-leading pump manufacturer Gould Pumps uses the RPI supercomputer to do fluid dynamic modeling to solve highly complex industrial pump problems.
- General Electric and New York Independent System Operator **(**NYISO**)** are using the Stony Brook supercomputer to do energy research with respect to distribution and smart grids.

Why it Matters:

- Ability to utilize supercomputing resources and expertise provides New York-based researchers and product developers a advantage over competitors and colleagues without these resources readily available.
- Research, product refinement and proof of concepts are completed faster; which allows for quicker discovery, innovation and commercialization.
- Access strengthens research proposals for federal, industry and foundation funding.
- Model for other programs: As a condition of its investment, the state reserved a percentage of the supercomputer capacity for its own discretionary use. Access to this allocation has been provided to industry and higher education institutions on the basis of potential economic development impact.

Stony Brook contributed to the founding of nine companies, including six which emerged from a new academic department (Biomedical Engineering) created by one of the faculty members.[9] The Task Force notes and endorses the emphasis placed on full-time faculty recruitment by the Final Report of the New York State Commission on Higher Education.

Customer Service Orientation

In order to facilitate a given company's access to a potential partner institution of higher education, colleges and universities must establish single points of entry – one-stop-shops – through which industry partners can consistently work. This entity can be the office of the empowered champion as described above, the technology transfer office, an industrial relations office or other. These communication points should act as facilitators, not gatekeepers, and while company partners may require the assistance of several different departments on a given partnership arrangement, they should not be expected to navigate the internal bureaucracy of a partner university.

Establishing a Commercialization Pipeline

Entrepreneurship and Business Start-Up Training Programs for Faculty

Many of the faculty members who partner with companies to commercialize their research or to start their own businesses based on their innovations have little or no experience creating a business. Schools can play an important role in providing such basic training. For example, the SUNY Stony Brook Economic Development Office has held "Pre-Seed Innovation Boot Camps" over the past two years to counsel faculty who are considering start-ups based on their research. Similarly, the New York Academy of Sciencess offers a twelve week course called Idea to IPO for researchers interested in commercializing their research.

Entrepreneur-in-Residence Programs

Entrepreneur-in-residence programs can serve to both raise awareness and guide commercialization. At Oregon State University, six entrepreneurs-in-residence are responsible for providing counseling to the campus community including reviewing business plans, clarifying market strategies, strategizing intellectual property issues, and developing fundraising plans. Such programs generally provide small or no salaries to the entrepreneur, but instead compensate the individual with access to university-generated opportunities for investment.

University-based Incubators

New York State is home to at least 25 university-based incubators. Such incubators are an important piece of the commercialization pipeline combining the crucial start-up office or laboratory space with the familiarity of the home campus to entrepreneurial-minded faculty. Increasingly, these incubators are transitioning to an "accelerator" model with greater emphasis on expediting growth into markets or otherwise exiting the incubators. One recent example of multi-state collaboration is The University Funds – an accelerator launched by several universities in the Northwest for the purpose of launching start-ups based on university-developed technology. The Task Force notes that incubators are generally cost-centers, and rents – often subsidized – paid by tenants do not cover the costs associated with running the incubators. In particular, the Task Force noted the importance of competent and professional

[9] From information provided by campuses.

management of such incubators: incubators cannot be thought of merely as low-cost, readily-available real estate.

University-based Venture Funds

Faced with the reality of limited available seed capital for high-risk start-ups based on university research, several universities around the country have created their own internal venture funds. One example is the student-run BR Ventures out of the Johnson School (the Cornell University graduate business school) which provides early-stage investments ranging from $50,000 to $200,000 to enterprises arising out of the university. Ultimately, if New York is to become the innovation capital it aspires to be, universities based here will need to invest their own funds in entrepreneurship and commercialization activities.

Leveraging Alumni

The alumni bases of New York State's colleges and universities are a powerful source of opportunity. The personal networks, experience and wealth they offer are all valuable resources of which one – wealth – is the primary focus of university-engagement in many cases. However, the potential exists to draw such alumni back into the university fold in support of commercialization and entrepreneurial activity. One member of the Task Force's Industry Leaders Advisory Committee noted that a basic challenge as grave as the lack of available seed capital in the so-called valley of death (see Access to Capital section below) was the lack of effective managers for early-stage start-ups. A school's alumni base can provide crucial resources to address this problem. Engaging their enduring commitment to the university in such a way could also prove a boon to fundraising.

Aligning Incentives with University Goals

The Task Force considered methods by which universities could encourage students and faculty to be more proactive in partnering with industry and starting new companies. Steps taken to raise awareness and establish visible commercialization pipelines provide an underlying powerful incentive. When hiring decisions reflect a commitment to entrepreneurship and industry collaboration campus priorities are clearly indicated.

The Task Force does not view an overhaul of the current faculty promotion and tenure system – which generally rewards publications in peer reviewed journals and success in garnering federal and foundation grants – as necessary or even desirable. The Task Force finds the current system effective at identifying the top faculty in their fields and that these top faculty attract industry research partners or generate the innovations that can be commercialized and form the basis for new company creation.

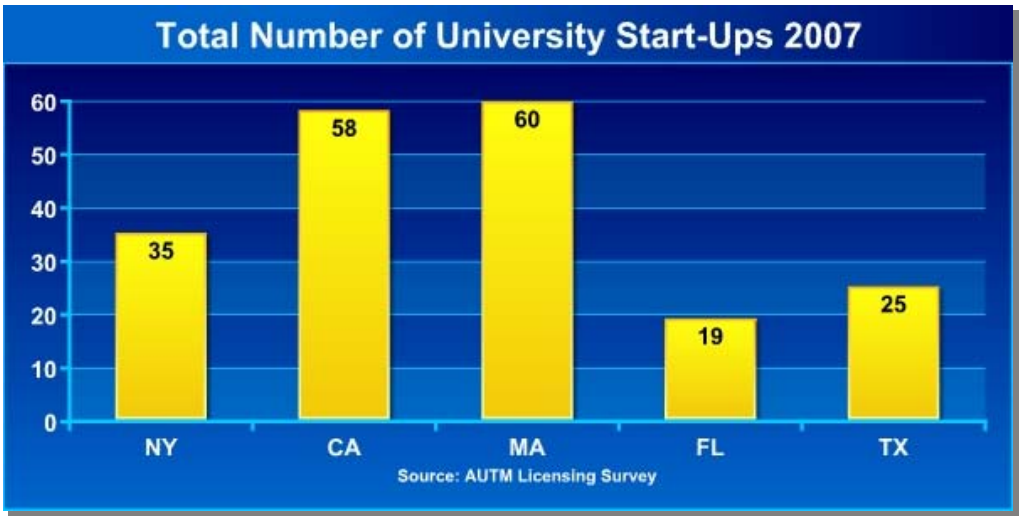
Instead, the Task Force identified two incentives that are crucial in influencing faculty members' decision-making process in addition to the recognition described above: leave policy and royalty policy.

Leave Policy

Faculty may hesitate to pursue a start-up enterprise for fear that if it fails, they will lose the reliable income stream previously enjoyed as a tenured or tenure-track faculty member. Schools can eliminate this fear by providing unpaid leave for faculty seeking to commercialize their research, and allowing these faculty to return after one or even two years without

disadvantaging themselves in future promotion decisions. Doing so eliminates a powerful disincentive for entrepreneurial activity by faculty.

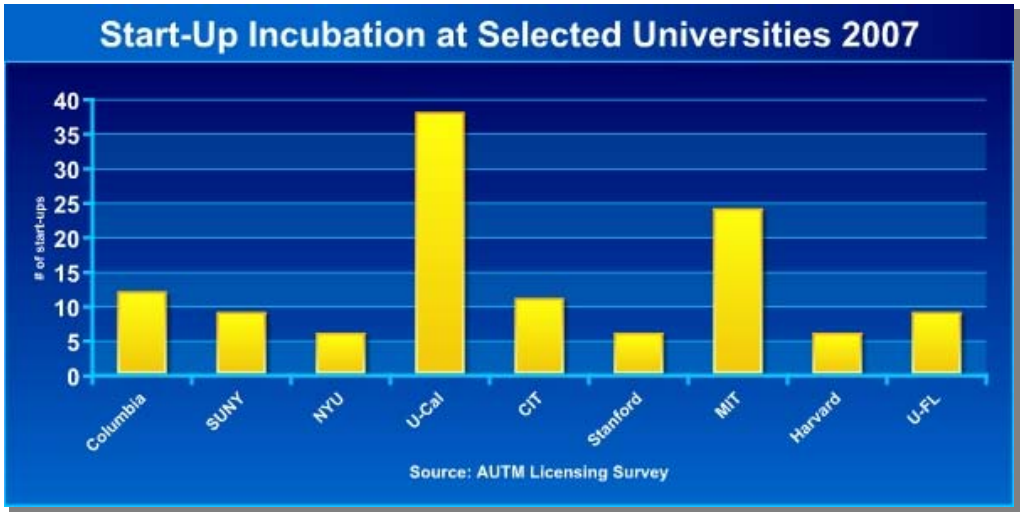
Royalty Policy



The federal Bayh-Dole Act mandates that intellectual property rights for innovations occurring on university campuses inure to the campuses themselves (as opposed to the researchers). Despite this legal right, individual campuses often cede a percentage of royalties to the responsible faculty member or student. Such internal campus policies have a powerful effect on the willingness of faculty to engage in commercialization efforts, and the more generous the terms, the stronger the incentive.

Intellectual Property Policy

Defining the proper allocation of rights and responsibilities with regard to ownership of intellectual property was one of the most complicated issues considered by the Task Force. The Task Force convened technology transfer officers from the State's major research institutions and, separately, a group of industry leaders who frequently interact with these research institutions. The findings from those meetings as well as the relevant literature indicate that disagreements over intellectual property are the source of the greatest friction in university-industry collaboration. However, there is a shared realization that the biggest opportunity for both the university and the industry partner rests in long-term relationships where companies have access to a portfolio of intellectual



property from the school and university researchers are not faced with "work-orders" from company partners. [10]

New York is home to several licensing revenue stars. In Fiscal Year 2007, three New York State-based universities were ranked among the top ten in total licensing revenue. NYU ranked 1st with over $791 million in licensing revenue, Columbia 2nd with nearly $136 million and the University of Rochester ranked 7th with $53 million.[11] Despite this impressive licensing performance, New York has not realized the full economic potential of its research activity as demonstrated by its far less impressive start-up numbers. New York universities generated 35 start-ups seeded in 2007 compared with California's 58 and Massachusetts' 60.[12] Notably, a university policy that seeks to maximize licensing income is generally unfavorable to research collaboration with existing businesses because as a university attempts to extract every last penny of potential value out of an intellectual property, they become less willing partners. One member of the Task Force's Industry Leader Advisory Committee noted that when dealing with a particular technology transfer office, "I often feel as if I'm in the room with a competitor." Several others participants on the advisory committee expressed similar sentiments.

While the state cannot actively direct intellectual property policies beyond those at the State and City Universities, it can avoid measuring and recognizing schools who are licensing champions in favor of those who maximize the broader economic impact of their ideas through so-called "deal flow." Deal flow measures the number and quality of interactions between a given university and a given industry. The Task Force defined "deal flow" as including the following elements:

a) Master agreements with partner companies
b) Industry-sponsored research
c) Joint invention disclosures
d) Joint patent filings
e) Licenses and license-for-equity
f) Federal SBIR/STTR grants won (number and value)
g) University start-ups or company spin-outs based on university-related research

The Task Force notes the ongoing work of the University-Industry Demonstration Project (UIDP) and the Business Higher Education Forum both of which focus on addressing the common difficulties faced by universities and companies across the country seeking to establish effective partnerships. The Task Force endorses the two general findings of the reports of these groups, namely that master agreements, as opposed to ad hoc individual research work orders are far preferable for both parties and that model agreements can be helpful to streamline the process.

The Task Force noted the ongoing development of the so-called "Turbo Negotiator" software developed by UIDP as a promising opportunity for simplified university-industry relations. Further, the Task Force ***recommends*** that the New York State Science, Technology and Innovation Foundation (NYSTAR) work with the Technology Commercialization Research

[10] See, for example, Jelinek , Mariann and Markham, Stephen, "Industry-University IP Relations: Integrating Perspectives and Policy Solutions," *IEEE Transactions on Engineering Management*, Vol. 54, No. 2 (May 2007): 257-267. Print.
[11] "Almanac of Higher Education 2009-10." *The Chronicle of Higher Education* 56.1 (2009):35. Print
[12] Tiecklemann, Robert, Ph.D. et al. *U.S. Licensing Activity Survey: FY2007.* The Association of University Technology Managers. 2008. Print. P. 44-47

Center at Syracuse University to develop templates for typical university-industry collaborations to be accessed and used as desired by New York State companies and universities.

Ultimately, technology transfer is most successful when both parties actively prioritize the partnership. Presidential-level prioritization of technology transfer and commercialization activities goes a long way toward making a university business-friendly, as epitomized by a recent speech by President William Destler of RIT in which he called for "A New Relationship Between Business and Academia."

Defining Success

- *Quality of faculty*: There are many ways to measure faculty quality including publications, citations, patents, grants won etc. The Task Force noted membership in the National Academy as one peer-reviewed indicator. Currently, New York State is home to 226 members of the National Academies of Science, Engineering and Institutes of Medicine.[13] Such stars can have a transformative impact on an individual institution and on an entire state.
- *"Deal flow" as a measure of university engagement with business*: The frequency and quality of interaction between industry and universities can be measured through metrics that include joint invention disclosures, joint patents filings, federal SBIR/STTR grants won (number and value), university start-ups or company spin-outs based on university-related research.
- *University-industry master agreements:* Umbrella agreements governing relations between a college and a company, a metric in which fewer agreements per company is a sign of success.
- *Industry-relevant and entrepreneurial programming:* Enrollment, degrees and certificates granted in targeted programs.
- *Ratio of start-ups created to total research funding*: A measure of the intensity with which a school pursues entrepreneurial activity.
- *Percentage of university-incubated start-ups successfully raising next round of funding:* A measure of the viability of university-incubated start-ups.

[13] "Membership Directory." National Academy of Sciences, n.d. Web.

INDUSTRY PRACTICES

"Getting it done once in the lab is not the same as producing it 1 million times per week in a factory." – Keith Blakely, New York State-based entrepreneur

Key Findings

- Industry spending on R&D by New York State-based companies dwarfs higher education spending on R&D with New York's top 5 patent holders spending over $11 billion worldwide in 2008.
- There are several very strong industry R&D participants in New York, but as an overall percentage of total state economic activity, New York ranks below peer states.
- Companies are increasingly adopting open-innovation business models to leverage research investments and remain on the cutting edge of technology development.
- Industry collaboration with universities, as measured by industry-sponsored research at New York colleges and universities, is less robust than in other states.
- Critical mass requires collaboration between industry and universities in targeted fields.

Key Recommendations

- Companies should convey pre-competitive research and technology needs and business opportunities, thereby 'flipping the model' and enabling university-based researchers to react more directly to market forces.
- Companies should seek to establish enduring relationships with universities that extend beyond individual research partnerships so as to maximize mutual understanding and effective collaboration.
- Universities should solicit information on industry research and technology needs.
- The State should implement a tax credit for industrial research and development performed in-state.

Defining Success

- Industry-sponsored research at universities
- Master agreements between universities and businesses
- Deal flow with universities
- Number of fast-growing high technology ('gazelle') companies and jobs based in New York State
- Tax credit utilization

The Business Case for Industry-Higher Education Partnerships

While New York State colleges and universities rank second in the nation in R&D spending at approximately $4 billion annually, that spending is dwarfed by R&D spending by existing companies based in New York State. In 2008, New York's top 5 industrial patent

recipients spent approximately $11.1 billion worldwide on R&D.[14] Only a portion of this spending occurred in New York.

Notably, only 4.6% of university research spending in New York is sponsored by industry as compared to peer states California (5.3%), Massachusetts (7.0%), Florida (6.3%) and nation-leading North Carolina (13.6%). Universities should view this as a growth opportunity.[15]

TOP 5 NYS PATENT HOLDERS: WORLDWIDE R&D EXPENDITURES

	2008	2007	2006	Avg. (06-08)
IBM	$6.3b	$6.2b	$6.2b	$6.2b
GE	$3.0b	$3.0b	$2.8b	$2.9b
Xerox	$788m	$672m	$660m	$707m
Kodak	$501m	$549m	$596m	$549m
Corning	$510m	$446m	$409m	$455m

Source: Company Annual Reports

Universities present a growth opportunity for New York's companies as well. Despite the impressive performance of the State's largest companies, New York lags behind in its share of total industrial R&D, ranking 8th overall with 4.1% of the nation's total $269 billion in annual business R&D spending.[16] By contrast, the first and second ranking states, California and Massachusetts, boasted companies accounting for nearly 23.8% and 7.2% of the national investment respectively. New Jersey (6.6%), Michigan (5.8%), Texas (5.2%) and Washington (4.7%) rounded out the top five.[17] Both proprietary and open innovation collaboration with New York universities can boost the amount and the impact of industry R&D investments.

A symptom of the relative weakness of New York's innovation ecosystem can be found in its smaller number of fast-growing, high technology firms – many of which emerged as a result of university-based technology development or which collaborate with universities as part of their business model. New York is home to only 11 of the companies on the Deloitte Technology Fast 500 List, as compared with California's 169, Massachusetts' 46 and Texas' 40.[18]

Commercialization Processes

In order to promote such collaboration, it is important to understand how and why companies seek to work together with universities. Interviews with industry leaders from around the State, as well as a review of the relevant literature, demonstrate that companies

[14] 2008 Annual Report." GE. 2009. Print. Page 48
"2008 Annual Report.," IBM. 2009. Print. Page 101
"2008 Annual Report." Xerox. 2009. Print. Page 19
"Corning 2008 Annual Report." Corning. 2009 Print. Page 49
"Eastman Kodak Company Annual Report 2008 on Form 10-K and Notice of 2009 Annual Meeting and Proxy Statement" Kodak. 2009. Print. Page 104

[15] "F&D expenditures at universities and colleges, by geographic division state and source of funds: FY2007." NSF, n.d. Web.

