

# innovate RI

Innovation and Economic  
Prosperity in Rhode Island



2006 RECOMMENDATIONS

# Innovation and Economic Prosperity: Charting a Course for Rhode Island's Future

From strengthening our economy and improving our schools to providing high quality healthcare at a cost families can afford, Rhode Island will face tremendous challenges in the years to come. These serious issues will not be solved with old ways of thinking. To make Rhode Island a more prosperous place – a place where citizens have access to better, higher-wage jobs and a decent standard of living – Rhode Island's leadership must make innovation a central part of the state's vision for the future.

Today, the word *innovation* is used to describe everything from medical advances to new snack foods. So what is innovation and why is it so important to Rhode Island's economic prosperity?

Innovation happens when a new idea, process or technique is applied to deliver benefits to a person, organization or community. In this sense, innovation transcends the introduction of new technology and surpasses the advances we gain by “building better mousetraps.” An innovation transforms how we run businesses, how we interact with our world, and how we govern our communities. *Innovation changes lives.*

Innovation is *not* a synonym for invention. Although invention plays a critical role in the pipeline of ideas and activities that lead to new products and services, the creation of new devices or new technologies doesn't always result in real benefits. It's not an innovation until *value is delivered*, whether this applies to a customer, citizen, student, patient or other stakeholder.

Nor is invention the only source of innovation. Opportunities to create new value and deliver new benefits can arise when existing technologies and ideas are applied in new or unexpected ways. This is particularly true today, when our ability to create new technology exceeds our ability to fully apply it.

For example, stores sell hundreds of devices that allow people to talk to each other from opposite ends of the earth. Yet most doctors still cannot remotely monitor a patient's vital signs in real time. Similarly, imagine a world where firefighters can view a building's architectural plan on a handheld device as they search for injured or trapped occupants. Now imagine if a firefighter could use global positioning to track the movements of other emergency responders in the building within an accuracy of a few feet. The technology to enable these opportunities exists, but models for bringing them to life – technical, operational and otherwise – often elude us.

Like their counterparts across the country, Rhode Island's leaders must endorse a long-term strategy for success while meeting the daily needs of its people. Given the myriad challenges we face *today*, it is easy to lose track of where Rhode Island wants to be *tomorrow*. Yet maintaining a strong vision for the future – one built on a culture of innovation – is vital to preserving what makes Rhode Island a great place to live and work.

In this spirit, we believe that creating a more prosperous Rhode Island depends on our ability to make investments with both short and long-term potential, a strategy that will enable us to harvest immediate benefits while sowing the seeds for future growth.

### The Rhode Island Science Technology Advisory Council

(STAC), a coalition of business, academic, and government leaders, believes that this vision for the future rests on our ability to make innovation a cornerstone of the state's leadership agenda. By supporting the state's research institutions, promoting entrepreneurial development, and enabling all organizations to become more innovative, Rhode Island's leaders can play a pivotal role in creating an *innovation economy*, one that produces better jobs, better services, and better solutions to the problems facing our communities.

Created in April 2005, STAC seeks to assist Rhode Island's leadership in creating a long-term strategic vision for how the state can apply science and technology resources to strengthen the state's economy and improve quality of life in Rhode Island.

For its first initiative, STAC partnered with the Council on Competitiveness, a national organization that tracks the innovation capacity and global competitiveness of the U.S. economy. Under STAC's leadership, the Council on Competitiveness conducted a state-wide assessment of Rhode Island's ability to grow an innovation economy. Through the assessment, called **innovate RI**, the Council on Competitiveness used a combination of research and outreach to benchmark Rhode Island's

performance against approximately 50 regional and national innovation indicators. The assessment included quantitative data evaluations, interviews, and a survey of approximately 100 senior-level business, community, and government leaders.

Results from the **innovate RI** assessment enabled STAC to conduct a substantive evaluation of Rhode Island's current innovation landscape and create a clearer picture of the state's performance in areas such as talent recruitment, research activity, and new company creation.

Based on these results, STAC developed an initial set of recommendations, presented here, for increasing the state's ability to:

- Conduct and commercialize outstanding science and technology research;
- Help Rhode Island entrepreneurs create and grow new businesses;
- Promote public/private partnership; and
- Position Rhode Island as a unique place for *Innovation @ Scale* – a place where innovators from across the country come to develop and test new ideas.

These recommendations do not address every issue and factor affecting Rhode Island's ability to prosper in the 21<sup>st</sup> century.

Instead, these recommendations are the initial building blocks of a long-term effort to strengthen the state's science and technology infrastructure and reposition its economy. Together with Rhode Island's leaders, STAC intends to build upon these recommendations each year and continue its efforts to create an innovation economy that benefits the people of Rhode Island.

“An innovation transforms how we run businesses, interact with our world, and govern our communities. Innovation changes lives.”

<sup>1</sup> Results from the **innovate RI** innovation capacity assessment were presented at the Science and Technology Advisory Council's October 20, 2005 meeting.

# Building an Innovation Economy: Today's Challenges, Tomorrow's Rewards

For most of its history, America has led the world in defining the frontiers of innovation, excelling in the sciences, and pioneering the commercialization of new technologies. During the 19<sup>th</sup> and 20<sup>th</sup> centuries, America's unparalleled investment in industry, education and research enabled the U.S. to attract and retain the world's best science and technology talent and support a rich culture of entrepreneurship. Perhaps even more important to national prosperity was America's success at transforming new ideas into a steady stream of products and services that had a significant impact on everyday life.