[16] Wolfe , Raymond M. "U.S. Business R&D Expenditures Increase in 2007; Small Companies Performed 19% of Nation's Business R&D." NSF July 2009. Web.

[17] *Ibid*

[18] 2008 Technology Fast 500. San Jose: Deloitte LLP. 2008. Print.

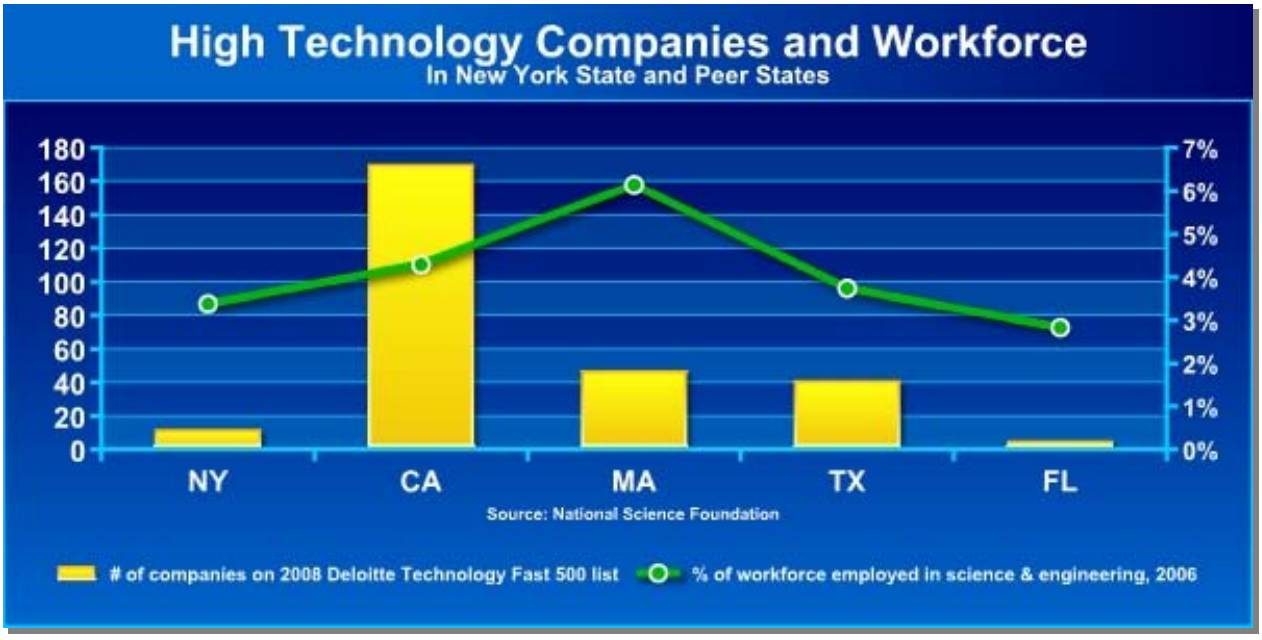
seek to partner with universities for three main reasons, all of which provide the opportunity to leverage R&D investments and develop a competitive advantage:

- To access cutting-edge expertise in areas of their own core competence so as to remain at the top of their fields;
- To access expertise in fields complementary to their core competence, where there is limited in-house expertise; and
- To recruit talent

The emergence of a significant body of research literature can alert industry to an emerging market opportunity. Company-based research officers pay particular attention to the work at universities with a reputation for excellence in a related or umbrella field. The recognition of an emerging opportunity is typically followed by an interaction between industry scientists and university faculty, often in the form of funded research, or simply through visits and discussion. Such scientists and faculty often know each other or at least each other's work, making for a social network more governed by experience and expertise than by geography.

Traditionally academic researchers attempt to identify problems and solve them in a vacuum without the benefit of industry's experiences, business processes and market access while companies await relevant research emerging from universities when they are unable to perform the relevant development in-house. As a result, university-based research is traditionally pursued without regard for commercial relevance.

In some ways, this arrangement is by design: universities are places for teaching, learning and knowledge creation without regard to the short- and medium-term economic imperatives that govern for-profit companies. And yet, many universities explicitly pursue applied research, and many researchers hope to impact the broader community with their research.



Flipping the Model

Elsewhere in this report, the Task Force has outlined methods by which individual universities and faculty members can *push* their research out to industry through institutional showcases, entrepreneurship training and other approaches. However, what faculty are *pushing*

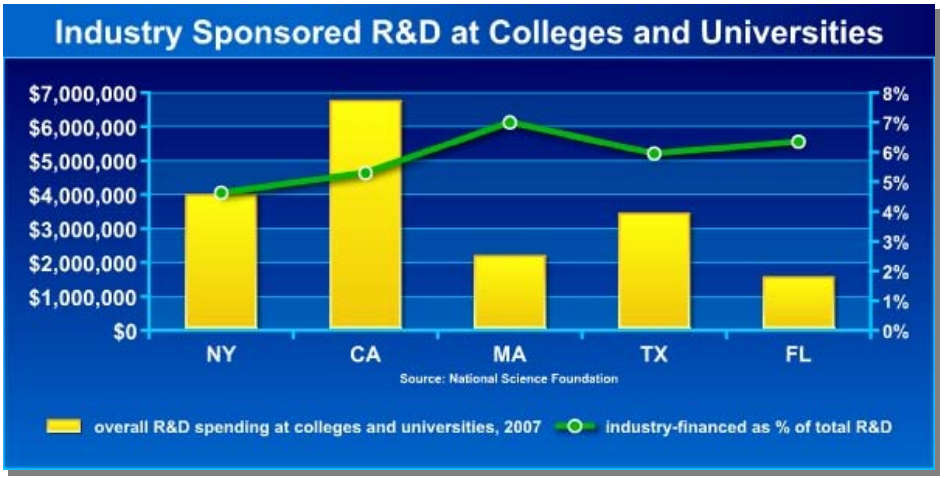
may have minimal connection to what businesses see as competitive opportunities. One opportunity for improving New York's status as an applied innovation hub is to "flip the model" whereby industrial clusters *pull* the relevant research from the State's universities. Under this model, industry partners jointly identify their needs for pre-competitive research, communicate those needs to the relevant experts at community colleges, colleges, universities and labs, and then fund the researchers or jointly pursue funding for the identified project.

The limiting factor in such collaboration is that companies with similar interests pursuing the development of similar products are, by definition, competitors. Status as competitors creates a hurdle to cooperative identification of shared research interests. When companies have similar technology needs – advancement in material strength for instance – but different competitive applications, resistance to collaborative approach is reduced.

The Task Force ***recommends*** that industry leaders and convening bodies such as the Business Council of New York and the New York Academy of Sciencess take responsibility to maximize the *pull* effect from industry. The proposed Innovation Advisory Council could provide assistance in providing advice and leadership for this endeavor.

Open Innovation

Companies should be willing to participate given the reality that cutting-edge R&D is expensive, and companies can not afford to maintain all the relevant expertise in-house. Gone are the days when the nation's most innovative companies could depend on their own corporate structure to produce the breakthroughs the market demands and shareholders and management desire. As a result, companies are adopting an "open-innovation" model which stresses partnered innovation processes and less restrictive intellectual property sharing arrangements. This development will benefit universities and businesses alike. More attention must be devoted to understanding and responding to this movement, and New York entrepreneurs and entrepreneurial faculty must themselves engage as resources in this global innovation movement.



The trend is an encouraging one for New York, given its combination of home-grown research assets and the significant industry appetite for collaborative intellectual property generation. To fully exploit this shift, colleges and universities must similarly shift toward long-term relationships with industrial partners and stress deal flow as opposed to licensing income. The State must play a convener role – as it has with energy initiatives such the Battery and Energy Storage Technology and Smart Grid Consortia – so as to provide a platform upon which the traditional commercialization model can be reversed where appropriate.

SCIENCE & TECHNOLOGY ENTREPRENEURS: BLUE HIGHWAY & X-RAY OPTICAL SYSTEMS

Companies and Universities are important sources of entrepreneurial activity and start-ups.

The Company: Blue Highway

- A wholly owned subsidiary of Welch Allyn, a privately held leader in diagnostic healthcare product manufacturing.
- Formed to "create economic value through new customer insight, products or services, policy and regulatory insight, or business models" – a new idea incubator for Welch Allyn.

The Business Model:

- 80% of employees are PhD holders focusing on radical and breakthrough innovations in the medical devices technology market
- 30% of budget dedicated to basic sciences: a high risk/high reward model.

The Collaboration:

- 40 ongoing relationships with universities including Cornell University, Rochester Institute of Technology and Syracuse University.
- IP conflicts in collaboration with academia minimized through ongoing agreements established early and repeated collaborations that build trust over time.

Al Di Rienzo, CEO: "The key is to connect university, industry and funding sources more closely together…"

The Company: X-Ray Optical Systems

- Privately held company just outside of Albany, New York that has grown to over 75 people with global sales.
- Develop X-ray optics for equipment manufacturers and dedicated analyzers for sulfur in diesel fuel, lead in toys.

The Business Model:

- Sell high-value optics and optic-enabled analyzers for material analysis.
- Global distribution with local inputs for raw materials and technical talent.
- Significant revenue generation through commercial sales of products that originated with federal research funding.

The Collaboration:

- Continued collaboration with Wadsworth Center, NYSERDA, SUNY Albany, and RPI.

David Gibson, CEO: "Access to the facilities and expertise at SUNY Albany allowed us to demonstrate feasibility and get traction with little capital. That enabled the business to demonstrate sufficient success to obtain resources from companies, federal agencies, and investors. Without that help, it is unlikely we would have succeeded. Now we prosper together."

Research and Development Tax Credit

As the relative levels of R&D expenditures between New York's top research universities and its top companies indicates, establishment of critical mass in areas of strategic importance to the State cannot be accomplished by institutions of higher education alone. To achieve critical mass, research collaboration with industry is crucial. The Task Force noted the testimony of Kathryn Wylde of the Partnership for New York City which stated simply, "the single most important tool…to promote better alignment of state university and industry assets to spur economic growth is a robust research and development tax credit."[19] The Task Force notes that the 2009-10 Executive Budget included a proposal for such an R&D tax credit which was not included in the Enacted Budget. The Task Force ***recommends*** the adoption of a research and development tax credit, to be governed by the following principles:

- Eligibility for the tax credit should flow automatically from the existing Federal R&D tax credit to minimize bureaucratic hurdles for both companies and state agencies.
- The tax credit should increase for companies collaborating with institutions of higher education located in New York State.

Defining Success

- *Industry-sponsored research at universities:* Metrics include: total amount of industry-sponsored research; amount as percentage of total; amount in target areas (life sciences, energy, nanotechnology, agriculture, service sector); Peer states used as benchmarks.
- *Master agreements with partner universities:* Enduring, multifaceted ties with partner universities that ensure access to a portfolio of intellectual property.
- *Deal flow with universities:* The frequency and quality of interaction between industry and universities can be measured through metrics that include joint invention disclosures; joint patents filings; federal SBIR/STTR grants won (number and value); university start-ups or company spin-outs based on university-related research.
- *Number of "gazelle" companies and jobs:* Fast growing (20% or more annually) companies; a proxy for successful new businesses.
- *Tax credit utilization/impact:* Level of tax credit claims relative to increases in overall industry-financed R&D (in-house and at New York universities).

[19] Wylde, Kathryn S. "Testimony Before the Governor's Task Force on Diversifying the NYS Economy through Industry-Higher Education Partnerships." *Task Force on Industry-University Collaboration*. City College of New York., 9 October 2009. Testimony. Page 2

ACCESS TO CAPITAL & BUSINESS SERVICES

"It takes money to make money." – American business adage

Key Findings

- Lack of available funding between technology maturity and company revenues (the "valley of death") is a structural problem occurring in New York State as elsewhere.
- Angel investors currently provide the crucial start-up capital and mentoring for start-up companies.
- New York has done less than other states to make capital available to start-ups and small technology businesses.
- Investors located in the state are not being made aware of potential investment opportunities.
- Investors are frequently not integrated into the university-industry research community.
- Significant amounts of venture capital are available in New York State but are predominantly invested elsewhere.
- The typical faculty innovator has expertise in the laboratory, but minimal experience writing a business plan, marketing opportunities to venture capitalists or recruiting management talent.

Key Recommendations

- Create a seed fund for pre-revenue start-up companies.
- Provide capital gains relief for founding investors.
- Increase exposure of investment opportunities to angel investors and venture capitalists through outreach and inclusion in relevant summits, advisory boards and campus activity.
- Promote university collaboration with investor community.
- Existing business assistance organizations should adopt a regional hub model.
- Academic institutions should adopt a credit-for-service model for entrepreneurial minded students to provide consulting services for course credit.

Defining Success

- Return on investment for seed stage investments
- Capital gains relief claimed as associated with early-stage investment
- Total venture investment in NYS
- Number of companies assisted by professional and academic business service providers
- Company success in achieving next funding round

Bridging the Valley of Death

One of the main ways to improve the economy through industry-higher education partnerships is to create new companies based on university-related research. Such start-up enterprises have defined the well-documented economic expansion of regions such as Silicon Valley and others. One of the crucial challenges that start-up companies face is difficulty in attracting investors. This is a function of risk: most university-related start-ups fail. As such, investors from venture capitalists to banks to individuals are hesitant to invest before market-

viability is demonstrated with robust proof of concept and even actual sales. This lack of investment yields what is widely referred to as the "Valley of Death" between the laboratory and the marketplace.

Angel Investment

Currently, the valley of death is bridged for the select few through seed funding provided by angel investors – high net worth individuals, often with entrepreneurial backgrounds. Angel investors take risks where others do not: according to the University of Washington, 52% of angel investments returned less than the capital the angel had invested in the venture. Only 7% of investments achieved returns of more than 10 times the money invested accounting for 75% of the total investment dollar returns.[20]

The value provided by these angel investors is three-fold: they provide the capital required to produce a product at some initial scale, advice and mentoring based on their own past experiences and connections to other potential investors. Given the relatively labor-intensive nature of this work, angel investors typically hold their investments for a period of 3.5 years.[21] Well-known angel investors can also provide a stamp of approval that attracts later-stage investors such as venture capitalists.

Investment Continuum

	Sweat Stage (Pre-Seed)	Seed Stage	Late Stage
Description	Funding to launch a business	Funding to produce an initial product	Funding to scale a product for widespread distribution
Source of Investment	Self, friends and family	Angel investors	Venture capitalists
Size of Investment	Minimal, often totaling less than $1 million	$100,000-$5 million	$10-$100 million
Investment Decision Driver	Knowledge of founding individual	Buy-in to entrepreneurial vision	Market viability

According to a National Governor's Association report, "angel activity is correlated with four initial conditions: seasoned entrepreneurs, new wealth, a strong university base, and a relevant industry base."[22] Angel-backed companies have been some of the most prolific job creators and innovators in recent times: Google, Yahoo, Amazon, Facebook, Costco, and PayPal are just a few examples of these businesses.[23] Nationally, some 260,500 angels invested $19.2 billion in almost 55,500 ventures in 2008.[24]

[20] Wiltbank, Robert, Ph.D. and Boeker, Warren, Ph.D. "Returns to Angel Investors in Groups." Kansas City: Ewing Marion Kaufman Foundation, November 2007. Print. Page 1.
[21] 3.5 year claim: "ACA Briefing and Angel Group Stats." Angel Capital Association. 20 May 2008.;
VC claim: *Gottschalg, Oliver. "Private Equity and Leveraged Buy-outs Study," Policy Department, Economic and Scientific Policy, European* Parliament, IP/A/ECON/IC/2007. *25 November 2007.*
[22] National Governors Association. "State Strategies to Promote Angel Investment for Economic Growth." *NGA Center for Best Practices Issue Brief*, 2006: 5. Print.
[23] May, John. *Sub-committee on Investigations and Oversight.* U.S. House of Representatives, 26 Mar. 2009. Testimony. Page 1
[24] Sohl, Jeffrey. "The Angel Investor Market in 2008: A Down Year in Investment Dollars But Not in Deals", Center for Venture Research, 26 March 2008 Web.

Exposure to Investment Opportunities

The Task Force noted the testimony received from Brian Cohen, a member of the Board of Directors of the New York City-based angel network New York Angels, that, "the best practice that the state can put forth is one where building relationships and communication among entrepreneurs and angel investors can thrive."[25] Relationships can be facilitated through the establishment of active and effective communication networks as recommended in the Communication Networks section of this report. The Task Force ***recommends*** that representatives from the angel investment community be included on statewide economic development planning bodies including the proposed Innovation Advisory Board.

The Task Force noted the absence of an online marketplace for existing companies to identify and evaluate emerging technology for potential investment. It ***recommends*** that such a marketplace be considered and developed by the Innovation Advisory Council.

State-supported Seed Funding

Given the well-documented shortage of available seed funding in the valley of death many states have provided an infusion of state funds dedicated to supporting promising start-up ventures. The most prominent national example is the Pennsylvania Ben Franklin Technology Partners which offers loans to venture capital funds making investments in early-stage technology companies based in Pennsylvania.

The Task Force noted and welcomed the creation of NYC Seed – a $2 million early-stage seed fund investing up to $200,000 per start-up. The fund architecture exemplifies many of the principles articulated in this report and represents a promising collaboration between government (the New York City Economic Development Corporation and NYSTAR), academia (NYU-Poly) and the non-profit and foundation sectors (the Industrial & Technology Assistance Corporation [ITAC] and the New York City Investment Fund).