This has changed however, and America risks losing its innovation edge.

Although the U.S. still boasts some of the world's most impressive innovation resources, our global neighbors are catching up fast, and in some cases, already beginning to out-invest and out-perform the U.S. To create better and higher wage jobs, solve serious social issues, and raise the standard of living for all, we must recommit to making innovation central to the national leadership agenda. And what is true for the nation is true for Rhode Island: Our economic prosperity depends upon our ability to innovate and turn new ideas into better solutions for the problems we face.

Although Rhode Island has many qualities that make it a great place to live and work, the Council on Competitiveness reported that the state must improve in several key areas to be economically competitive in the 21<sup>st</sup> century.

Productivity, a measure of innovation that weighs labor and financial investment against the return gained on that investment, is lower for Rhode Island than for its regional and national peers. At \$40,425 the state's gross state product per capita lags behind both the New England and national averages (\$48,237 and \$40,778, respectively). *[See Figure 1]*

The impact of this productivity gap is reflected in the state's median household income, *[See Figure 2]* which at \$46,199 is slightly above the U.S. average (\$44,473) but significantly below neighboring Connecticut (\$55,970) and Massachusetts (\$52,345). At 11.3%, Rhode Island's poverty rate is below the national average, but it is the second highest in New England and well above Connecticut and Massachusetts.

Similarly, the state's educational performance shows room for improvement. Despite above average funding levels, fewer Rhode Islanders graduate from high school than both the Northeast and national averages. The number of Rhode Island college graduates, although roughly on par with the national average, is below average for the Northeast. *[See Figure 3]*

Rhode Island also trails the rest of New England in the percentage of workers employed in business and finance, computers and mathematics, and the life and physical sciences, industries typically regarded as important drivers of a knowledge-based economy. Creating new growth in these areas is critical for Rhode Island given that the state's economy has traditionally relied upon manufacturing and other industrial-based activities. From a workforce development perspective, Rhode Island trails both New England and the nation in the percentage of workers in management, architecture and engineering occupations, reinforcing concerns that the state needs to increase efforts to recruit management level talent in high growth industries.

Lastly, a large number of educated young workers, the mainstay of the emerging knowledge economy, are leaving Rhode Island for other parts of the country. Rhode Island is ranked 46 out of 50 in the net migration rate of this population.

We believe that the first step towards addressing these statistics is establishing a clear goal to make innovation a top legislative priority for Rhode Island's leadership. It is only by strategically investing in the state's innovation infrastructure that Rhode Island can offer its residents access to the industries, occupations and benefits that will define the 21<sup>st</sup> century global economy.

# Innovation in Rhode Island: Strengths, Weaknesses, and Opportunities

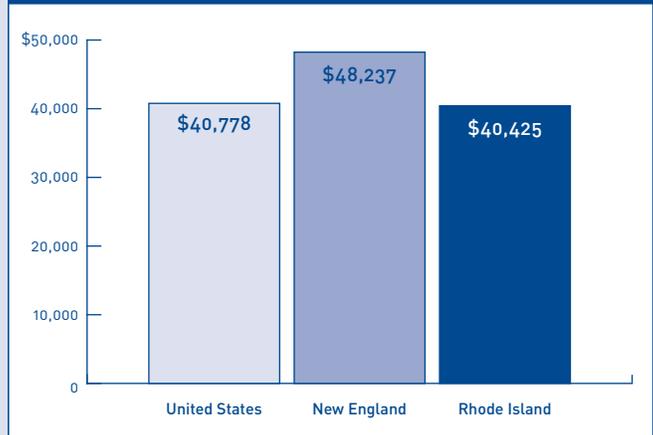
When it comes to the basic building blocks for creating an innovation economy, Rhode Island has much to be thankful for. As part of the greater New England region, Rhode Island is located within a resource and knowledge rich corridor that stretches from New Hampshire to New York. With 86 colleges and universities located within a 50-mile radius, Rhode Island enjoys the highest concentration of higher education institutions in the United States. New England also is home to a diverse network of large and small businesses, as well as a diverse and well-educated labor force.

With institutions like Brown University, the University of Rhode Island, the Rhode Island School of Design, Lifespan, Care New England, and the Naval Undersea Warfare Center located within its borders, Rhode Island has a strong base to support research-driven activities in fields widely recognized to be new pillars for strong economic growth. In particular, Rhode Island has nationally recognized strength in areas such as health and life sciences, the defense and national security industry, marine and environmental technology, information technology, material sciences, and the design disciplines.

Beyond top notch academic institutions, a rich history of entrepreneurship, and ready access to a variety of economic and advanced technology resources, Rhode Island has another important asset in building an innovation economy: Unlike any other state in the nation, Rhode Island is a unique place for *Innovation @ Scale*.