The Task Force felt that the shortage of available seed capital had a significant negative impact on the ability of New York State-based universities to contribute positively to the state economy. Despite the presence of such funds as the Small Business Technology Investment Fund (SBTIF) (a NYSTAR-run $5 million early-stage fund) and Excell Partners (a state-supported $2 million early-stage fund) the Task Force heard consistently from entrepreneurs and researchers across the state that the absence of seed funding remains a devastating hurdle. As such, the Task Force ***recommends*** the creation of a state-supported seed fund for start-up companies. Such a fund could significantly increase the economic impact of the state's research institutions. The Task Force agrees that the following principles should govern any such state-supported fund:

- New York State should not be the sole or majority investor; public investment should be matched by third party investment at a ratio of at least 1:1. Third parties include universities, professional investors, existing companies, the federal government among others.
- Individual investment decisions should not be made by a State entity; instead, the State should hire professional, independent investment managers based on a competitive process, creating incentives for high performance.

[25] Cohen, Brian. "Regarding Professional Angel Support." *Task Force on Industry-University Collaboration.* City College of New York., 9 October 2009. Testimony. Page 8.

- Investment targets should be based on anticipated return on investment as opposed to geographic considerations.
- Investments should exclusively target companies that are pre-revenue or just starting to realize revenues to ensure that the seed fund does not follow the trend of many venture capital by shifting its investments toward more mature (and less risky) companies.
- Where possible, investments should target syndication with other venture capital investors that have the capacity to support subsequent investment rounds.

Partnership with the Venture Capital Community

Seed funding does little good if it creates "orphan" companies that are unable to secure subsequent funding. The Task Force asserts that the entire funding pipeline should be of concern to policymakers (particularly if seeded companies are to remain in-state). More must be done to leverage the natural advantage enjoyed by New York's aspiring entrepreneurs: venture capital investors prefer to be close to their investments given the hands-on nature of their investment, and significant venture funding is based out of New York. While New York start-ups receive only 4.5% ($1.17 billion) of the total venture capital investment in the nation ($30 billion), New York State-based venture capital firms deployed $2.8 billion in 2007, indicating a significant opportunity for gains by New York-based start-ups. [26] The Task Force noted in particular the work of Excell Partners and its report on venture investment activity in New York State.

The Task Force convened a group of leading NY-based venture capitalists to discuss their perspective on the issues under examination. That group indicated that although they generally prefer to invest locally, that preference would not trump a lack of perceived opportunities – that is, while they prefer to invest locally this requires suitable fundable opportunities.

The famed Sand Hill Road in California and Route 128 in Massachusetts are communities characterized by close ties between university and industry researchers *and* venture capitalists. In these thriving innovation ecosystems, venture capitalists function as miners of ideas and talent as much as investors. Such collaboration will result primarily from enhanced efforts on the part of individual universities to prioritize technology transfer and commercialization efforts and from state efforts to integrate venture capitalists into economic development decision-making processes.

In addition to ***recommending*** that universities make a concerted effort to integrate professional investors into their spheres of influence, the Task Force notes that professional investors can also be better integrated into state processes. As such the Task Force ***recommends*** that relevant economic advisory boards, in particular the proposed Innovation Advisory Council, include members of the venture investment community.

Capital Gains Relief for Founding Investors

The Task Force takes expects that the strengthening of the innovation ecosystem – through increasing access to seed capital; through adopting best practices in commercialization and entrepreneurship within industry and academia; through developing effective state policies and collecting appropriate metrics; through the fostering and coordinating of efficient communications networks – will influence the behavior of New York-based professional

[26] Albers, Judith J. Ph.D., Mazzullo, Theresa, Navani, Samir H., and Pandey, Vivek. *Venture Capital and Seed Activity in NYS: Statistics for Upstate and Downstate 2005-2008.* Rochester: Excell Partners, Inc. May 2009. Print, pages 4-6, 14.

investors. However, the Task Force notes that targeted financial incentives are an important part of changing behavior as well.

Many professional investment funds include a substantial base of non-taxable investors, relegating tax benefit calculations to a minor factor in investment decisions. Instead, the Task Force ***recommends*** capital gains relief on the eventual liquidity event (the sale of the company or an initial public offering) for early-stage investors and company founders. Such a policy provides two benefits: it encourages initial investment by company founders and professional investors by increasing access to future profits, and it provides an incentive for the company itself to remain in New York for subsequent investment rounds. The Task Force asserts that the following principles should govern the establishment of such relief:

- Recipients of the state capital gains reduction or exemption must hold founders shares (as defined by the IRS).
- The company must be founded and located in New York State to qualify.
- The company must remain in New York until the liquidity event.
- Departure from the State triggers the capital gains reduction or exemption.

Business Services

The Case for Business Services

As detailed above, funding for early-stage, pre-revenue companies is hard to come by. As such, the Task Force ***recommends*** the creation of an early-stage seed fund and a capital gains relief for founding investors. However, another way to increase available funding for aspiring entrepreneurs is to help them recruit such funding themselves. The typical faculty innovator has expertise in the laboratory, but minimal experience writing a business plan, marketing themselves to venture capitalists or recruiting management talent. As such, the efficient provision of business services can help entrepreneurs and innovators help themselves, thereby strengthening the all-important ecosystem in which university-industry collaboration drives economic growth.

Defining "Business Services"

The Task Force received a large variety of proposals related to business service provision. Generally, these proposals identified a need for assistance in the development of business plans, the identification of potential capital sources and assistance in the earliest stages of actually running the business. Such business services are currently provided in New York with some significant successes, although without sufficient scale to have a large impact on the statewide economy.

The term "business services" as used here covers a variety of territory. For an entrepreneur running a small business or a faculty member considering starting one up, there are several basic needs: management, capital and markets among others. Business services, generally speaking, aid entrepreneurs in identifying and accessing these basic needs. The State provides such assistance through the NYSTAR Regional Technology Development Centers (RTDCs), with 10 throughout the state. These programs are geared toward "providing direct, strategic assistance to companies in the areas of entrepreneurship, technology commercialization, product development, high-tech business incubator management and technology transfer services." Some programs are more effective than others, and the Task Force recommends collecting and publishing relevant metrics on the performance of these centers as well as using such data to

ACCESS TO OPPORTUNITY: PROFESSIONAL AND ACADEMIC BUSINESS SERVICES

Access to business services connects innovators with the tools required for commercialization.

High Tech Rochester

The Model:

- Entrepreneur-in-residence provides mentorship and helps navigate the business-creation process
- MBA interns provide business plan counseling
- HTR performs preliminary business evaluation, connects aspiring entrepreneurs with appropriate capital sources including angel networks, regional industrial development authorities, revolving loan funds, venture capital, commercial banks
- HTR runs two business incubators available for use by start-up companies

The Collaboration:

- Works closely with researchers and students out of University of Rochester, RIT, Cornell Agriculture and Food Technology Park, local community colleges
- Over 2 ½ years, HTR has screened 200 technologies, developed 40 business plans, helped raise over $40 million in seed capital

Why it Works:

- A one-stop-shop for access to capital (HTR president James Senall is co-founder of local angel network), business services and incubator space. A true "regional hub."

NYS Technology Commercialization Clinic Network at Syracuse

The Model:

- Graduate law students, supervised by faculty, provide pro-bono business consulting services to community businesses through clinic-style arrangement for academic credit
- Financial due-diligence, market opportunity analysis, competitor analysis, intellectual property analysis provided to clients. Model can be expanded to engineering or business graduate students to provide relevant expertise
- Satellite clinics offered at Niagara University, RIT and SUNY Stony Brook

The Collaboration:

- Students exposed to realities of entrepreneurial activity
- Government funding through Assemblyman William Magnarelli

Why it Works:

- After 23 years, network provides both competitive advantages to NYS companies and a pool of professionals skilled in early-stage technology commercialization.

inform future funding decisions. As described above, one regional hub, High Tech Rochester provides access to mentorship, business plan counseling, access to capital and incubator space. Task Force notes the success of this model, and ***recommends*** the replication of the transferable program elements at other RTDCs around the state.

Universities with a community and industry orientation play an important role both by educating their own faculty in how to start a business as well as providing entrepreneurs in the local community with business planning advice (for example, the Clarkson University "My Small Business 101" program which educates local entrepreneurs on productivity maximization and strategic planning or the Rochester Institute of Technology Center for Integrated Manufacturing Studies with a mission to "increase the competitiveness of manufacturers through applied technology and training"). Others deploy their business, law and engineering graduate students (who receive academic credit) to provide *pro bono* consulting services to community businesses through a clinic-style arrangement (see for example, the Syracuse University-based Technology Commercialization Clinic Network [TCCN]). The Task Force ***recommends*** the Syracuse TCCN as a model to be replicated where appropriate at other colleges in the State.

Defining Success

- *Number of university-based start-ups:* The purpose of providing seed funding and promoting angel investment is to create more start-ups. This is the basic measure.
- *Return on investment for seed stage investments:* Creation of start-ups is without value if the start-ups quickly fail. This metric measures whether start-ups succeed (and what their value is) five and ten years beyond receipt of the original seed funding.
- *Capital gains relief claimed:* The purpose of the capital gains tax relief is to increase the volume and size of early-stage investments. While a baseline is difficult to achieve (numbers are not widely available currently), a requirement that recipients of the tax credit report on their investments allows for benchmarking against the base year in subsequent years.
- *Total venture investment in NYS:* Though a function of several factors, venture capital investment in NYS (both from firms based in NYS and elsewhere) provides a proxy for effectiveness of the innovation ecosystem.
- *Companies assisted:* The purpose of business services is to assist businesses. To do so, regional development hubs and university-based clinic programs need to meet with clients. This metric counts these interactions.
- *Company success in attracting next funding round:* The purpose of receiving business services is to advance to the next step along the innovation continuum.

STATE PRACTICES

"If you do what you did, you're going to get what you got." – Dennis Mullen, Chairman & CEO Designate, Empire State Development

Key Findings

- State economic development resources and policies have been geared primarily towards attraction and retention of larger businesses with less emphasis on new business creation and promotion of entrepreneurial activity.
- State agencies such as NYSTAR and NYSERDA are strong assets for developing and executing innovation-focused policies.
- State practices to promote an innovation ecosystem include raising awareness of entrepreneurial activity and successful industry-higher education partnerships, building critical mass in areas of existing and potential strength and establishing effective commercialization pipelines.
- Successful promotion of an innovation ecosystem requires consistent, long-term government policies strategically oriented towards promotion of the state's existing and potential research and commercialization strengths.
- Economic development policies driven by geographic and political concerns have yielded uneven results and an unpredictable business environment in New York State.

Key Recommendations

- The Governor should establish an Innovation Advisory Council made up of leaders from academia, industry, the investment community, and government.
- The State should adopt new business creation and talent attraction and development as central elements of its economic development policies.
- Economic Development agencies should actively market New York State as a hub of innovation and an inviting platform for successful entrepreneurship.
- Data collection and performance reporting should be central to the mission of economic development agencies; future funding decisions should respond to demonstrated success on pre-identified metrics.
- Commercial application should be a central element of state-funded research efforts.

Defining Success

- Statewide innovation capacity
- Statewide innovation activity
- Statewide innovation impact

Building an Ecosystem

Today New York already boasts many of the tools required for a thriving knowledge-based economy: it has an educated workforce, high-performing research assets, significant available capital and government agencies with explicit innovation missions. What the State lacks is a thriving innovation ecosystem that brings these assets together with a synergy that

enhances the value of its constituent parts; it lacks a culture of risk-taking entrepreneurship and educational institutions oriented toward industry collaboration.

Over the past quarter century, New York has invested billions of dollars to enhance the State's research and technology infrastructure. These investments are manifested in the state's six Centers of Excellence (COE), fifteen Centers for Advanced Technology (CAT), seventeen GenNYsis Centers, and eight Strategically Targeted Academic Research (STAR) Centers, all of which have specific technology missions in specialized research areas. Additionally, the State has committed hundreds of millions of dollars for operational and program funding, with prominent examples including a $600 million Stem Cell Initiative and a $100 million matching program for federal research grants.

Performance of the centers has varied considerably while annual funding streams have generally proceeded equally, unresponsive to performance, in part as a result of difficult-to-access performance data. The Task Force notes the robust commercialization-focused reporting required by the individual CATs, as reflected in the NYSTAR annual report, and ***recommends*** similar metrics be collected to track future New York State innovation investments.

Guiding Policy

Consistency in government policy is crucial to fostering an innovation ecosystem. To advise the Governor and the Legislature on such matters and to help both articulate and execute a strategic vision for innovation, the Task Force ***recommends*** the creation of an Innovation Advisory Council. This Council should make recommendations on activities, investments, regulations, legislation, opportunities for collaboration, and other issues related to the establishment and promotion of an effective innovation ecosystem. The Advisory Council should include:

- Representatives from research-intensive higher education institutions including individuals from SUNY, CUNY and the independent sector.
- Agency heads from ESD, NYSTAR, NYSERDA.
- Legislative leaders focused on innovation-centric economic development.
- Industrial leaders from established companies with significant investments in research and development.
- Industrial leaders from fast-growing companies.
- Representatives from the investment community including angel (early-stage) and venture capital investors.

The Advisory Council should be staffed by members of the Governor's staff and the participating agencies. A member of the Governor's staff should be designated to internally champion the innovation agenda and translate the Advisory Council's recommendations into policy. The Task Force stresses that such advisory bodies are effective only when they enjoy significant support and attention from the chief executive and can contribute substantively to policy decisions and outcomes. Without these prerequisites, the level of commitment and efficacy of the advisory council will inevitably wane.

Raising Awareness

Marketing

The Task Force ***recommends*** the State make an explicit effort to market New York as innovation-friendly. The Task Force cites the well-known "I Love NY" tourism campaign as an

example of the potential efficacy with which the State can and has branded itself. Primary responsibility for such marketing should fall to the marketing department of Empire State Development, the state's chief economic development organization. Such a campaign should highlight New York's higher education and research assets, the opportunities offered by NYSTAR and NYSERDA, entrepreneurial success stories, and those existing New York-based companies which are global leaders in innovation. The Task Force welcomed recent signings of economic development memoranda of understanding with foreign countries including Israel and China that have included higher education collaboration as central elements. New York's fourteen international economic development offices offer prime opportunities for marketing New York's innovation assets.

Recognition

The Task Force ***recommends*** that the State recognize and celebrate successful entrepreneurs and university-industry collaborations. Prestige is a powerful incentive for performance, and the government can contribute to a cultural shift through recognition programs, gubernatorial awards, legislative proclamations, and statewide entrepreneurship days. It should encourage regional and local recognition programs and provide the media and local communities with a constant flow of information on success stories.

Metrics Collection and Publication

States measure what they treasure. To that end, the Task Force ***recommends*** that NYSTAR – in collaboration with Empire State Development, NYSERDA, the State Department of Labor and others – collect and publish, on a regular basis (at least once every two years), an innovation index which measures the State's status benchmarked against previous years and against peer states including California and Massachusetts. The proposed elements of that index appear later in this report. NYSTAR will also develop methods for collecting university-level data regarding partnerships with industry and entrepreneurial activity that reflect the fields noted in this report under the heading of "defining success." The Task Force notes the Kauffman Foundation for Entrepeneurship's New Economy Index, the Center for an Urban Future's Index of the New York City Innovation Economy, the Index of the Massachusetts Innovation Economy and the Milken Institute's State Science and Technology Index. Responsibility for revising the index should fall jointly to the Innovation Advisory Council and NYSTAR, in collaboration with partner state agencies.

Achieving Critical Mass

Talent, Talent, Talent

There is no substitute for talent – researchers, investors, entrepreneurs, technology champions – in the promotion of industry-higher education partnerships and, more broadly, the innovation economy. According to the Milken Institute, New York ranks 6th among states in human capital concentration and momentum in science and technology fields.[27] The Task Force ***recommends*** that the retention and recruitment of talented individuals should be a stated and prioritized goal of New York's economic development strategy. A variety of tactics must be employed to retain and recruit talented students, faculty, managers and entrepreneurs to New York. New York is already a net importer of students, but the well-publicized "brain drain" of

[27] DeVol, Ross, Charuworn, Anita, and Kim, Soojung. *State Technology and Science Index: Enduring Lessons for the Intangible Economy*. Santa Monica: Milken Institute, June 2008. Print.

ENDURING GOVERNMENT COMMITMENT TO INNOVATION: NYSTAR & NYSERDA

Innovation-promotion depends on long-term, consistent investment. New York is a leader in government-led technology innovation.

NYSTAR: New York Foundation for Science, Technology and Innovation

The Mission:

- *To support technology development, innovation and commercialization leading to economic growth in New York State*

The Strategy:

- Enhance the research strengths of colleges and universities in technology areas that are aligned with the state's strategic industry sectors.
- Leverage the state's research and technology investments by facilitating and increasing the interaction with established and new businesses across the state.

The Mechanisms:

- *Centers for Advanced Technology:* Fifteen specialized centers designed to spur technology-based applied research and economic development in targeted areas.
- *Faculty Development Program:* Financial assistance to NYS research institutions for recruiting/retaining distinguished faculty who develop and commercialize technologies
- *Regional Technology Development Centers:* Business services to small and medium manufacturers (less than 500 employees) and early stage technology companies.

NYSERDA: New York State Energy Research and Development Authority

The Mission:

Advance innovative energy solutions in ways that improve New York's economy and environment.

The Collaboration:

- Working with high-technology companies, colleges and universities, energy producers, and other government agencies, recent collaborative efforts include Battery and Energy Storage Technology (NY-BEST) Consortium and New York Smart Grid Consortium.