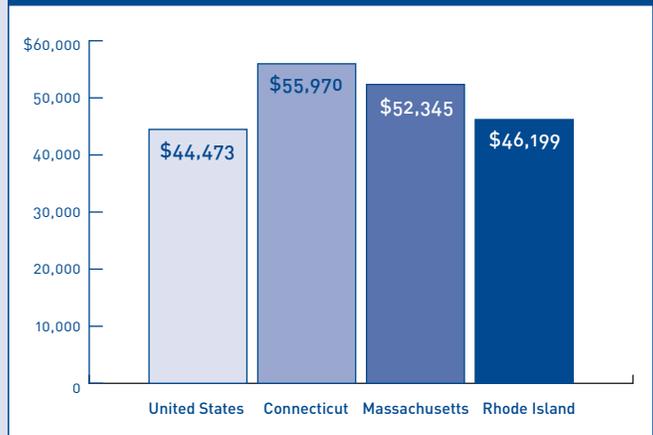
Given the state's location, size, and accessible public and private sector networks, Rhode Island is uniquely positioned to serve as an innovation laboratory for organizations wanting to explore and test new ways of doing business. In Rhode Island, innovators can reach a diverse population of one million people in an area of just over 1,000 square miles. More importantly, innovators can leverage easy access to the state's business and political leaders and more quickly mobilize key stakeholders around an issue or activity. This unique

Figure 1: Gross state product per capita, 2004



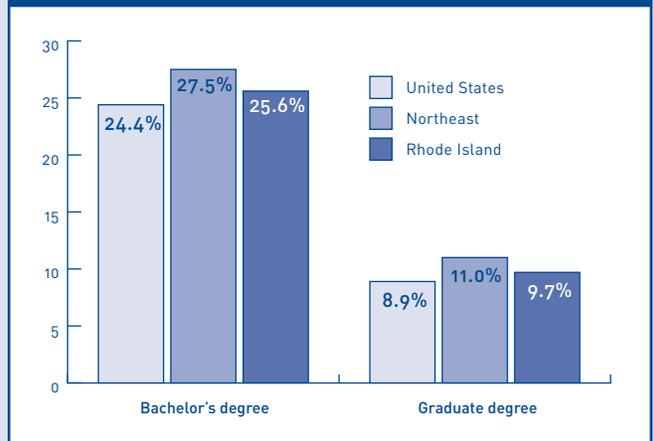
Source: Council on Competitiveness. Rhode Island Innovation Assessment data. Based on data from the U.S. Bureau of Economic Analysis and the U.S. Census Bureau.

Figure 2: Median Household Income, 2002–2004



Source: Council on Competitiveness. Rhode Island Innovation Assessment data. Based on data from the U.S. Census Bureau.

Figure 3: Educational Attainment, 2000



Source: Council on Competitiveness. Rhode Island Innovation Assessment data. Based on data from the U.S. Census Bureau.

environment offers innovators the optimal conditions to cost efficiently test new ideas in a more manageable and less risky environment, enabling Rhode Island to meet a need that is well documented by today's leading innovation thinkers and business management experts.

Most importantly, new models tested and refined in Rhode Island are much better positioned to scale nationally and globally, yield greater results, and produce deeper rewards.

We believe that Rhode Island must build on these existing innovation resources, better utilize its unique ability to enable *Innovation @ Scale*, and take immediate action to increase innovation in both the public and private sectors.

Although the Council on Competitiveness' **innovate RI** assessment evaluated a broad set of innovation indicators, STAC's first set of recommendations is focused on three keystone areas considered critical to creating a strong innovation economy: research and development activity, entrepreneurship, and the state's ability to foster public/private partnerships.

## Research and Development

Why is research and development important to building an innovation economy in Rhode Island?

Research and development is vital in creating the new knowledge, technologies, processes and products that enhance our lives. From the study of disease and human behavior to investigations into history and the physical forces that control the universe, research helps us understand the world and alter how we interact with our environment. In economic terms, the outputs of research and development can lead to the commercialization of new ideas and encourage the creation of new and often better jobs.

Important research is conducted at virtually all of Rhode Island's higher education institutions. Major contributors to Rhode Island's academic research endeavor are Brown University, the University of Rhode Island, and both the Lifespan and the Care New England hospital systems, all of which devote significant attention to research and produce results with national impact.

For example, Brown University's strength in multidisciplinary research is opening new possibilities in the areas of arts and humanities, brain science, cognitive and linguistic sciences, computational molecular biology, computer science, genomics, materials, and the social sciences. Today, Brown's capacity for research is growing and a new spirit of momentum exists. For example:

- With research expenditures totaling \$144.6 million in fiscal year 2005, Brown has increased its spending on research by 72 percent since 2000.
- More than 50 new faculty positions have been established and filled in the last two years, part of a faculty expansion that will total more than 100 new positions.
- Brown's new Laboratories for Molecular Medicine contains 105,000 square feet of life sciences research space.
- The new Life Sciences Building, scheduled to open in 2006, will add another 168,000 square feet of research space, expanding Brown's total life sciences lab space by 75 percent.
- In 2006, Brown expects to begin construction of Sidney E. Frank Hall, a new 60,000 square-foot academic building that will house the University's programs in cognitive and linguistic sciences and the Brain Science Program administrative offices.
- Brown has the state's only medical school, with 350 students in 2005. More than 33 percent of the state's 4,508 licensed physicians hold faculty appointments at Brown.
- New multidisciplinary efforts in genetics and proteomics, digital creative media, public humanities, spatial structures in social sciences, and other areas are creating new opportunities across all disciplines.

Similarly, the University of Rhode Island has a strong tradition of research in areas that affect people in their daily lives, including activity in the marine, environmental, life, and social sciences. For example:

- Since its founding in 1978, URI's Cancer Prevention Research Center has attracted more than \$60 million in federal funding for preventing disease and promoting health through changes in behavior in areas such as alcohol and drug abuse, diabetes, and hypertension.