The Mechanisms:

- *Clean Energy Incubators:* Four located throughout State delivering technical and business assistance to early-stage companies in the clean energy industry. Two more incubators under development.
- *Product Development Programs:* Targeted energy and environmental research and development program through the support of universities and industry.
- *Business Growth and Manufacturing Expansion:* Assistance to develop successful clean energy business strategies and expand hi-tech manufacturing capacity.

graduates and others leaving for greener pastures has plagued the New York, particularly the upstate region.[28]

Targeted loan forgiveness programs can be effective, but carry significant costs. The Task Force identified the recruitment of doctoral and, in particular, post-doctoral researchers to the State's graduate schools and companies as promising opportunities given the fact that such researchers are more likely to settle where they work. Promoting university-industry collaboration through joint research or start-up incubation can further root students and faculty into their local communities. Quality of life, exciting urban centers and affordable costs of living contribute to retention but were deemed outside the scope of this Task Force's examination.

Faculty recruitment programs such as the NYSTAR Faculty Development Program which provides supplemental funding to institutions of higher education to recruit top-flight faculty are crucial state-funded investments. With regard to student recruitment, the Task Force welcomed the creation of the Study New York initiative – a self-funded consortium of New York colleges and universities working to brand New York State as the world's premier destination for higher education for foreign students.

Funding Practices:

The need for a strategic economic development approach geared toward the innovation-based economy – particularly in the areas of health care and life sciences, energy and nanotechnology – is well documented (see, for example, the AT Kearney report Delivering on the Promise of New York State).[29] A recent report by the Kauffman Foundation for Entrepreneurship notes that two-thirds of job growth in the United States in 2007 came from firms that were one to five years old.[30] The Task Force ***recommends*** that the State's economic development agencies explicitly identify the creation of new enterprises as central to their mission.

Whenever possible, state-funded economic development programs involving university-industry collaboration should employ performance measurements with clear and public documentation of outcomes. Peer review is appropriate for faculty awards and explicit performance measures should be required for business/university investments. Requiring industry to match state investments is a form of peer review as companies tend to invest only where they see potential for returns. The Task Force ***recommends*** that future allocation of innovation-related economic development funding provide:

- Incentives for collaboration with industry and/or commercialization efforts.
- Incentives for collaboration between existing programs.
- Rewards for performance on pre-determined metrics.

Geographic diversity alone is an ineffective criterion for innovation investment decisions. As a report on state innovation policies by the National Governor's Association advises, states must avoid "the temptation to send funds to every region in a state, which can dilute the critical

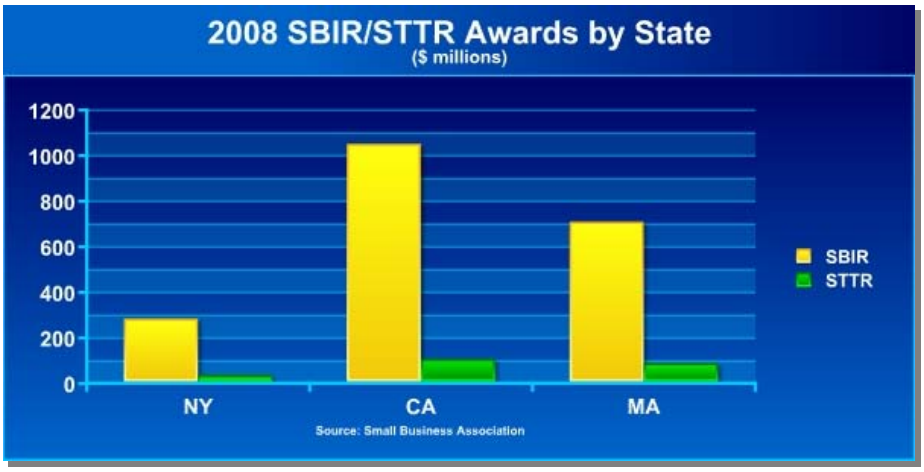
[28] According to NCES statistics 36,297 freshmen migrate to New York State annually. See: "Residence and Migration of All Freshmen in Degree Granting Institutions, by State or Jurisdiction: Fall 2006" *http://www.nces.ed.gov*. Digest of Education Statistics, n.d. Web.

[29] AT Kearney, *Delivering on the Promise of New York State*, 2007.

[30] Stangler, Dane and Litan, Ropert E. "Where Will the Jobs Come From?" *Kaufman Foundation Research Series: Firm Foundation and Economic Growth* 1 (2009): 1-17. Print.

mass necessary for success."[31] The Task Force endorses as a model the Center for Advanced Technology (CAT) Development Program which provides additional funding "to enhance and expand the capabilities of existing CAT's that have achieved a record of success and demonstrate significant potential to increase the economic impact generated by the CAT."[32]

The Task Force notes the success of recent matching programs under which the State matches federal funding in areas of strategic importance. Matching funds have the benefit of outsourcing the decision making process to a peer-review body (thus avoiding any political pressures). The Task Force ***recommends*** that future state matching programs prioritize joint applications by teams consisting of industry and university-based partners including Federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants which are explicitly geared toward technology commercialization and new business creation. Such grants provide opportunities across all federal funding streams including those relevant to agriculture-based research and business development. New York has been out-performed by California and Massachusetts in pursuing these grants, an indication of fewer commercialization efforts statewide. In 2008, New York won 278 SBIR grants at a value of $84 million and 30 STTR grants at a value of $9.6 million as compared with California's 1,044 SBIR grants (valued at $356 million) and 101 STTR grants ($34.5 million) and Massachusetts' 703 SBIR grants ($227 million) and 83 STTR grants ($27 million).[33]



The Task Force ***recommends*** that state-funded research programs require a goal of commercialization. In particular, efforts such as the New York Stem Cell Initiative – a $600 million, 11 year program run out of the Wadsworth Center of the Department of Health – should emphasize the applied and translational directives of their charters. Basic research without a foreseeable commercial application should be left to the Federal Government.

Establishing Commercialization Pipelines

The State's contribution to commercialization comes from the incentives it provides through funding programs, the critical mass it engenders through recruitment of talent and the effort its expends to facilitate interaction between all the stakeholders in this process.

Later in this report, the Task Force provides recommendations concerning the availability of capital (in particular seed funding for pre-revenue start-up companies), university-industry portal creation and maintenance, and targeted investments in prioritized areas, all of which contribute to an effective commercialization pipeline.

[31] National Governor's Association. *Innovation America: Investing in Innovation.* Washington, NGA Center for Best Practices, 2007. Print. p. 47
[32] *Centers for Advanced Technology*. http://www.nystar.state.ny.us/cats.htm. NYSTAR, n.d. Web.
[33] Small Business Association TECH-Net Statistics http://web.sba.gov/tech-net/public/dsp_search.cfm

Defining Success

In the Metrics section of this report, the Task Force articulates the details of those metrics which it ***recommends*** be collected by NYSTAR and partner agencies on a regular basis. These metrics reflect:

- *Innovation capacity:* Does the State have the right raw materials (federal and industry-funded R&D at the university-level, research technology infrastructure, educated workforce, entrepreneurial talent and experience, available capital) to promote an innovation-based economy?
- Innovation activity: Are the raw materials yielding tangible commercialization progress (invention disclosures, patents, intellectual property licenses, start-ups, initial public offerings)?
- Innovation impact: Are the commercialization activities yielding economic results (jobs, wages, exports, taxes, revenue-producing products and processes, greater market share, shareholder value)?

The individual metrics are described in detail in the section on Metrics.

CRITICAL MASS IN STRATEGIC AREAS

"The best way to predict the future is to invent it." – American computer scientist Alan Kay

Key Findings

- New York has research strength with economic growth potential in the areas of health care/life sciences, energy, nanotechnology and agriculture, all of which benefit from university-industry collaboration.
- An emphasis on the service sector, particularly services benefiting from advances in the Science Technology Engineering and Mathematics (STEM) fields, offers an opportunity for New York to take a leadership role and attract entrepreneurs and existing companies seeking to maximize their service-based revenue streams.

Key Recommendations

- State government should focus economic development efforts in strategic areas of health care and life sciences, energy, nanotechnology and agriculture, with explicit focus on translational science, commercialization and services sciences in these fields.
- New York institutions of higher education prioritizing state and local economic development should emphasize education and research in areas of strategic importance to the State.
- Service sector sciences, particularly in the STEM fields, should be emphasized by New York's colleges and universities. Collaborating with industry, these institutions should develop core services science curricula with specializations corresponding to local industry.

Defining Success

- University and industry research expenditures in strategic areas: health care/life sciences, energy, nanotechnology, agriculture, service sector
- University and industry invention disclosures and patents in strategic areas
- Jobs, wages, sales and exports in strategic areas
- Start-ups and expansions in strategic areas
- Cluster development in strategic areas

Defining Critical Mass

To achieve strong economic performance, every entity, be it a state, an institution of higher education or a company, must identify priorities and pursue them. These priorities should be a function of existing strengths and growth potential. The Task Force finds that health care and life sciences, energy, nanotechnology, agriculture and the service sector (New York's "strategic areas") all fit these criteria, and can all be enhanced significantly through the collaboration of research universities and the relevant industries. The Task Force recognizes that the State possesses other strengths in areas such as information technologies and new media, but has concentrated its focus on these five sectors which have the added benefit of tremendous impact (or potential impact) on the everyday lives of New York's citizens.

In addition, the Task Force has identified the service sector – particularly those companies gaining a competitive advantage by tapping the expertise of employees with STEM

skills – as presenting vast opportunities for enhanced collaboration between New York State companies and higher education institutions.

The following briefly reviews the case for each of the above-mentioned categories and highlights opportunities for targeted action. The Task Force did not identify specific sectors within these broad categories given its short timeline and the priority of identifying the necessary elements of an innovation ecosystem. Specific opportunities within the broad categories defined here should emerge from industry-university communication through the structured dialogue process described in the Communications Networks chapter of this report.

Given these existing areas of strength and their strong potential for growth and contribution to the State's economic diversity, the Task Force ***recommends*** that existing and future economic development funding be prioritized in the strategic areas of health care and life sciences, energy, nanotechnology and agriculture. It recommends that research institutions, industry and government work with liberal arts and community colleges around the state toward targeted education and training programs in these fields. Similarly, representatives from these industries should be included on statewide economic development boards such as the proposed Innovation Advisory Council.

Individual companies and universities share in the responsibility to build innovation capacity in these targeted fields. Universities with relevant programs must continue to develop such programs and recruit talented individuals in target areas. Public universities in particular have the opportunity to align themselves with statewide economic development priorities by developing expertise and curricula in such fields. Individual companies must also play their part by communicating their understanding of the commercial state of a given field and actively seeking university partners to engage in relevant cutting-edge research.

Health Care and Life Sciences

New York is a national and world leader in the fields of health care and life sciences. Of the $4 billion in annual research and development spending occurring at New York's institutions of higher education, a full 65% occurs in the life sciences, defining a strong opportunity.[34] New York is home to more medical schools than any other state in the country and boasts several of the most renowned teaching hospitals in the world. New York trains 11% of the nation's medical students and a particularly notable 17% of the nation's medical residents.[35] In 2007, New York received nearly 10% of all National Institutes of Health (NIH) funding, ranking 3rd among all states.[36]

A world-class biosciences cluster exists in the New York City and Long Island region. The New York City Economic Development Corporation provides a useful interactive map of the impressive array of over 120 biotechnology companies and research assets located in Manhattan. New York City has encouraged the development of the East River Science Park which will provide a statewide focal point for commercialization and translational science in the life sciences. On Long Island, the cluster of the SUNY Stony Brook Medical Center, Cold Spring Harbor Laboratories and Brookhaven National Laboratories provides unparalleled

[34] "Almanac of Higher Education 2009-10." *The Chronicle of Higher Education* 56.1 (2009):42. Print

[35] 11% reference determined by using data from the Association of American Medical Colleges web site (aamc.org) and from the American Association of College's of Osteopathic Medicine's web site (aacom.org) on the number of students in NYS' medical schools divided by the total number of medical students in the country. 17% reference as provided by Associated Medical Schools of New York (amsny.org).

[36] "Dollars Awarded by State, 2008." http://report.nih.gov/award/trends/State_Congressional/StateOverview.cfm. NIH Research Portfolio Online Reporting Tool, n.d. Web.

potential for research and commercialization in cancer research, neurosciences and quantitative biology.

New York State is home to seven NIH-funded translational research centers – the most of any state in the country. These centers are located at Mt. Sinai School of Medicine, NYU School of Medicine, Albert Einstein School of Medicine, Weill Cornell Medical College, Columbia University Health Sciences, Rockefeller University and University of Rochester.

The Task Force notes the proposal for a shared biomedical research platform of the SUNY Academic Health Centers – Upstate Medical, Downstate Medical, SUNY Stony Brook and SUNY Buffalo. The platform will target the following research areas: cancer; infectious diseases and merging pathogens, disorders of the nervous system, diabetes and cardiovascular disease. For an initiative related to hypertension, Welch Allyn, an Upstate New York-based medical devices manufacturer has already been identified as an industry collaborator. The Task Force notes that this effort achieves the goals articulated elsewhere in the report: collaboration with existing assets, prioritized research targets, explicit commercialization goals and industry collaboration.

Energy

New York State boasts strong assets in both traditional and alternative energy production and energy efficient technology. It is home to a dedicated agency – the New York State Energy Research and Development Authority (NYSERDA) – that provides research funding and targeted programs for next-generation energy production, technology and storage. The existence of such an agency provides a built-in competitive advantage for the State and allows for statewide coordination of research and commercialization efforts.

New York is a leading producer of nuclear and hydroelectric power with the potential for substantial natural gas production.[37] New York currently produces 445.2 trillion BTUs of nuclear energy at six reactors.[38] These areas could benefit significantly from university-industry collaboration on research and training. The Task Force notes the well-documented national shortage of nuclear engineers and ***recommends*** that the state's colleges actively seek partnerships with New York's nuclear power producers to establish collaborative research and training programs.[39]

The Task Force identified two recent efforts in particular that epitomize the potential for university-industry collaboration and demonstrate models for future such collaboration: the New York Smart Grid consortium and the New York Battery and Energy Storage Technology consortium. These two programs target specific areas within the broad energy category and bring together stakeholders from industry, academia and government with a specific market or class of products in mind, providing a model for collaboration in the state's other fields of strategic strength.

The Task Force welcomes the strategic planning process associated with the ongoing development of the statewide energy plan, and, in particular, the explicit strategy to "stimulate innovation in energy technologies" through fostering "collaboration among academia, research

[37] "Natural Gas Assessment." New York State Energy Plan 2009. August 2009. Print. Page 16

[38] "Energy Production Estimates in Trillion Btu by Source and State, 2007." Energy Information Administration, n.d. Web.

[39] "Readiness of the U.S. Nuclear Workforce for 21st Century Challenges." APS Panel on Public Affairs. June 2008. Print. Page 21

EXCELLENCE IN COLLABORATION: ENERGY CONSORTIA

NYS energy sector leading in product development through university-industry collaboration

New York Battery and Energy Storage Technology (NY BEST) Consortium

Building on Strength

- New York has research strength in advanced battery and energy storage; New York won 3 of 6 national Energy Frontier Research Center awards in 2008 in the energy storage field, totaling nearly $60 million.
- Participating entities include: Cornell University, SUNY Buffalo, RPI.

Clearly Articulated Commercialization Focus:

- Goal of developing products that will reduce NOx emissions and transform the transportation and renewable power generation sectors
- NYBEST funded through $25 million from NYSERDA for *applied* research

Opportunity for World-Leading Science in Market Relevant Field

- Unique collaborative environment plus built-in research strength positions New York as *the* leader in energy storage technology research, development, and manufacturing
- Battery technology a crucial enabler of alternative energy generation and clean transportation.

New York Smart Grid Consortium

Mission

- To facilitate the comprehensive, coordinated and accelerated transformation of today's electric transmission and distribution system into a more dynamic, efficient, reliable and renewable-friendly system.

Structure

- A not-for-profit 501(c)4 incorporated to harness the resources of the State as it manages the collaborative development of the smart grid with participation from the State's major investor owned utilities (ConEd, National Grid, CH Energy, Energy East), State and regional power authorities (NYPA, LIPA), Governor's office, State agencies (NYSERDA, NYSTAR), local government (New York City), universities (NYU/Poly, SUNY Stony Brook, Clarkson, Syracuse, University of Rochester), one national laboratory (Brookhaven National Laboratory) and major corporations (IBM, GE, CA).

Value Proposition:

- Consortium assisted in submittals for DOE Smart Grid Stimulus funding resulting in federal awards exceeding $261 million for projects approaching $600 million.
- The Consortium plans are focused upon three primary components, customer enablement, grid enhancements and diverse supply integration. The Consortium coordinated process for transformation of the grid is intended to result in enhanced economic development, higher levels of customer satisfaction and improved reliability.

and development organizations, national laboratories, and private businesses and industry to accelerate the commercialization of emerging clean energy technologies by New York-based firms."[40]

Nanotechnology

Nanotechnology is expected to become a multi trillion-dollar industry over the next decade.[41] New York is well positioned to maximize its share of this economic growth with national leaders in nanotechnology research at the SUNY Albany College of Nanoscale Science and Engineering, and at three National Science Foundation-funded nanotechnology centers: the Cornell University NanoScale Science & Technology Facility and the Columbia University Nanoscale Science and Engineering Center and the RPI Nanoscale Science and Engineering Center for Directed Assembly of Nanostructures as well as notable research programs at Alfred University, Brookhaven National Labs, Clarkson University, and RIT. Nanotechnology has the added benefit for New York State of significant complementary applications in the other areas of strategic strength – energy and health care/life sciences.

The huge levels of activity in nanotechnology in the Capital District in particular – totaling some $13 billion in government, industry and academic investment – have demonstrated the power of prioritization, critical mass and an innovation-promoting ecosystem to transform an entire regional economy. The SUNY Albany College of Nanoscale Science and Engineering has come to define university-industry collaboration in New York. Collaboration with local community colleges on training programs and the establishment of a bachelors degree in nanotechnology demonstrate strong progress toward addressing the full commercialization pipeline from education, to research to industrial application.

Nanotechnology is a strategic interest of many of New York's largest and most active innovation-based companies including Bausch & Lomb, IBM, Corning, Kodak, Endicott Interconnect, GE, Lockheed Martin and Xerox. Collaboration is already occurring at many New York universities and additional opportunities for collaboration are developing and should be strongly encouraged. The investment community must be brought in early as the third leg of the nanotechnology commercialization stool.

Agriculture and Food Processing

The New York State economy is heavily agriculture-based including over 36,600 farms generating almost $4.4 billion annually of unprocessed agricultural product sales.[42] New York is also home to nearly 4,300 food and beverage enterprises employing over 57,000 people and generating sales of nearly $19 billion annually.[43] The agriculture and food processing sectors are well-suited to university-industry collaboration, and a focus on innovation can provide a crucial competitive advantage nationally for New York's farmers.

Successful collaboration already exists through the Cornell University College of Agriculture and Life Sciences which executes Cornell's Land Grant mission, and the agricultural community throughout the state. The New York State Agricultural Experiment Station

[40] New York State Energy Plan 2009. August 2009. Print.
[41] Davey, Michael E. "Manipulating Molecules: Federal Support for Nanotechnology Research." CRS Report for Congress, 29 March 2006. Web. Page 2
[42] "New York Field Office Annual Bulletin 2008-2009." National Agriculture Statistics Service, n.d. Web.
[43] The data is as of 2006, the most recent currently available, and comes from County Business Patterns, the Annual Survey of Manufacturers, and NonEmployer Statistics, all from the U.S. Census Bureau.

PIONEERING PUBLIC-PRIVATE PARTNERSHIP: GLOBAL LEADERSHIP IN NANOTECHNOLOGY

The strategic vision and investment of New York State in partnership with industry and academia has enabled the premier global location for nanotechnology

The Vision:

- Creation of a nanotechnology "innovation ecosystem," anchored by the technological, educational, and business collaboration between the State, IBM and the College of Nanoscale Science and Engineering (CNSE) of the University at Albany (UAlbany)
- Leverages unparalleled intellectual assets and technological infrastructure to establish public-private partnerships in research, education, and commercialization.

Arial photo of CNSE Complex in Albany

The Asset:

- CNSE's Albany NanoTech (ANT) Complex, the most advanced nanotechnology innovation and education resource at any university in the world
- An 800,000-square-foot megaplex with over $5 billion in high-tech investments
- CNSE's ANT Complex features the only 300mm wafer, computer chip pilot prototyping and demonstration line within 80,000 square feet of Class 1 capable cleanrooms

The Collaboration:

- Partnerships with more than 250 leading global nanoelectronics companies, including IBM, AMD, GlobalFoundries, SEMATECH, and Tokyo Electron
- More than 2,500 scientists, researchers, engineers, faculty and students on site
- Headquarters for worldwide academic and industry research consortia catalyzing innovations across the entire spectrum of nanotechnology-driven industries, including nanoelectronics, green energy, nanomedicine and health sciences

The Results:

- The NYS-IBM-CNSE partnership has generated over $20 billion in private high-tech investments, and created and retained over 12,000 nanotechnology jobs across New York State since 2001
- Direct economic impact of over $1 billion in salaries and wages in 2008
- The partnership is projected to create or retain over 20,000 nanotechnology jobs across New York by 2015, with the resulting direct economic impact estimated to exceed $2.25 billion in salaries and wages.

operated by Cornell provides an example of translational science in the agricultural fields. The SUNY Morrisville School of Agricultural and Natural Resources is an effective facilitator of industry-university collaboration and joins 12 other SUNY campuses in conducting agriculture development and related programs.

The Task Force notes that the three focus areas of this report – industry, academia and government – combine to form a powerful marketplace. The Task Force ***recommends*** that the State, its institutions of higher education and its local businesses make an explicit and concerted effort to patronize local farms wherever possible. The Green Procurement initiative associated with Executive Order #4 offers a model under which the state, in collaboration with industrial partners, helps to create a market for emerging New York State products. In addition, opportunities exist to diversify agriculture through developing of markets for local and slow foods.

The Task Force ***recommends*** that the State, through its Department of Agriculture and Markets, seek to promote collaborative programming similar to the Battery and Smart Grid consortia. Forums to convene Cornell University, SUNY Agricultural and Technical Colleges, The New York Farm Viability Institute, First Pioneer Farm Credit, Farm Credit of Western New York, local banks, industry sector leaders and others should jointly examine expanded opportunities for student internship programs and applied research collaboration.

As with nanotechnology, agriculture has applications to other areas of strategic importance for the state. One particularly promising opportunity is energy generation through the reuse of organic waste streams from dairy farms and food processors to produce biogas. The national dairy industry has identified New York as the state best positioned to take advantage of this emerging energy-generating technology.[44] Collaboration between the State Department of Environmental Conservation, Empire State Development, the Department of Agriculture and Markets, and NYSERDA could promote and further the science and business development associated with this opportunity.

Service Science and the Future of STEM Jobs

The service sector is the fastest growing component of both New York's economy and the national economy. Perhaps because it is so evident, little attention has been given to the role of technology in advancing this growth. When package delivery companies use scanning devices to track our orders, we do not see how this enables more efficient routing of trucks and planes, and when we order products and tickets on line we think little of the information management technologies supporting the purchase. We see how our banking records are more accessible than our health records. Quality of life depends on smarter systems and smarter systems depend on advances in science and technology in fields such as life sciences, energy, nanotechnology and agriculture. However, despite some isolated examples, in the United States no state has emerged as a leader in services-related education.

Achieving these smarter systems involves service sector jobs which are growing fastest in those companies which deploy innovative technologies to better serve and attract their

[44] In July 2009, New York State was selected to host the Dairy Power Project, a pilot project coordinated by the Innovation Center for U.S. Dairy to aid dairy farms with managing manure waste. Press release available at: http://www.agmkt.state.ny.us/AD/release.asp?ReleaseID=1835

customers.[45] According to a recent report published by the Royal Society of the United Kingdom, over 80% of graduates in STEM fields find jobs in the knowledge-intensive service sector.[46] Yet, university instruction continues to focus on products and manufacturing instead of stressing the development of so-called "T-shaped" graduates (those who have deep knowledge in one or more disciplines and broad knowledge across many). Industry has played an important role in encouraging education in the services sciences as exemplified by the IBM Service Science, Management and Engineering initiative. In New York, an innovative collaboration between JPMorgan Chase and Syracuse University focuses on teaching and experience in financial services information technology. Over 400 faculty in 50 nations have established service science courses, which emphasize multidisciplinary teams working to understand, improve, and scale service systems. [47]

Some of New York's largest and most prominent companies, such as Xerox, IBM and General Electric have fundamentally refocused their business models to emphasize service innovations. This confluence creates tremendous opportunity for New York State's higher education institutions to pursue service science innovation in collaboration with New York-based industry. Doing so would offer a competitive advantage to New York State businesses as well as make New York a more attractive place in which to do business. The focus on service science would help meet the growing need for STEM graduates who can fill knowledge-intensive service sector jobs and contribute to high-skill, high-value service science innovations.

The Task Force ***recommends*** that the State's higher education institutions engage with industry along a hub and spoke model whereby one university – the hub – takes the lead in collaborating with leading industries to develop a general STEM-oriented service science curriculum to be offered at participating universities around the State. This effort would build upon existing Professional Science Masters initiatives at New York State universities, which are improving the diversity of science graduates with business and science skills, but do not directly address the service science innovations. The participating universities – the spokes – would then customize the curriculum to meet the individual needs of the university and of the local industrial base. These specializations should correspond to the State's strategic strengths, including life sciences, energy, nanotechnology, and agriculture.

The Task Force has already begun to engage individual institutions of higher education as well as companies which have indicated interest in participating in a services science initiative. Funding to develop these programs could come from federal, state and foundation grants as well as contributions from participating industries and institutions of higher education themselves.

Defining Success

- *Research expenditures in strategic areas*: Total, federally funded and industry-funded research expenditures provide measures of capacity and activity.
- *University and industry invention disclosures and patents, in strategic areas:* A measure of knowledge creation in target fields.

[45] See: Job growth, both in the United States and in the developing world, is occurring fastest in knowledge-intensive service sectors. For example, the employment growth projections of the US Bureau of Labor Statistics is lead by management, scientific, technical, and consulting jobs. http://www.bls.gov/news.release/ecopro.t02.htm
[46] The Royal Society. *Hidden Wealth: The Contribution of Science to Service Sector Innovation.* London: Techset Composition Limited, July 2009. Print. p. 14.
[47] See: http://www.ibm.com/developerworks/spaces/ssme

- *Start-ups in strategic areas:* A measure of the activity and impact of research conducted in life sciences, energy, nanotechnology and agriculture.
- *Jobs, wages in strategic areas:* A measure of the impact of life sciences research
- *Cluster development in strategic areas:* A measurement aggregating several related employment classifications which will allow for measurement of job growth, business incorporations, sales, etc.

COMMUNICATION NETWORKS

"Investors don't invest in inventions, they invest in inventors." – Richard Hitt, CEO, HYPRES

Key Findings

- There is a spectrum of unconnected existing and potential networks for facilitating interaction between industry and higher education institutions ranging from ad hoc local social gatherings, to structured forum and networking sessions convened by regional and statewide organizations.
- The internet is the primary means of communication for participants of the innovation ecosystem, making geography a less powerful indicator of behavior.
- There is a need for entrepreneurs and emerging companies to find "early adopters" who can validate their products.

Key Recommendations

- Develop an early adopter mechanism to expose procurement officers from industry, higher education and government to opportunities to purchase new products emerging from university-related start ups.
- Research institutions and businesses should communicate by way of "structured dialogues" to identify the current state of research, areas of industry demand, and opportunities for jointly developed products/processes.
- Create a single, online and open source repository for innovation-related programs and assets.

Defining Success

- Active networks in place; number of participants
- Growth of network participation
- Network outputs and outcomes

Communication as Facilitation

Ultimately, the promotion of industry-higher education partnerships requires solving a networking problem: how can communication and subsequent collaboration best be facilitated? The Task Force received many proposals concerning establishing effective communication and networking mechanisms, all based on the premise that the group in question could better achieve its goals if it had easier access to more complete information. The members of the Task Force agreed that a top priority must be the establishment of effective, mutually beneficial mechanisms to facilitate the requisite communication.

Effective networks *raise awareness* by connecting innovators with their target audiences – whether those be investors, managers, entrepreneurs or other innovators. These formal and informal networks help connect researchers with each other and facilitate collaboration which can, in turn *establish critical mass.* While networks do not directly provide a commercialization pipeline, they are prerequisites for such commercialization. Effective networks share the following characteristics:

- They are *iterative:* Investors are able to identify new opportunities on an on-going basis. Researchers are able to refocus their work to respond to industry needs, market

opportunities and investor desires. Technology managers and entrepreneurs are able to identify opportunities where innovations and industry demands find common ground.

- They are *issue focused:* While geography is a natural limiting factor, the data collected by this Task Force indicates that investors gravitate toward excellence and critical mass in particular fields of research. As such, communication networks should reflect such market preferences and focus on a given problem (e.g. diabetes), an emerging technology (e.g. solar panels) or an available tool (e.g. a synchrotron light source).

Grassroots Networks

A grassroots network refers to a group of individuals who are brought together by common interests. An example is the New York Tech Meet-Up: a New York City-based community of over 10,000 technology-interested people, a sub-set of which meets once per month to view presentations from companies and developers who provide demonstrations of ongoing work in a variety of technology fields. Motivated individuals have also had significant impacts through the creation of New York Entrepreneur Week – which brings together thousands of entrepreneurs, investors and dealmakers in a single setting to discuss entrepreneurial activity and opportunity in New York State – and the Livingston Nanotechnology Conference – which convenes investors, academics, business leaders and government officials involved in the nanotechnology industry to identify emerging trends and broker deals.

To thrive, grassroots networks need access to the internet, sufficient virtual and physical meeting venues and engagement with groups outside the individual network. Universal access to broadband internet connection is the most fundamental means for connecting like-minded individuals. The Task Force ***recommends*** that ongoing efforts such as those of the New York State Broadband Development and Deployment Council be encouraged and pursued. Similarly, the State government, institutions of higher education, large companies and local businesses all have physical space which can be shared at minimal cost. The Task Force ***recommends*** that State agencies, institutions of higher education and companies located in the state make physical space available wherever possible at no or minimal cost.

Institutional Platforms, Regional Hubs, Statewide Convening Bodies

A variety of institution-based communications networks exist throughout the state, operating with varying levels of efficacy. Ultimately, what is needed is not necessarily more events, but instead, broader participation within events targeted at a specific purpose (say, market developments in energy applications of nanotechnology). The following is a brief overview of the various types of communications networks.

Higher Education Institutions

The September 2009 Long-Island Life Sciences Summit offers an example of the convening power of individual higher education institutions working collaboratively with other schools and with industry partners**.** The Center for Biotechnology, a New York State Center for Advanced Technology in Medical Biotechnology located at SUNY Stony Brook, held a 2-day summit including approximately 500 biopharmaceutical industry executives, innovators, CEOs of emerging companies, leading academic scientists, and early-stage investors. The summit included presentation on ongoing faculty research, funding seminars and opportunities for one-on-one coordination.

Regional Hubs

While the Task Force has emphasized the importance of coordination beyond geographic boundaries, the reality of commercialization, particularly on high-risk, early-stage technologies is that proximity to the necessary inputs is crucial. Regional hubs bring together technology, talent, platform and capital. The relevant inputs include: researchers, managers, entrepreneurs, incubator space, access to business services and access to capital.

At one regional hub, High Tech Rochester, aspiring entrepreneurs are connected with an entrepreneur-in-residence who provides mentorship and helps navigate the business-creation process. MBA interns provide business plan counseling, and the center connects entrepreneurs with local angel and venture investors, banks, industrial development authorities and revolving loan funds. The regional hub also runs two business incubators which provide operating space for emerging enterprises. This is an effective model and the Task Force ***recommends*** that the State seek to expand the High Tech Rochester model throughout the existing network of NYSTAR Regional Technology Development Centers or other established regional economic development organizations. The Task Force notes that competent managers are crucial to the success of such regional hubs and ***recommends*** that funding streams ensure sufficient funding to hire competent, results-oriented individuals to run such business service centers.

Statewide Convening Bodies

The Task Force heard consistently about the irreplaceable value of senior-level buy-in. Multi-regional and statewide "convening bodies" are best positioned to bring together high-level executives from both higher education institutions (presidents, research deans etc.) and industry (CEOs, directors of research etc.). The Task Force has already identified willing conveners at the Partnership for New York City, the Metropolitan Development Association, the Business Council of New York State and the New York Academy of Sciencess.

Topics of discussion should include opportunities for collaboration, actions to reduce or eliminate existing hurdles to such collaboration, and, most importantly, execution plans which hold participating parties accountable. The Task Force ***recommends*** these convening bodies hold at least two meetings per year focused on sub-sets within the above-defined areas of strategic strength in New York (life sciences, energy, nanotechnology, agriculture). Such meetings should be attended by high-level representatives from industries in the examined fields, higher education institutions with demonstrated strengths in these fields, government representatives and active venture investors. Venture investors and industrial partners should not be limited to those who are New York State based.

Structured Dialogues

The task force ***recommends*** that a process of *structured dialogues* facilitate interaction between industry representatives and university- and laboratory-based researchers at the institutional, regional and statewide levels to identify market-relevant, pre-competitive "targets" associated with existing research. Initial activities include agreement among researchers on an area of analysis, current capabilities within the area and expectations for medium-term (e.g. 5-years) innovations. The second round of activities introduces the viewpoints of industry practitioners who articulate their perspective on the current state of capacity. Industry partners then define expectations about the next generation of products that they hope to commercialize. Finally, in a third round, university researchers and company technology officers discuss opportunities for future collaborative research.

Spectrum Management

Although the various elements of the communication and network spectrum are largely self-organizing, it is important for a single body to monitor, promote and measure the efficacy of those activities occurring around the state. The Task Force concludes that the Innovation Advisory Council should be assigned this responsibility, and that the internal champion within the Governor's office work with the various conveners to ensure all strategic research areas are covered. Notably, there will likely be significant overlap between members of that advisory board and people involved with the various networks.

Purchasing Networks

As much as they require university-partnership to develop new technologies, emerging companies require "early adopters" who can validate their products and provide access to consumer markets. Industry, higher education institutions and government together provide huge markets unto themselves. As such, the Task Force ***recommends*** the state develop a mechanism for identifying entities willing to consider testing and validation of products for which they have a need or interest.

This initiative could establish an initial group of approximately twelve representatives each from industry, academia, and government to routinely examine products from emerging start-up companies. The new product pipeline would be filled through referrals from venture capital firms, angel investors, academic partners, and economic development staff that could assist in identifying technology companies developing products or services. Executive Order #4 which established a Green Purchasing and Sustainability Program for state agencies is a model that can be expanded for this initiative.

The willingness of participating organizations to provide field testing and become early adopters of new products would be an invaluable addition to the resources we can offer to New York's emerging companies. Not only would it provide them with valuable input for next generations of their products, but it would establish a customer base from which they can expand their operations and seek additional funding to grow.

Online Asset Inventory

Cutting across all elements of the spectrum as defined above, the Task Force identified the need for an internet portal which facilitates collaboration between industry and higher education institutions by showcasing available assets (both physical and human) at higher education institutions, targeted government and non-governmental programming and available funding resources.

The Task Force welcomed the ongoing efforts toward this goal by "Knowledge for New York," a collaborative effort between the State University of New York (SUNY) and the Commission on Independent Colleges and Universities (CICU). The effort has identified a vendor and is now entering the design phase. The Task Force offered the following ***recommendations*** regarding the design, participation and functionality of the proposed portal:

- *Universality*: The portal should provide information on as many of New York State's colleges and universities as possible. To that end, the City University of New York (CUNY) campuses should be integrated into the development process as soon as possible.