- URI's Graduate School of Oceanography (GSO) is one of the largest and most widely known graduate schools of oceanography in the United States. It is the cornerstone of an array of marine programs at the university.
- The new Center for Biotechnology and Life Sciences building, funded by a \$50 million bond initiative supported by Rhode Island voters and scheduled for completion in 2008, is the largest academic building project in URI's history and will form the anchor project for a new Life and Health Sciences quad on the Kingston Campus.
- URI's federally funded Sea Grant program conducts research on a wide range of issues that are critically important to Rhode Island's ocean-dependent economy.

Rhode Island's research platform also benefits from the activities of its expansive hospital and healthcare system. In particular, the Lifespan hospitals (Rhode Island Hospital/Hasbro Children's Hospital, The Miriam Hospital, Emma Pendleton Bradley Hospital and Newport Hospital) and Care New England hospitals (Butler Hospital, Kent Hospital and Women & Infants Hospital) both conduct world-class basic and clinical research.

In addition, these institutions also make a significant contribution to the state's health care industry, employing more than 40,000 Rhode Islanders. Many of these employees hold undergraduate or advanced degrees in scientific disciplines, boosting Rhode Island's ability to attract and grow a workforce that supports a science and technology-driven economy.

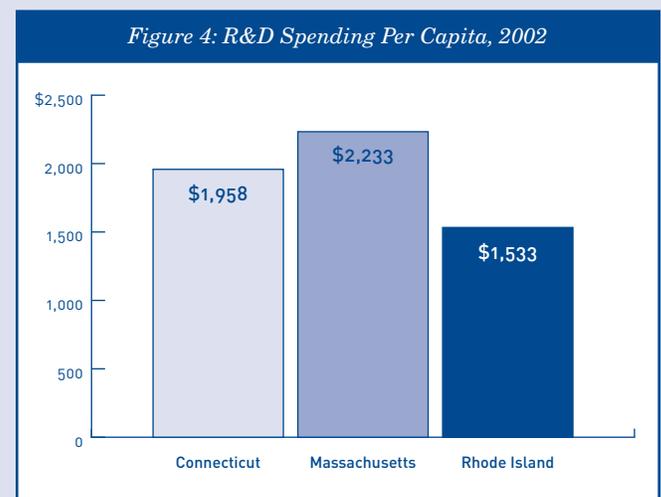
Other contributions include:

- Bradley Hospital, Rhode Island Hospital, and The Miriam Hospital are teaching hospitals affiliated with Brown Medical School. More than half of all clinical clerkships and courses taken by third and fourth-year students at Brown Medical School are provided at Lifespan institutions.
- Through its educational and research activities, Lifespan's Academic Medical Center plays a leading role in developing the "intellectual capital" of the state's health services industry, and in producing the skilled professionals upon whom that industry depends.

- According to the National Science Foundation, Rhode Island Hospital and The Miriam Hospital ranked 20th and 21<sup>st</sup>, respectively, among American hospitals for federal research funding in 2000.
- Care New England's Butler Hospital, which serves as the principal teaching affiliate for psychiatry and human behavior for Brown Medical School, offers nationally recognized expertise in behavioral health and substance abuse.
- Care New England's Women & Infants Hospital, another primary affiliate of Brown Medical School, is recognized as a national leader in obstetrics, gynecology and newborn pediatrics.

Although Rhode Island has many of the building blocks for a research and development-driven innovation economy, the Council on Competitiveness concluded that the state could do significantly more to strengthen its research and development capacity.

For example, Rhode Island fares rather poorly in several important R&D measurements, particularly when compared to regional neighbors. Although per capita R&D spending is nearly twice the national average, Rhode Island ranks well below Massachusetts and Connecticut. [See Figure 4] Rhode Island institutions also invest less in R&D than other American universities. With the exception of Brown, no other Rhode Island school ranks among the top 100 American universities in R&D expenditures (Brown is ranked 98<sup>th</sup>).



*Council on Competitiveness. Rhode Island Innovation Assessment data. Based on data from the National Science Foundation and the Indiana Business Research Center.*

Rhode Island also suffers from an unusually low level of industry investment in academic R&D. Compared to the New England and national averages, a far smaller percentage of academic R&D in the state is industry financed. Although federal funding for academic R&D in Rhode Island has grown by an order of magnitude since the early 1970s – with Rhode Island now leading the region in federal R&D obligations per scientist and engineer – funding from industry, state government and municipalities has essentially remained level for the past thirty years.

Similarly, the state is not realizing its full potential in producing a stronger, more science and technology-oriented workforce. Rhode Island is home to more college and university students per capita than any other state and confers more bachelor's degrees per capita than every state but Vermont. However, the number of higher education degrees conferred in science and engineering is smaller than the national average and is less than every other New England state. Between 1990 and 2000, Rhode Island was the only New England state that experienced a decline in the number of advanced science and engineering degrees awarded at its home institutions. In New England as a whole, the number of advanced science and engineering degrees awarded increased by 11 percent, whereas in Rhode Island, the number of advanced science and engineering degrees decreased by 15 percent.

According to a 2004 report issued by the National Innovation Initiative, the distinctive features of the American educational system – comprehensive public high schools, a high rate of college graduation, and the finest science, technology, math and engineering programs in the world – have contributed to the success of U.S. workers in all phases of the innovation process. To attract high-growth, innovation economy industries to the state, Rhode Island must bolster its efforts to grow a workforce capable of supporting these industries.