- *Demand-driven*: Though the portal may eventually include over one hundred participating institutions, interested parties should be able to enter through a single input and search based on their partnership interests, not based on the institutions. The portal should be agnostic as to the individual colleges, and facilitate a self-guided search process based on the user's desired assets.
- *Collaborative*: The portal should maximize the use of web 2.0 tools such as LinkedIn, Wikis, Twitter and others to facilitate communication between individuals.
- *Accountable*: Responsibility for the portal should be the clearly assigned to a single person or a small group of individuals who manage it so as to facilitate collaboration.

In the course of its work, the Task Force created a working inventory of innovation assets and programs throughout the state. The Task Force ***recommends*** that this inventory be posted online by the Knowledge for New York consortium and that this inventory be maintained as an open-source wiki to which network participants can add their own content as necessary and desirable.

Defining Success

- *Network participants* (number, level of responsibility, growth): While the overall number of portals is a poor indicator of efficacy (more portals could indicate ineffective portals), the number and level of participants involved in various networks can provide an indication of their use. Given the importance of high-level buy-in, particular attention should be paid to participation executive-level administrators.
- *Network outputs and outcomes*: The purpose of these portals and networks is to promote collaboration among researchers. As such, indicators of such collaboration – joint invention disclosures, joint patent filings, federal SBIR and STTR grants won among others – provide the best indication of the efficacy of the system of networks as a whole.

METRICS

"You get what you inspect, not what you expect." – Anonymous

Key Findings:

- New York currently does not collect regular metrics that measure statewide and university-level performance on innovation economy impacts.
- Universities are responsive to perceived state priorities as reflected in statewide reporting documents.
- Some of the relevant metrics cannot currently be collected.
- Massachusetts provides a best practice in terms of metrics collection with its annual Index of the Massachusetts Innovation Economy.

Key Recommendations:

- An inter-agency team lead by NYSTAR, in collaboration with ESD, DOL and other state agencies, should collect annual data at the state and university level regarding performance on a variety of innovation-related metrics.
- The inter-agency team should work to develop the necessary inputs to collect those metrics which are currently not available.

Defining Success:

- Performance metrics should be benchmarked against previous performance and against peer states, including Massachusetts and California, the clear top performers in university-industry collaboration.

Metrics: Collect and Publish

The Task Force believes that it is critically important to develop, maintain and publish an annual or bi-annual assessment of progress being made to diversify and grow the state's economy. It ***recommends*** the State collect and publish metrics as described below which reflect the elements of a functioning innovation ecosystem as described in this report: universities, industry, access to capital, state practices, critical mass and communication networks.

Given these themes, the focus of the Task Force with regard to metrics has been to assess the most appropriate strategies for measuring the state's effectiveness in these targeted areas. These metrics should be used to assess general policy and individual university success in the area of industry-higher education partnerships. The Task Force looks to an interagency team of NYSTAR, ESD, the Division of Research and Statistics of the Department of Labor and the proposed Innovation Advisory Council to identify additional metrics.

The Task Force reviewed those measurements and indicators included in the Kauffman Foundation's *2008 State New Economy Index* (developed by the Information Technology & Innovation Foundation), the *2008 Index of the Massachusetts Innovation Economy*, and the Milken Institute State Science and Technology Index.

Experience has demonstrated that the State's primary metric for evaluating any economic development initiative is the creation or maintenance of jobs. While jobs are an ultimate goal, the findings of the task force indicate that jobs are a lagging indicator of economic expansion and

therefore cannot be examined in a vacuum in evaluating policies aimed at promoting industry-higher education collaboration in the short run. While the task force believes strongly that high-quality jobs for a diverse set of constituents will result from enhanced collaboration between industry and academia, an exclusive focus on job creation in the near-term would be short sighted and could actually hinder long-term job growth. The most direct output of innovation is often intellectual property (IP). Therefore, to measure the success of industry-higher education collaborations, the primary focus should be on those metrics which quantify innovation, creation, transfer and application of IP. Intellectual property is the raw material that leads to the creation of companies, jobs and wealth.

Notably, several data elements which the Task Force recommends collecting are currently unavailable. For example, the main industry classification system which exists today, the North American Industry Classification System (NAICS), does not readily allow for comparisons of employment within the "Nanotechnology" and "STEM-driven Service sectors" to the extent that would be desirable. The ability to tailor employment and earnings data for economic development purposes was demonstrated in 1999 when information was developed for the strategic industry sectors identified by the Empire State Development Corporations at that time. The databases and survey instruments utilized and collected by the State Department of Labor will allow for more detailed measurements of industry clusters going forward, and the Task Force ***recommends*** that a multi-agency team be charged to work with industry specialists to develop the best available mechanism for tracking targeted performance. Such a multi-agency team should examine other data sources developed by other organizations, which could be utilized to strengthen the state's performance measurement efforts.

These measures are intended to assess the State's "capacity" to promote economic growth through industry-higher education collaboration; the level of "activity" generated over a given period of time; and the "impact" of that activity on the state's economy.

University-level data collection and publication can have an important effect on influencing behavior by establishing an element of competition for high-performance among New York schools. The Task Force asserts that such data should be included as available with the annual data report. Relevant data fields are those associated with the "defining success" headings found throughout this report.

Performance Metrics Provided in this Report:

Innovation Capacity

- Industry Investment in R&D
- Venture Capital held in-state
- Scientists and Engineers located in-state

Innovation Activity

- Patents
- Inventor Patents
- Initial Public Offerings
- Entrepreneurial Activity

Innovation Impact

- Gazelle Jobs (jobs at fast-growing technology companies)
- Fastest-Growing Firms
- Knowledge Jobs
- Information Technology Jobs

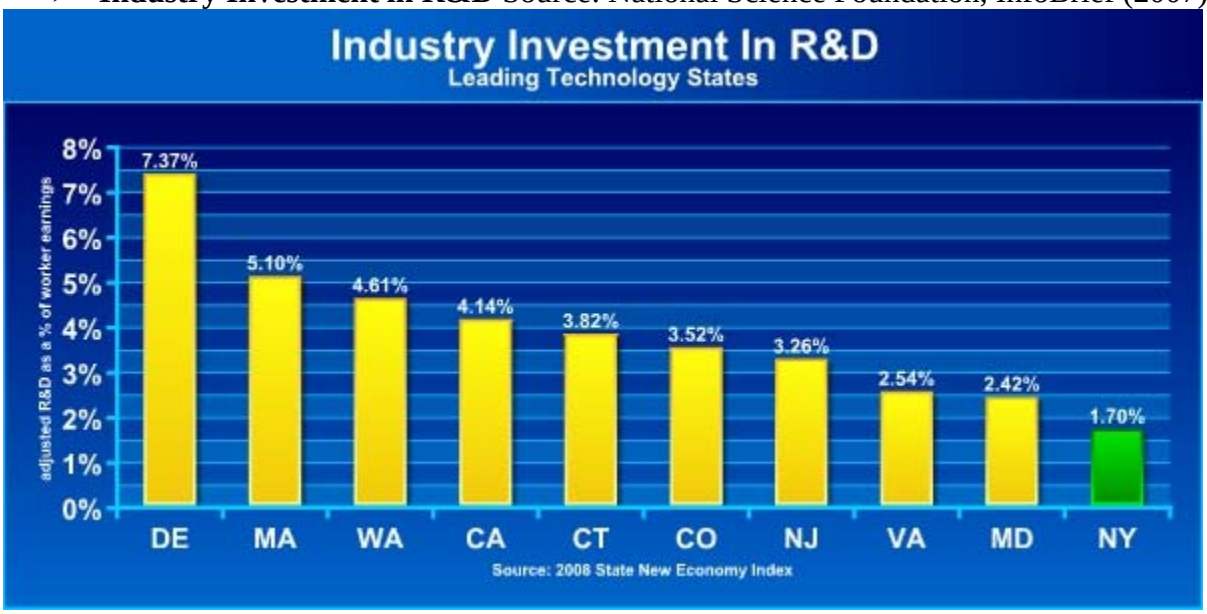
Performance Metrics of Interest for Future Reporting:

- Employment and Wage information by Industry Cluster within Strategic Industries (Energy, Life Sciences/Health Care, Nanotechnology, Agriculture, Services Sciences) by state and by region
  - *Appropriate NAICS codes to be developed by multi-agency metrics team*
- Master agreements between universities and partner companies, by university
  - *To be provided through university technology transfer offices*
- Patents by source, by technology, by firm, by inventor
  - *To be collected subsequent to analysis of public information at US Patent and Trade Office*
- SBIR/STTR grants won by amount, by region, by technology, by campus
  - *To be collected subsequent to analysis of public information available from federal agencies*
- Angel investments by amount, by region, by technology
  - *To be collected from angel investor reporting organizations*
- Venture investments by amount, by region, by technology
  - *Analyze and report on information available from venture fund investment organizations*

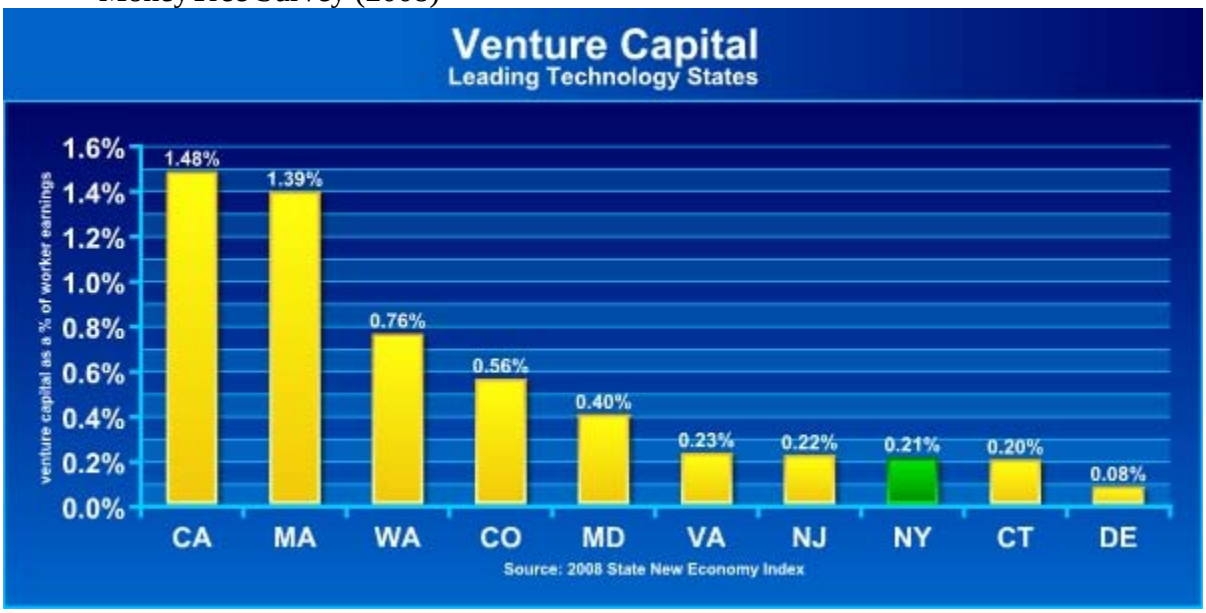
Innovation Capacity

- Industry Investment in R&D
- Venture Capital held in-state
- Scientists and Engineers located in-state

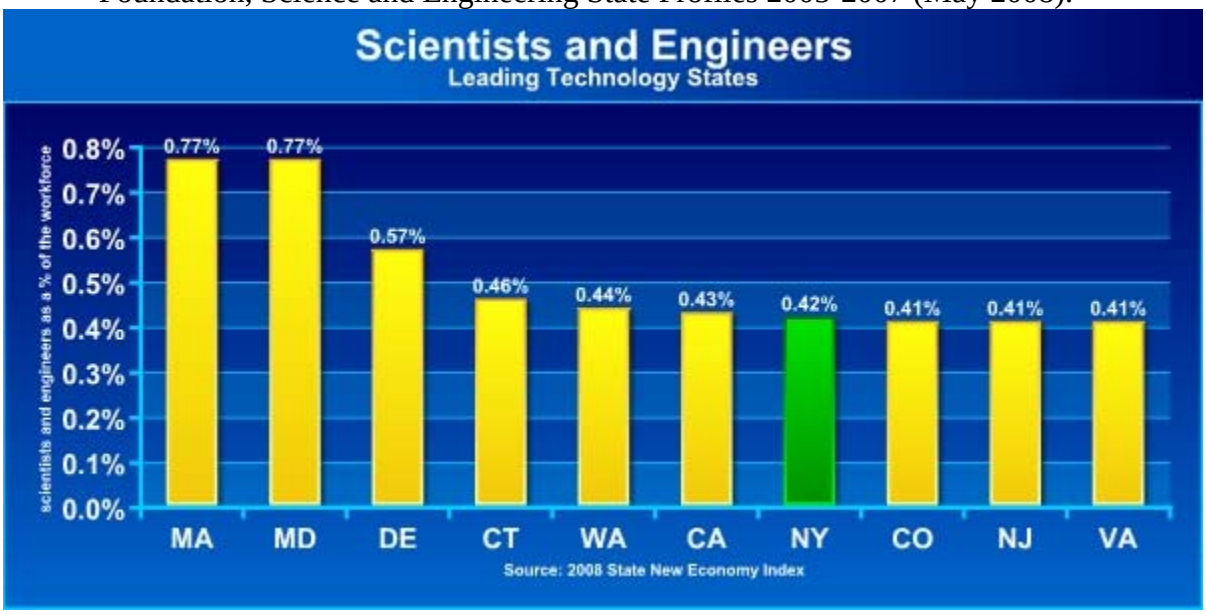
➢ **Industry Investment in R&D** Source: National Science Foundation, InfoBrief (2007)



➢ **Venture Capital** Source: PricewaterhouseCooper/Venture Economics/NVCA MoneyTree Survey (2008)



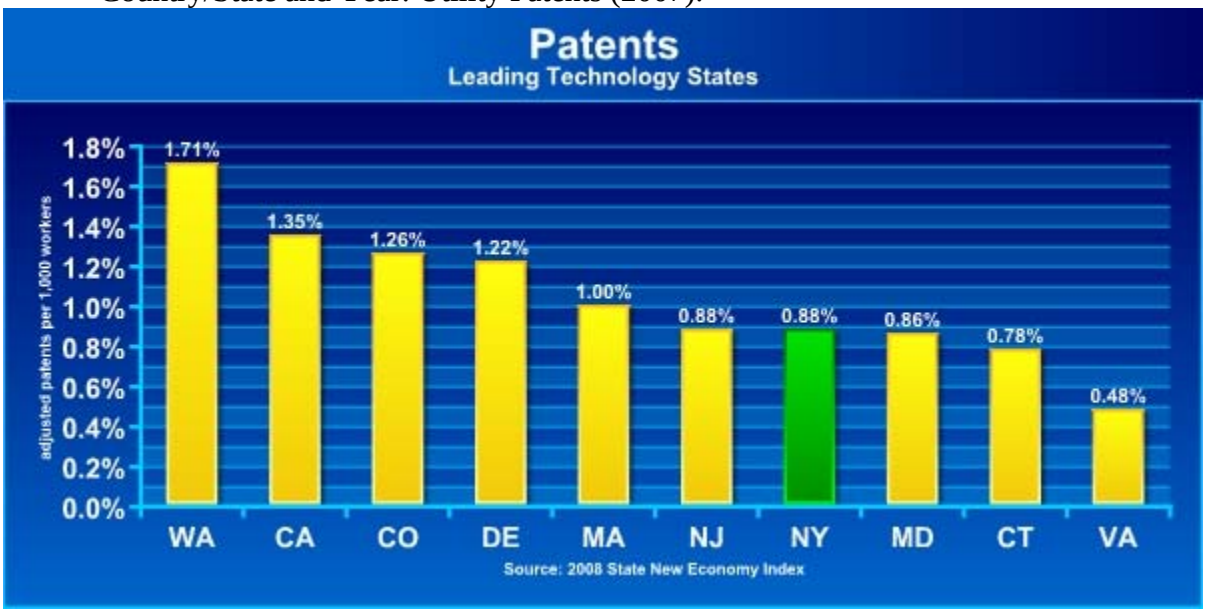
- **Scientists and Engineers** Source: Scientists and Engineers: National Science Foundation, Science and Engineering State Profiles 2005-2007 (May 2008).