## Success Through Collaboration: Rhode Island's Competitive Advantage

Like all states, Rhode Island's ability to invest public money in research is limited. And given its size, Rhode Island cannot expect to out-invest its larger neighbors. This reality makes it critical for Rhode Island to be strategic about how it expands its statewide research capacity and deploys funds earmarked for research-oriented activities.

The **innovate RI** assessment found that Rhode Island, bolstered by its ability to enable *Innovation @ Scale*, is especially well positioned to capitalize on research endeavors that benefit from public/private partnership and cross-organizational collaboration. Given Rhode Island's size and densely connected networks, the state has a distinct advantage in clearing the hurdles that make building these partnerships very difficult.

Based on the Council of Competitiveness' findings, STAC believes the best investments Rhode Island can make involve efforts that build on current momentum, take advantage of existing assets, and create stronger connections across the state's public and private institutions.

For example, three research programs in the health and life science arena – the Center for Biomedical Research Excellence program, the IDeA Network of Biomedical Research Excellence, and the Rhode Island Experimental Program to Stimulate Competitive Research – are creating new and productive connectivity among the state's health and life sciences research institutions<sup>2</sup>.

While there are many other health and life science research efforts happening across the state, these three programs represent more than \$80 million in focused investment. We believe that using future state investments to enhance these programs will build on Rhode Island's current strengths and create a "critical mass" of resources to measurably enhance Rhode Island's innovation capacity in the health and life sciences sector.

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### <sup>2</sup> Center for Biomedical Research Excellence (COBRE)

Over the past five years, Rhode Island research institutions have qualified for five COBRE grants that have resulted in more than \$50 million of federal investment in Rhode Island's healthcare and life sciences innovation capacity. COBRE programs support multidisciplinary research efforts by establishing the core facilities needed to carry out multidisciplinary and collaborative programs. Since 2000, Rhode Island institutions – including Brown University, Rhode Island Hospital, Women & Infants Hospital, and Roger Williams Medical – have received nearly \$53 million as a result of COBRE grants.

### IDeA Network of Biomedical Research Excellence (INBRE)

The University of Rhode Island's College of Pharmacy has received two NIH grants totaling \$24.5 million to provide funding for life science research capacity building across Rhode Island. This statewide effort created the IDeA Network of Biomedical Research Excellence, a collaboration that includes URI, Brown, Rhode Island College, Providence College, Roger Williams University, and Salve Regina University. INBRE aims to build upon Rhode Island's current biomedical research capacity by increasing the number of Rhode Island-based investigators who can successfully compete for NIH funding.

## Rhode Island Awarded \$6.75 Million to Seed Collaborative Research

Rhode Island's efforts to stimulate important new collaborative research received a boost in January 2006, when the National Science Foundation (NSF) awarded the state a \$6.75 million grant earmarked to support cutting-edge competitive research in the life sciences and enable the integration of research, education, and innovation across the state's academic institutions.

The award was made through the NSF's Experimental Program to Stimulate Competitive Research (EPSCoR) office. EPSCoR, established to help states strengthen their academic science and technology infrastructure, seeks to build a foundation for economic growth based on a state's existing science and technology resources.

Led by URI and Brown, the Rhode Island EPSCoR partnership will use these funds to build research expertise and statewide core facilities for genomics, proteomics, and marine life sciences, and establish the Rhode Island EPSCoR Academy, a centralized state program to educate and train life sciences students, researchers, and future entrepreneurs. Specific investments will be made in state-of-the-art equipment for the core facilities, graduate training programs, undergraduate research and training programs, and high potential faculty research.

STAC, which is serving as an advocate for the EPSCoR partnership, will put significant energy into helping the partnership grow and assuring that RI-EPSCoR projects succeed.

Rhode Island has a comparable opportunity to create productive collaborative research programs in the defense and military technology sector, as demonstrated by the state's recent success in creating the Rhode Island Port Security Wireless Communications Network (RIPSWCN).

RIPSWCN, a collaborative project of the Rhode Island Emergency Management Agency (EMA), Rhode Island Economic Development Corporation (RIEDC), Rhode Island Department of Environmental Management (DEM), and Rhode Island Department of Administration (DOA) was created as a demonstration project funded by an \$856,000 grant from the U.S. Department of Homeland Security through its Information Technology and Evaluation Program. A great strength of Rhode

## Naval Undersea Warfare Center (NUWC)

As a research and development hub for the nation's defense industry, Rhode Island supports a diverse network of institutions and companies that perform world-class technology research and development.

Headquartered in Newport, the Naval Undersea Warfare Center (NUWC) is the Navy's full-spectrum research, development, test and evaluation, engineering and fleet support center for submarines, autonomous underwater systems, and offensive and defensive weapons systems associated with undersea warfare. NUWC Division Newport has a research and development budget of approximately \$900 million and employs a workforce of about 2,600.

Leadership areas at NUWC include undersea warfare modeling and analysis, submarine combat and combat control systems, surface ship and submarine sonar systems, submarine electronic warfare, submarine unique on-board communication systems and communication nodes, undersea ranges, submarine electromagnetic, electro-optic and non-acoustic-effects reconnaissance, search and tracking systems, submarine vulnerability and survivability, and torpedoes and torpedo countermeasures.

Island's bid for the grant was the state's unique ability to quickly create and more efficiently manage a system for interagency cooperation.