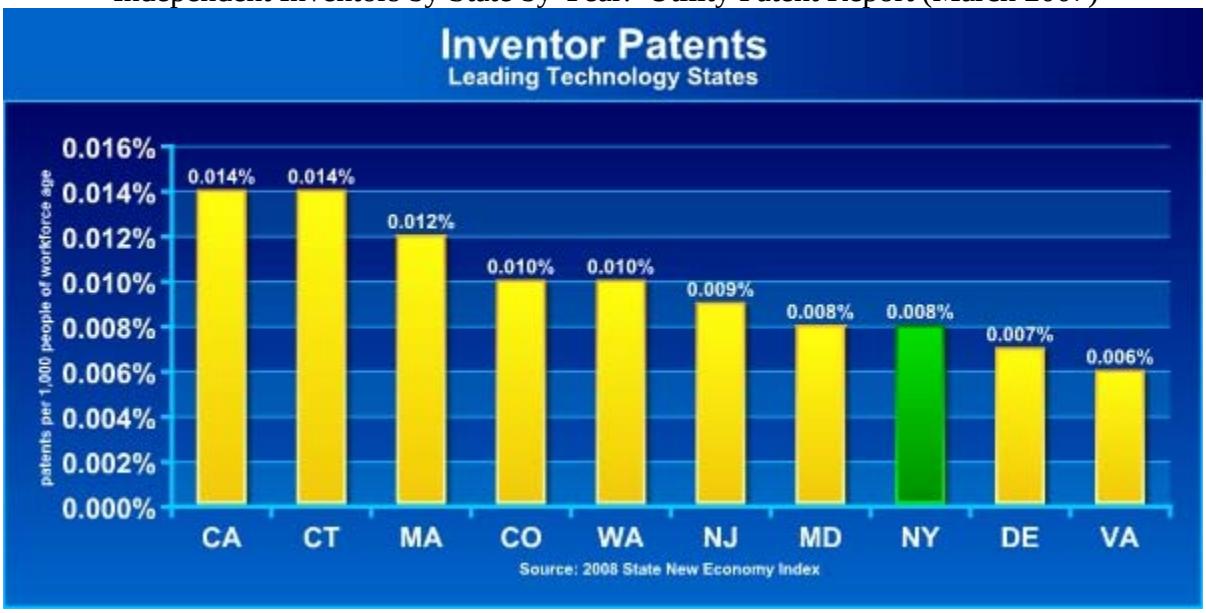
Innovation Activity

- Patents
- Inventor Patents
- Initial Public Offerings
- Entrepreneurial Activity

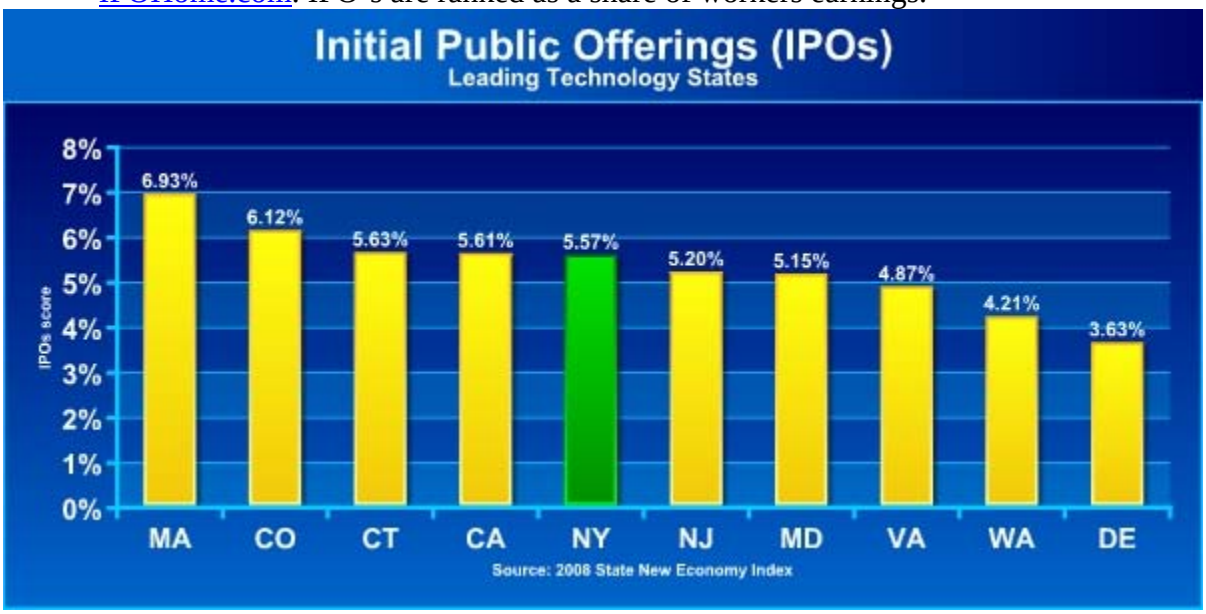
➢ **Patents** Source: Patents: United States Patent and Trademark Office, Patent Counts by Country/State and Year: Utility Patents (2007).



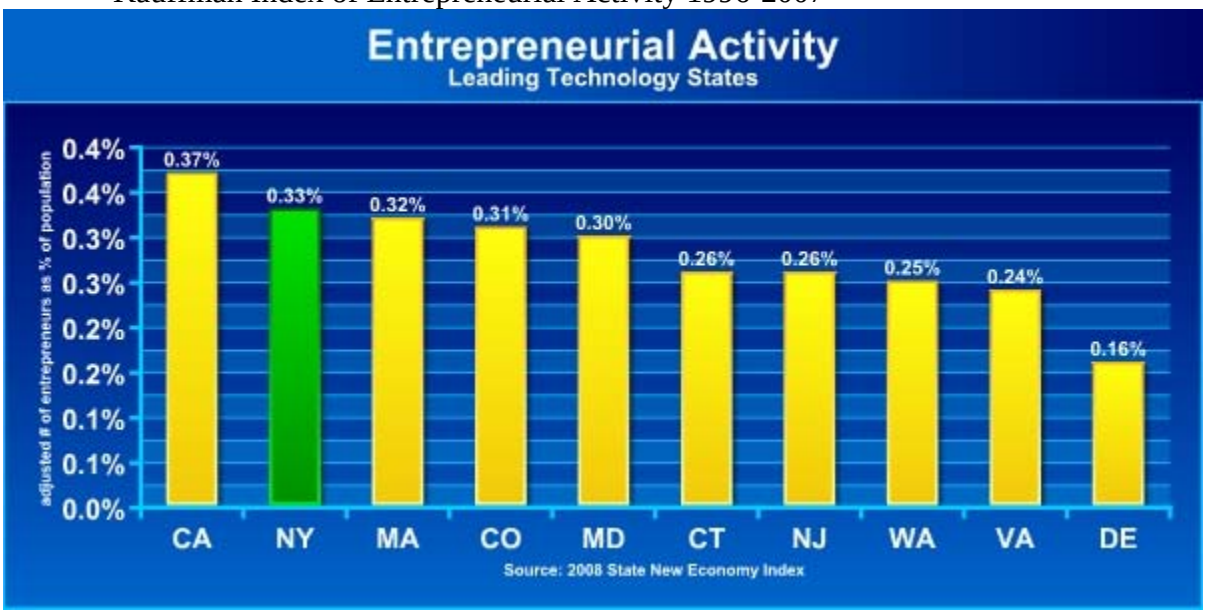
➢ **Inventor Patents** (page 35) Source: Patents: U.S. Patent and Trademark Office, "Independent Inventors by State by Year: Utility Patent Report (March 2007)



- **Initial Public Offerings** Source: State IPO Totals: Renaissance Capital's IPOHome.com. IPO's are ranked as a share of workers earnings.



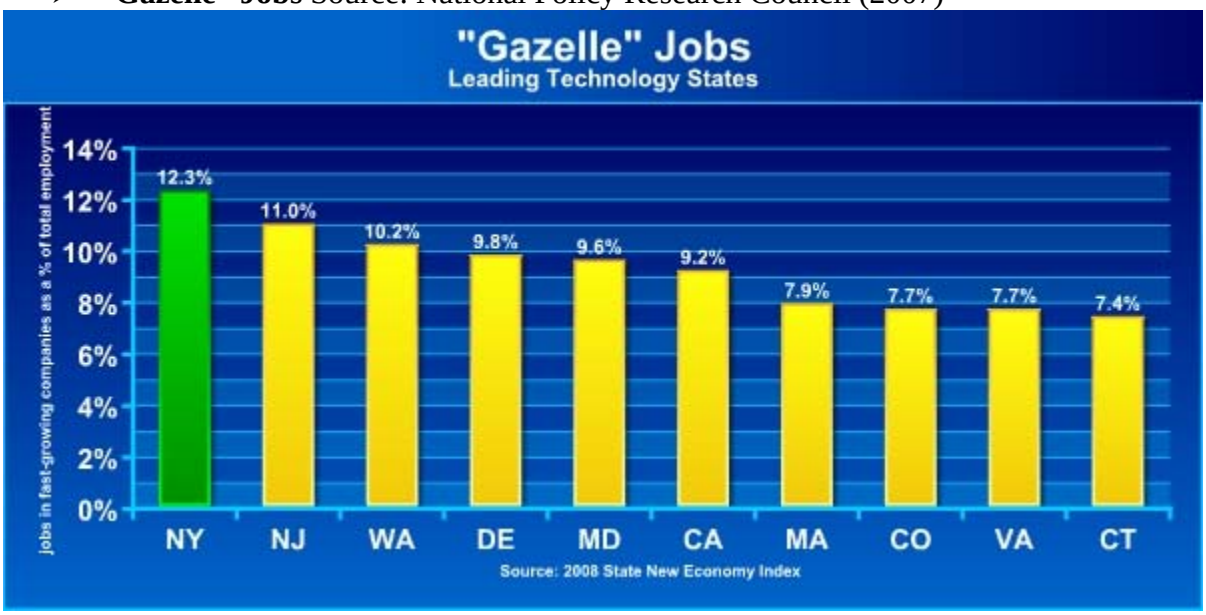
- **Entrepreneurial Activity** (page 34) Source: Entrepreneurs: Robert W. Fairlie, "Kauffman Index of Entrepreneurial Activity 1996-2007"



Innovation Impact

- Gazelle Jobs (jobs at fast-growing technology companies)
- Fastest-Growing Firms
- Knowledge Jobs
- Information Technology Jobs

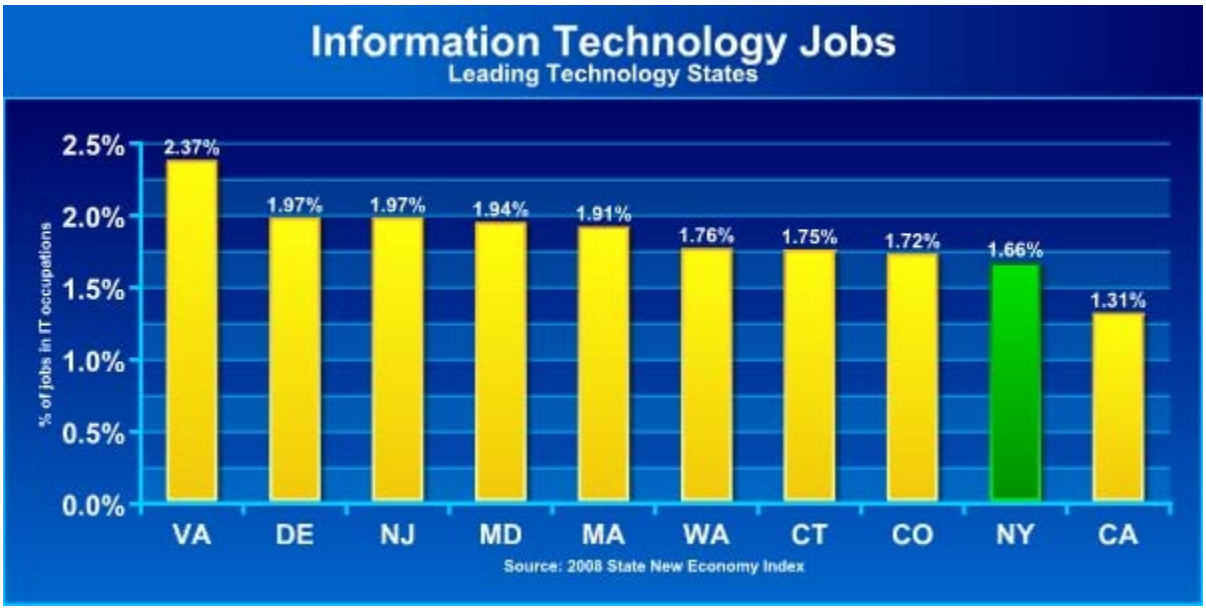
➢ **"Gazelle" Jobs** Source: National Policy Research Council (2007)



➢ **Fastest-Growing Firms** Source: Deloitte, "2007 Deloitte Technology Fast 500".

➢ **Knowledge Jobs** Source: Task Force calculations based on the state's scores in seven indicators – IT jobs; managerial, professional, and technical jobs; workforce education; immigrations of knowledge workers; migration of U.S. knowledge workers; manufacturing value added; and high-wage traded services.

➢ **Information Technology Jobs** Source: IT Occupations: U.S. Department of Labor, Bureau of Labor Statistics, May 2007 Occupational Employment Statistics (2008)



APPENDIX A: REGIONAL EMPLOYMENT CLUSTERS

2008 Top Employment Industry Clusters by Region
*Source: New York State Department of Labor based on **existing** NAICS codes*

Capital District

- Biomedical Cluster
- Misc Manufacturing Cluster
- Front Office & Producer Services Cluster

Hudson Valley

- Electronics & Imaging Cluster
- Biomedical Cluster
- Communications, Software & Media Services Cluster

Central New York

- Industrial Machinery & Services Cluster
- Biomedical Cluster
- Forest Products Cluster

Long Island

- Biomedical Cluster
- Electronics & Imaging Cluster
- Misc Manufacturing Cluster

Finger Lakes

- Electronics & Imaging Cluster
- Industrial Machinery & Services Cluster
- Food Processing Cluster

Mohawk Valley

- Fashion, Apparel & Textiles Cluster
- Biomedical Cluster
- Materials Processing Cluster

Southern Tier

- Electronics & Imaging Cluster
- Biomedical Cluster
- Industrial Machinery & Services Cluster

New York City

- Fashion, Apparel & Textiles Cluster
- Financial Services Cluster
- Communications, Software & Media Services Cluster

Western New York

- Industrial Machinery & Services Cluster
- Materials Processing Cluster
- Biomedical Cluster

North Country

- Forest Products Cluster
- Biomedical Cluster
- Materials Processing Cluster

APPENDIX B: UNIVERSITY RESEARCH EXPENDITURES

R&D Expenditures at Universities and Colleges, New York State 2008 (in thousands of dollars)
by Total Academic R&D Expenditures

Academic Institution	Total Academic R&D Expenditures	Industry Financed Academic R&D Expenditures	Federally Financed Academic R&D Expenditures	State/Local Govt Financed Academic R&D Expenditures	Institutionally Financed Academic R&D Expenditures	Other Academic R&D Expenditures
Cornell University, All Campuses	653,996	25,544	358,944	75,460	123,011	71,037
Columbia University in the City of New York	548,704	12,724	461,029	9,958	48,349	16,644
University of Rochester	375,218	27,151	276,268	10,918	38,572	22,309
SUNY at Buffalo, All Campuses	338,300	21,433	157,578	16,823	96,916	45,550
New York University	310,699	7,005	199,363	6,126	40,420	57,785
Mount Sinai School of Medicine	296,380	13,811	253,319	2,488	7,115	19,647
SUNY at Albany	270,414	25,560	108,747	56,121	45,761	34,225
SUNY at Stony Brook, All Campuses	252,745	5,396	106,419	29,990	103,869	7,071
Rockefeller University	247,505	2,060	81,557	242	147,196	16,450
Yeshiva University	197,311	1,731	143,866	-	39,505	12,209
Rensselaer Polytechnic Institute	77,295	4,337	47,109	10,078	13,134	2,637
SUNY at Binghamton	59,017	3,274	14,402	8,207	27,662	5,472
Syracuse University, All Campuses	38,455	1,757	24,207	4,047	6,691	1,753
SUNY Health Science Center at Syracuse	36,359	2,916	23,117	1,934	1,228	7,164
CUNY City College	34,452	3,018	21,739	3,115	3,595	2,985
SUNY Health Science Center at Brooklyn	32,299	1,062	25,299	80	3,198	2,660
New York Medical College	31,644	4,878	23,107	414	208	3,037
CUNY Hunter College	30,402	169	14,978	4,573	7,078	3,604
SUNY College of Environmental Sci & Forest	26,359	1,007	9,239	1,346	13,421	1,346
Rochester Institute of Technology	24,018	3,452	14,370	811	4,131	1,254

Source: National Science Foundation (NSF) Survey of R&D Expenditures at Universities and Colleges, available through WebCASPAR.

R&D Expenditures at Universities and Colleges, New York State 2008 (in thousands of dollars)
by Industry Financed Academic R&D Expenditures

Academic Institution	Total Academic R&D Expenditures	Industry Financed Academic R&D Expenditures	Federally Financed Academic R&D Expenditures	State/Local Govt Financed Academic R&D Expenditures	Institutionally Financed Academic R&D Expenditures	Other Academic R&D Expenditures
University of Rochester	375,218	27,151	276,268	10,918	38,572	22,309
SUNY at Albany	270,414	25,560	108,747	56,121	45,761	34,225
Cornell University, All Campuses	653,996	25,544	358,944	75,460	123,011	71,037
SUNY at Buffalo, All Campuses	338,300	21,433	157,578	16,823	96,916	45,550
Mount Sinai School of Medicine	296,380	13,811	253,319	2,488	7,115	19,647
Columbia University in the City of New York	548,704	12,724	461,029	9,958	48,349	16,644
New York University	310,699	7,005	199,363	6,126	40,420	57,785
SUNY at Stony Brook, All Campuses	252,745	5,396	106,419	29,990	103,869	7,071
New York Medical College	31,644	4,878	23,107	414	208	3,037
Rensselaer Polytechnic Institute	77,295	4,337	47,109	10,078	13,134	2,637
Rochester Institute of Technology	24,018	3,452	14,370	811	4,131	1,254
SUNY at Binghamton	59,017	3,274	14,402	8,207	27,662	5,472
CUNY City College	34,452	3,018	21,739	3,115	3,595	2,985
Clarkson University	17,654	2,921	8,269	2,068	4,396	-
SUNY Health Science Center at Syracuse	36,359	2,916	23,117	1,934	1,228	7,164
Polytechnic University	12,674	2,258	6,050	2,355	121	1,890
Rockefeller University	247,505	2,060	81,557	242	147,196	16,450
Syracuse University, All Campuses	38,455	1,757	24,207	4,047	6,691	1,753
Yeshiva University	197,311	1,731	143,866	-	39,505	12,209
Albany College of Pharmacy	3,486	1,433	582	1,211	260	-

Source: National Science Foundation (NSF) Survey of R&D Expenditures at Universities and Colleges, available through WebCASPAR.