RIPSWCN will pilot a wireless broadband network to monitor activity in Narragansett Bay. The network will enable first responders and local law enforcement to share text, voice, data, video and other critical security information and to use robotic cameras, wireless networking systems, and a variety of other sensors for vessel identification and tracking. In addition to providing a new way to protect Rhode Island's shoreline, RIPSWCN will demonstrate new port security technologies that have the potential for nationwide application, creating the opportunity for Rhode Island to set the standard by which other port security communication approaches are measured.

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## **RECOMMENDATION 1: Support the Creation of the Rhode Island Collaborative Research Alliance**

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Maximizing the state's full research and development potential will not happen overnight, nor is there a quick fix for developing the infrastructure, talent, and funding streams to support a significantly expanded research and development platform in Rhode Island. Nonetheless, STAC believes that there are actions Rhode Island's leadership can take today to begin strengthening the state's research and development capacity and create a strong foundation for future growth.

*In FY 2006, STAC recommends that Rhode Island invest \$1.5 million as a state match to the \$6.75 million NSF EPSCoR grant recently awarded to strengthen the state's life science research platform. This investment will build on the infusion of federal funds to create an alliance of the state's research institutions. The creation of a collaborative research alliance will enable Rhode Island to consolidate its energies and focus federal and state resources on a common agenda, maximizing the potential of the state's research investment while strengthening Rhode Island's ability to win additional federal research dollars.*

Like those projects initially funded through the EPSCoR program, the alliance will catalyze and support collaborative research activities that fortify the state's research infrastructure and create prosperity for the greater community.

By deepening the connections made through the state's current collaborative projects, including EPSCoR-funded projects and activities of the INBRE and COBRE programs, the alliance aggressively will seek additional federal and private sector funds to support new projects, magnify the impact of the state's investment, and build a stronger state-wide research platform.

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## **Best Practice: Georgia's Research Alliance**

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Rhode Island can learn from efforts other states have taken to strengthen their research and development capacity and make innovation central to economic development efforts. One example is the Georgia Research Alliance.

In 1990, a group of business leaders in Georgia recognized that academic research was critical to creating a strong innovation pipeline. After convincing government leaders that investment in academic research would encourage economic development, the state created the Georgia Research Alliance.

The initial work of the Alliance was focused on bringing talented scientists and engineers to Georgia's research universities, funding research and infrastructure with high potential for commercialization, fostering new company creation, and strengthening academic/industry collaboration.

The Alliance has invested more than \$400 million in the state's research platform and attracted ~50 Eminent Scholars. These scholars have garnered an additional \$2 billion in federal and private research funding, marking a return of five dollars for every dollar invested. Since the early 1990s, universities partnering with the Alliance have increased their industry research collaborations by 800 percent. Venture capital investments in the state grew by an order of magnitude (from \$100 million to \$1 billion) between 1995 and 2000.

The Alliance's efforts have created 5,000 new technology jobs, generated 120 new high-value technology companies and allowed existing businesses in Georgia to expand into new markets. The state now ranks ninth in the nation in the number of biotechnology companies based there and seventh in having the infrastructure to start new companies.

## RECOMMENDATION 2: Strengthening the University of Rhode Island

As an institution of undergraduate education, the University of Rhode Island provides a vital educational service to students both in and outside of Rhode Island. With a fall 2004 enrollment of 14,749, URI accounts for 18% of the students attending colleges and universities in the state, and 37% of enrollment at Rhode Island's public institutions of higher education.

However, undergraduate education is not the only mission of Rhode Island's flagship public university. URI's mission statement acknowledges that it is the "principal public research and graduate institution in the state of Rhode Island with responsibilities for expanding knowledge, for transmitting it, and for fostering its application."

In order for Rhode Island to strengthen its innovation capacity, it must support URI in fulfilling its mission as the "principal public research institution in the state." Although URI has a number of research strengths to build upon, recent data from the National Science Foundation suggest that URI must address several issues to fulfill its critical research mission.

For example, the university's ability to train the next generation of Rhode Island scientists and engineers is being increasingly compromised. Though URI still has the largest number of graduate students in science and engineering in Rhode Island, its share of America's

and Rhode Island's graduate students in these fields is eroding (from 0.29% to 0.23% and 59.1% to 53.5% respectively). Between 1995 and 2002, Rhode Island's science and engineering graduate student population shrank by 6%, with the majority of the losses coming from URI. During the same time period, URI's share of the nation's and the state's post-doctoral scholars in science, engineering and health fields decreased as well (from 0.17% to 0.08% and from 37.7% to 27.1%, respectively).

At the same time, URI's standing as measured by research expenditures is also declining. Though URI experienced increases in research and development expenditures between 1996 and 2003, this growth has not kept pace with the nation or the state. URI's share of both national and state academic R&D expenditures has decreased during that time period (from 0.172% to 0.154% of the nation and from 36.9% to 33.0% of the state) despite dramatic growth in federal research support available from the National Institutes of Health and the NSF during the same time period.

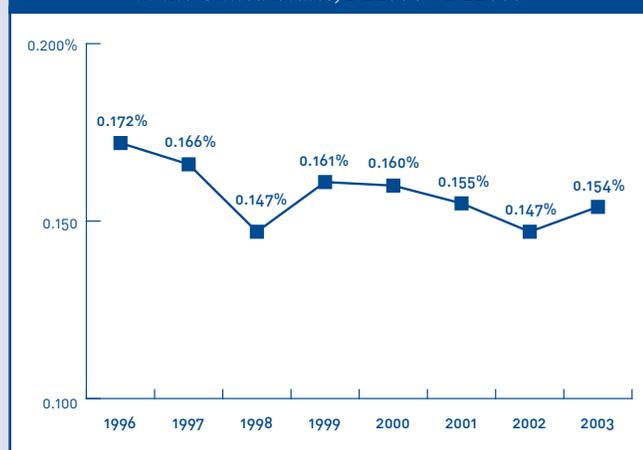
*[See Figure 5]*

The success of URI's research program is very important for the state's research enterprise as a whole. The same may be said of the relationship between the strength of URI and Rhode Island's broader innovation economy. STAC recognizes that no easy answer exists for increasing URI's research capacity and that there are many complex issues and stakeholders involved. However, given the importance of URI to Rhode Island's innovation capacity, STAC aims to assist URI in achieving its full potential as a research-performing institution.

*In FY 2006, STAC recommends that Governor Carcieri appoint a blue-ribbon URI Commission to propose specific actions to strengthen URI's position as a nationally competitive public research university and as a key institution in Rhode Island's effort to strengthen its innovation capacity.*

The commission will examine issues that relate specifically to URI's research mission, with the intent of reporting to the State and URI leadership a set of recommendations to help URI strengthen its position as a nationally competitive public research university.

Figure 5: URI's share of academic R&D expenditures in the United States; FY1996 – FY2003



Based on data from the National Science Foundation.

The commission should be led by an independent, nationally prominent expert in public higher education research, be comprised of both in- and out-of-state expertise, and have all key stakeholder groups directly involved.

## Entrepreneurship and New Company Creation

Entrepreneurship and new company creation are critical components of building an innovation economy. While many new companies do not succeed, those that do add vibrancy to the economy, which can quickly result in high-wage job growth.

Creating a culture that celebrates and supports entrepreneurship brings important benefits to the economy. Beyond creating new jobs and spawning new products and services, entrepreneurs seek and develop ideas and opportunities that larger, more established organizations often cannot or will not exploit.

Entrepreneurs, passionately driven by individual initiative, are typically more flexible and less burdened by bureaucratic process. These qualities make it far easier for entrepreneurs to pursue new and sometimes “far-flung” opportunities. Similarly, entrepreneurs typically are more adept at ushering in the kind of disruptive innovation that drives deep transformation and industry-wide change.

It also is widely accepted that innovations created by entrepreneurs are significant drivers of economic growth. For example, researchers have found a strong relationship between overall market growth and new company creation. As new and different firms enter the market they increase competition. New competition forces the incumbents to improve or lose, improving the market through a process of learning and natural selection.

Entrepreneurship increases productivity both for individual firms and for an economy as a whole. Continuous entry and exit of firms helps to increase productivity by shifting resources from older, less productive firms to newer, more productive ones. There simply is no substitute for building a community that encourages entrepreneurial exploration and inspires the pursuit of new endeavors.

Rhode Island has a long tradition of encouraging entrepreneurs and new company creation. Today, it offers

aspiring entrepreneurs a variety of support services and programs. A few examples from the many programs active in the state include the Brown Enterprise Forum, Entrepreneurship Forum of New England, the Rhode Island Tech Collective, Every Company Counts, the Rhode Island Center for Design and Business, and Rhode Island Small Business Development Center.

## Brown Technology Partnerships

In addition to its research, Brown has formed the Brown Technology Partnerships (BTP) to commercialize intellectual property created by its faculty and students. The BTP program assists in:

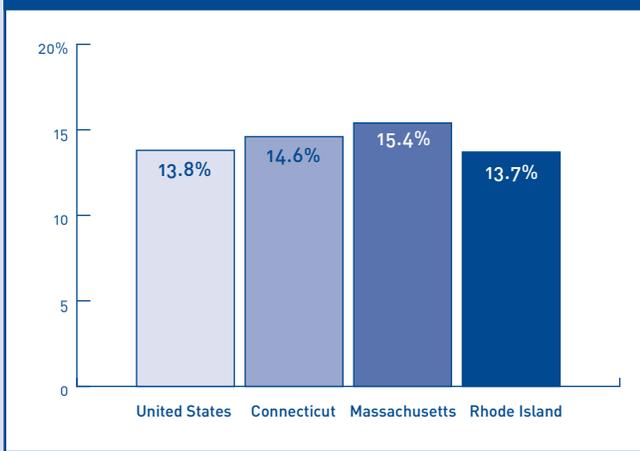
- Negotiating and maintaining licenses for intellectual property with existing companies and/or creating start-up companies;
- Developing industrial relationships and stimulating collaborative research;
- Overseeing the exchange of research materials between Brown and other institutions;
- Providing a focal point for new high-technology ventures involving the academic community and emerging areas of opportunity in evolving research fields; and
- Building partnerships based on the research enterprise to serve the broader community.

Working closely with faculty and students, the BTP team evaluates Invention Disclosures for patentability, assesses their commercial potential, and reviews the strength of the underlying science or technology. On average, fifty percent of the received Disclosures are taken forward and a patent is drafted using BTP’s internal resources or its network of external patent attorneys.

While the patenting process is underway, BTP works with inventors to identify potential commercial partners and manages the associated negotiations from drafting the original term sheet through the completion of a license agreement. In joint efforts with the Office of Sponsored Projects, cooperative research programs are arranged so that companies can increase their R&D effectiveness by drawing upon Brown resources.

Through the Brown Forum for Enterprise, BTP also organizes and manages monthly events to help build and support the Rhode Island enterprise community.