R&D Expenditures at Universities and Colleges, New York State 2008 (in thousands of dollars)
by Engineering Academic R&D Expenditures

Academic Institution	Total Academic R&D Expenditures	Industry Financed Academic R&D Expenditures	Total Engineering	Aerospace Engineering	Chemical Engineering	Electrical Engineering	Materials Engineering	Mechanical Engineering	Other Engineering
SUNY at Albany	270,414	25,560	99,995	-	39	-	-	-	99,956
University of Rochester	375,218	27,151	83,632	-	765	4,513	-	66,609	11,745
Cornell University, All Campuses	653,995	25,544	74,357	-	4,834	15,891	7,079	9,431	37,122
SUNY at Buffalo, All Campuses	338,300	21,433	49,038	973	17,923	2,704	1,454	12,075	13,909
Rensselaer Polytechnic Institute	77,295	4,337	44,215	-	5,930	14,430	8,754	11,801	3,300
Columbia University in the City of New York	548,704	12,724	41,373	-	5,280	3,607	1,226	3,620	27,640
SUNY at Binghamton	59,017	3,274	26,785	-	-	2,470	192	3,537	20,586
SUNY at Stony Brook, All Campuses	252,745	5,396	25,675	-	-	6,499	3,939	2,360	12,877
Syracuse University, All Campuses	38,455	1,757	12,046	181	188	2,447	-	5,303	3,927
Rochester Institute of Technology	24,018	3,452	10,465	-	-	2,799	-	1,521	6,145
Clarkson University	17,654	2,921	9,553	-	5,050	2,229	-	2,274	-
CUNY City College	34,452	3,018	9,249	-	2,269	3,599	-	1,559	1,822
Polytechnic University	12,674	2,258	5,875	-	-	2,445	-	1,397	2,033
Alfred University, All Campuses	5,478	1,357	5,242	-	-	-	5,184	58	-
SUNY College of Environmental Sci & Forest	26,359	1,007	5,083	-	2,491	-	-	-	2,592
United States Military Academy	10,123	-	4,317	-	-	589	-	591	3,137
Dowling College	1,545	6	1,317	1,317	-	-	-	-	-
New York Institute of Technology, All Campus	2,061	503	930	130	-	754	-	-	46
Union College (Schenectady, NY)	2,557	718	870	-	-	-	-	547	323
Manhattan College	378	139	378	-	-	-	378	-	-

Source: National Science Foundation (NSF) Survey of R&D Experditures at Universities and Colleges, available through WebCASPAR.

R&D Expenditures at Universities and Colleges, New York State 2008 (in thousands of dollars)
by Total Academic R&D Expenditures, Selected Academic Fields

Academic Institution	Total Academic R&D Expenditures	Total Engineering	Biological Sciences	Chemistry	Earth Sciences	Medical Sciences	Other Life Sciences	Other Physical Sciences	Physics
Cornell University, All Campuses	653,996	74,357	98,354	20,108	6,158	247,625	14,135	9,284	45,377
Columbia University in the City of New York	548,704	41,373	137,777	7,113	391	229,095	3,950	15,596	3,634
University of Rochester	375,218	83,632	59,346	3,949	938	193,412	7,474	-	7,932
SUNY at Buffalo, All Campuses	338,300	49,038	58,158	14,285	2,760	157,120	9,960	71	3,471
New York University	310,699	-	96,221	6,695	-	137,910	20,072	-	4,839
Mount Sinai School of Medicine	296,380	-	88,261	-	-	208,119	-	-	-
SUNY at Albany	270,414	99,995	89,259	1,600	1,588	12,558	248	46,343	686
SUNY at Stony Brook, All Campuses	252,745	25,675	50,773	18,140	7,771	52,266	206	-	19,836
Rockefeller University	247,505	-	215,435	6,378	-	12,133	-	-	3,582
Yeshiva University	197,311	-	-	-	-	197,311	-	-	-
Rensselaer Polytechnic Institute	77,295	44,215	4,398	4,124	1,097	-	-	-	7,079
SUNY at Binghamton	59,017	26,785	2,462	5,219	2,010	-	934	-	1,304
Syracuse University, All Campuses	38,455	12,046	2,402	1,863	1,357	101	99	20	4,154
SUNY Health Science Center at Syracuse	36,359	-	9,420	-	-	26,939	-	-	-
CUNY City College	34,452	9,249	6,723	3,154	417	1,653	-	-	3,089
SUNY Health Science Center at Brooklyn	32,299	-	11,669	-	-	20,630	-	-	-
New York Medical College	31,644	-	24,699	-	-	6,945	-	-	-
CUNY Hunter College	30,402	-	11,660	3,791	2,767	-	-	-	1,601
SUNY College of Environmental Sci & Forest	26,359	5,083	9,381	3,122	664	-	-	-	-
Rochester Institute of Technology	24,018	10,465	327	374	-	1,496	-	5,672	2,004

Source: National Science Foundation (NSF) Survey of R&D Expenditures at Universities and Colleges, available through WebCASPAR.

APPENDIX C: TASK FORCE CONTRIBUTORS

Advisory Committees:
The Task Force convened three advisory committees to provide additional insight into specific areas relevant to the Task Force's inquiry. Committees included: Industry, Technology Transfer and Venture Capital. The Task Force expresses its gratitude for the time and effort provided by these participants.

INDUSTRY LEADERS

Barry Abramowitz, Client Group Director, CH2MHill
Santokh Badesha, Fellow, Xerox
Rene Baston, Chief Business Officer, New York Academy of Sciencess
Tom Birdsey, President & CEO, Einhorn Yaffee Prescott (EYP)
Keith Blakely, CEO, Chairman, Nanodynamics, Inc.
Terry Brown, Chairman & CEO, O'Brien & Gere
Mark Campito, President & CEO, Marktech Optoelectronics
Joe Casper, Advanced Systems Engineering Manager, Lockheed Martin
Tom Coller, Partners and Founders, Progressive Machine and Design
Papken Der Terosian, President & CEO, Vistec Lithography
Albert DiRienzo, President & CEO, Blue Highway LLC
Matthew Cusack, Director of Research and Development, X-Ray Optical Systems
Pat Govang, President, e2e Materials
Richard Hitt Jr., President & CEO, HYPRES, Inc.
Patrick Hooker, Commissioner, NYS Dept. of Agriculture & Markets
Jerry Horton, Founder, CEO, VP Sales, Sweetwater Ethanol
John Lincoln, Former President, New York Farm Bureau
John Martini, Owner, Anthony Road Wine Company
Karin Pavese, New York Academy of Sciencess
Nathan Rudgers, Director of Business Development, Farm Credit of Western New York
William Schroeder, President, Kitware, Inc.
Paul Tolley, CEO, Infotonics Technology Center (ITC)
Rick Whitney, President & CEO, M+W Zander
Ray Yingling, Director, Octo US Kodak External Alliances, Eastman Kodak Company
Rick Zimmerman, Director of Business Development, ACDS

TECHNOLOGY TRANSER

Chester Bisbee, Vide President for Research, SUNY Stony Brook
William Bond, Director of Intellectual Preoperty Management Office, Rochester Institute of Technology
Jack Chen, Chief Information Officer, Adelphi University
Kathleen Denis, Associate Vice President Technology Transfer, Rockefeller University

Robert Genco, Director, Technology Transfer, UB Center For Advanced Biomedical And Bioengineering Technology
Abram Goldfinger, Industrial Liaison/Technology Transfer, NYU
Steven Goodman, Vice President for Research, Dean, College of Graduate Studies, Upstate Medical
Clover Hall, Vice President, Academic Planning & Institutional Research, St. John's University
Orin Herskowitz, Executive Director, Technology Transfer, Columbia University Center for Advanced Information Management
Terry Kane, Director of Government Relations, SUNY Binghamton
Ronald, Kudla, Rensselaer Polytechnic Institute, kudlar@rpi.edu, AC Technology Transfer
Marnie LaVigne, Director of Business Development,University of Buffalo Center of Excellence in Bioinformatics and Life Sciences
Patrick Looney, Associate Lab Director, Brookhaven National Laboratory
Carmen Manella, Associate Director, Research & Technology, Wadsworth Center
Andrew Maslow, Director, Office of Industrial Affairs, Memorial Sloan-Kettering Cancer Center
Patrick McGrath, Executive Director, Office of Technology and Business Development Mount Sinai School of Medicine
Dale Morse, Assistant Commissioner, Office of Science, New York Department of Health – Wadsworth Laboratory
Jeong Oh, Associate Director of the Office of Technology Transfer and Industrial Development, Syracuse University Center of Excellence in Environmental and Energy Systems
Alan Paau, Vice Provost, Technology Transfer, Cornell
Peter Pritchard, Licensing Associate, RPI
Theresa Walker, Assistant Vice President for Research and Director, Technology Development, SUNY Albany

VENTURE CAPITAL

Judith Albers, COO, Excell Partners
Thatcher Bell, Principal, DFJ Gotham
John Cococcia, Partner, FA Technology Ventures
Bob Greene, Partners, Contour Venture Partners
Reid Hutchins, VP, Advantage Capital Partners
Peter Joseph, Partner, Palladium Equity Partners LLC
Theresa Mazzullo, CEO, Excell Partners
Bela Musits, Managing Director, High Peaks Venture Partners
Divjot Narang, SBTIF @ NYSTAR
Geoff Smith, Managing Partner, Ascent Biomedical Ventures
Neil Suslak, Managing Director, Braemar
Misti Ushio, VP & Associate, Harris & Harris Group Inc.
Josh Wolfe, Co-Founder & Managing Partner, Lux Capital
Philip Proujansky, Managing Partner, Cayuga Venture Fund
Kathryn Wylde, President & CEO, NYC Partnership

Public Hearings:
The Task Force held two public hearings, in Rochester and New York City.

September 15, 2009 University of Rochester

Santokh Badesha – Fellow, Xerox
Anthony Collins – President, Clarkson University
Ted Hagelin – Director, Syracuse University Technology Commercialization Research Center
Marsha Henderson – Vice President, SUNY Buffalo
Rich Honen – Partner, Phillips Lytle LLP [on behalf of UNYTECH]
Patrick Hooker – Commissioner, NYS Department of Agriculture & Markets
Anne Kress – President, Monroe Community College
William Magnarelli – New York State Assemblyman (Syracuse)
Theresa Mazzullo – President, Excell Partners
Tim Murray – Director, Society for the Humanities at Cornell University
Peter Robinson – Vice President and Chief Operating Officer for the University of Rochester Medical Center
Laura Schweitzer – President, Union Graduate College
James Senall – President, High Tech Rochester
Robert Simpson – President and CEO, Metropolitan Development Association
Marc Smith – Assistant Director, Cornell New York State Agricultural Experiment Station

October 9, 2009 City University of New York

Sarah Boggess – Vice President for Institutional Advancement, Hudson Valley Community College
Brian Cohen – New York Angels
Jonathan Bowles – Director, Center for an Urban Future
Al DiRienzo – President & CEO, Blue Highway LLC
Patrick Govang – CEO, e2e Materials
David Hochman – Executive Director, Business Incubator Association of New York State, Inc.
Jason Kramer – Executive Director, New York State Higher Education Initiative
Yacov Shamash – Vice President for Economic Development and Dean of the College of Engineering and Applied Sciences, Stony Brook University
Gillian Small – Vice Chancellor for Research, City University of New York
Don Smith – Professor and Dean Emeritus, College of Veterinary Medicine, Cornell University
Geoffrey Smith – Ascent Biomedical Ventures
Phillip Smith – United University Professions
Gerald Sonnenfeld – Vice President for Research, SUNY Binghamton
Nathan Tinker – Executive Director, NYBA
Cynthia Ward – Dean, Metropolitan Center, Empire State College
Jo Wiederhorn – President & CEO, Associated Medical Schools
Kathryn Wylde -- President & CEO, NYC Partnerships
Nan-Loh Yang -- Director, the NYSTAR designated Center for Engineered Polymeric Materials

White Papers:
The Task Force solicited white papers from interested stakeholders around the State.

Jaison Abel -- Microeconomic and Regional Studies; Research and Statistics Group, Federal Reserve Bank of New York
Nada Marie Anid -- Dean, School of Engineering and Computing Sciences, NYIT, New York Institute of Technology
Margaret Ashida -- Project Director, Empire State STEM Education Initiative
Santokh Badesha -- Xerox Fellow
Sarah Boggess -- Vice President for Institutional Advancement, Hudson Valley Community College
Edward Bogucz -- Executive Director, Syracuse Center of Excellence in Environmental and Energy Systems
Jean Bonhotal -- Cornell Waste Management Institute, Cornell University, Characterizing and Facilitating Exchange of Organic Residuals for use in Digesters, to Manage Farm Nutrient Balances, Energy Production and Use as Livestock Bedding
Mathew Clark -- Director of Corporate, Foundation & Government Relations, Cazenovia College, Cazenovia College White Paper
Anthony Collins -- President, Clarkson University
Melissa Connolly -- Vice President of University Relations, Hofstra University, Hofstra University Submission
Christopher Dahl -- President, SUNY Genesseo, Genesseo
Michael Deering -- Vice President for Environmental Affairs, LI Power, Long Island Power Authority
Helene Dillard -- Director, Cornell Cooperative Extension
Barbara Drago -- Assistant Vice Chancellor, SUNY
Bruce Ganem -- Professor of Chemistry & Chemical Biology, Cornell University; and Tony Eisenhut, KensaGroup,
Robert Genco -- Chairman, UNYTECH, Universities of Upstate New York Venture Forum
Ted Hagelin -- Director of NYS Science and Technology Law Center, Syracuse University College of Law, New York State Technology Commercialization Clinic Network
Susan Henry -- Dean, Cornell College of Agriculture & Life Sciences
Vanessa Herman -- Assistant Director of Governmental Relations, SUNY Stony Brook
David Hochman -- Executive Director, Business Incubator Association of New York
Rod Howe, Executive Director, Community and Rural Development Institute (CARDI), Cornell University
Steven E. Isaacs -- Executive Director, Cornell Agriculture & Food Technology Park
Allison Jack -- Graduate Student, Department of Plant Pathology and Plant Microbe Biology, College of Agriculture & Life Sciences, Cornell University, Matching Funds
Allen Knowles -- Director, Franciscan Health Care Profession Programs, St. Bonaventure University
Thomas Kowalik -- Director, Continuing Education and Outreach, University of Binghamton, SUNY Business and Education Cooperative of the Southern Tier
Jason Kramer -- Executive Director, New York State Higher Education Initiative
Ann Kress -- President, Monroe Community College

Marnie Lavigne -- Director of Business Development, SUNY Buffalo Center for Advance Biomedical and Bioengineering Technology
Lesley Massiah -- Assistant Vice President for Government Relations & Sate Affairs, Fordham University, Creating Scholars and Opportunity in New York State
Theresa Mazzullo -- CEO, Excell Partners, Inc.
Michael McDonough -- Architect
Patrick McGrath -- Executive Director, Office of Technology and Business Development, Mount Sinai School of Medicine
Angela McNerney -- Director, PhD Move, Elsevier Foundation; Director, RAMP-Up!, NSF Advance Program, RPI, PhD Move - Pilot Program
Tim Murray -- Director, Society for the Humanities, Industry-Higher Education Partnerships in the Cultural Economy
Office of Government Relations -- NYU-Poly
Mark O'Rourke -- Manager, State Government Affairs, Takea Pharmaceuticals North America, Inc. and Founding Member, NY Roundtable on Innovation,
Peter Robinson -- Vice President and Chief Operating Officer, University of Rochester Medical Center, University of Rochester Medical Center
Beth Rougeux -- Associate Vice President, Government and Community Relations, Syracuse University, Syracuse University
Nancy Rurkowski -- Senior Director and General Manger; John Tabor , Vice President of External Manufacturing Biologics; and David Whitehead, Associate Director of Government Affairs, Bristol-Myers Squibb
Joe Scaduto -- Assistant Director of Business Development, New York State Center for Biotechnology at SUNY Stony Brook
Todd Schmit -- Assistant Professor, Department of Applied Economics and Management; Program Leader, Cornell Program on Agribusiness and Economic Development, Cornell University,
James Senall -- President, Higher Tech Rochester, Inc., A Model for Regional Technology Commercialization and New Venture Development in New York State
Charles Shafran -- Cornell Alumnus
Robert Simpson -- President & CEO, Metropolitan Development Association, Metropolitan Development Association
Gillian Small -- Vice Chancellor for Research, CUNY, City University of New York (CUNY)
Marc Smith -- Assistant Director, NYSAES, Cornell University, A Unique Economic Driver for Upstate New York
Gerald Sonnenfeld, Ph.D. -- Vice President for Research, Binghamton University
Deborah Stendardi -- Vice President for Government and Community Relations, Rochester Institute of Technology
Donald Smith -- DVM, Professor of Surgery and Dean Emeritus, College of Veterinary Medicine, Cornell University
Phillip Smith -- President, United University Professions
Joe Thomas -- Dean, Cornell Johnson Graduate School of Management
Nathan Tinker -- Executive Director, New York Biotechnology Association
Vincent Tomaselli -- Deputy Director, Center for Advanced Information Management, Columbia University, Columbia University
Paul Tonko -- Member of United States Congress

Andrew Turner -- Cornell Cooperative Extension, Executive Directors of the Cornell Cooperative Extension Association of the greater Albany Region
Garrick Utley -- President and Thomas Moebus -- Vice President, SUNY Levin Institute, SUNY Levin Institute White Paper
Randall VanWagoner -- President, Mohawk Community College
Cynthia Ward -- Dean, Empire State College
Jo Wiederhorn -- Chief Executive Officer, Associated Medical Schools of New York (AMSNY)
Kathryn Wylde -- President & CEO, Partnership for New York City
Professor Nan-Loh Yang -- Director, NYSTAR Designated Center for Engineered Polymeric Materials
Nancy Zimpher -- Chancellor, State University of New York

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