Figure 6: Share of employment in fast growing firms, 2001



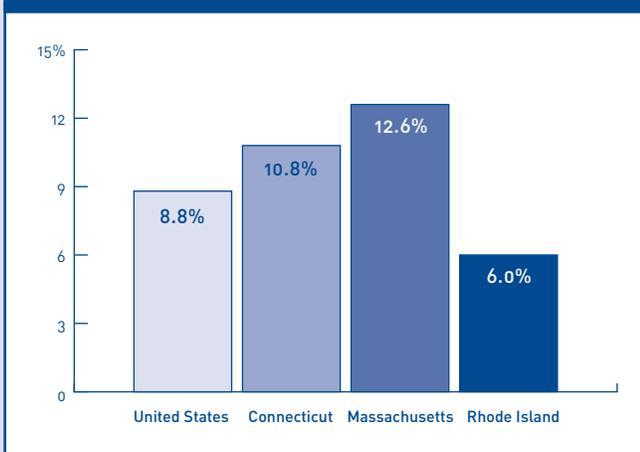
Note: "Fast growing firms" or "gazelle" companies are those that have an annual sales revenue growth rate of 20% or more. Source: Based on data from the Progressive Policy Institute.

It also is important to note the formation of the Cherrystone Angel Group, a new source of angel financing for entrepreneurs in the Rhode Island landscape.

The Slater Technology Fund plays a critical role in supporting new company creation in Rhode Island. As Rhode Island's principal source of seed capital financing for local entrepreneurs, the Slater Fund supports nascent companies and emerging entrepreneurs and assists with the creation of fast growing, innovative technology-based firms.

STAC strongly supports the state's continued investment in the Slater Technology fund. As a key organization in the state providing seed capital and mentorship, the state's continuing investment in entrepreneurship through the Slater Technology Fund is essential for the success of Rhode Island's economy.

Figure 7: Share of employment in high technology firms, 2000



Note: The Bureau of Labor Statistics (BLS) developed a list of high-technology industries based on Standard Industrial Classification (SIC) codes in 1999. The list was based on measures of industry employment in both R&D and technology-oriented occupations, using Occupational Employment Statistics surveys from 1993 to 1995 in which employers were asked to explicitly report the number of workers engaged in R&D activity. Source: Rhode Island Innovation Assessment data. Based on data from the National Science Foundation.

While Rhode Island has many programs to support entrepreneurs, the Council on Competitiveness found that they are not sufficient to stimulate the level of entrepreneurship activity and new company creation needed for a competitive innovation economy.

For example, Rhode Island trails Connecticut, Massachusetts, New Hampshire, Vermont, and the nation as a whole, with respect to the job share of fast growing companies (companies growing at an annual rate of 20% or more) [See Figure 6]. In addition, the share of jobs in high-technology sectors [See Figure 7] in Rhode Island trails neighboring states and the national average.

Figure 8: SBIR dollars awarded per worker, 2002



Council on Competitiveness. Rhode Island Innovation Assessment data. Based on data from the Corporation for Enterprise Development.

Rhode Island businesses also face challenges in obtaining federal funding to conduct research that can be easily commercialized into new products and processes. The Small Business Innovation Research (SBIR) grant program is critical in obtaining this federal funding. Rhode Island lags behind the New England average on the amount of these funds awarded per worker.

[See Figure 8]

Nationally, the average amount of venture capital invested per \$1,000 of gross state product is \$4.06. In New England the average investment is \$9.84, while Rhode Island lags considerably behind at \$1.86.

[See Figure 9]

The **innovate RI** assessment also found that Rhode Island can do more to create a culture of entrepreneurship. Only one quarter of survey respondents agreed that business leaders view entrepreneurs and start-ups as full partners in industry cooperation. Only one-fifth of survey respondents agreed that the state's business culture understands failure as part of the learning and innovation process.

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### RECOMMENDATION 3: Initiate an Incentive to Attract and Retain Serial Entrepreneurs

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There are many ingredients that go into creating an environment that enables new company creation, such as access to the right talent, space and financial resources. Elements of the overall business climate, such as tax structure, have a powerful effect on new company creation and affect how companies fare in the long haul. Rhode Island's leadership must continue to take steps to improve the state's overall business climate, as well as investigate new programming and support services specific to entrepreneurial development.

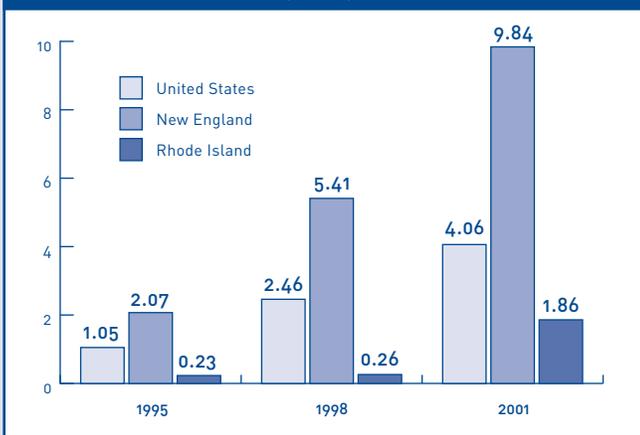
One imperative for entrepreneurship and new company creation is access to a critical mass of "serial entrepreneurs" – motivated entrepreneurs experienced at navigating the turbulent waters of new company creation. First time entrepreneurs are rarely successful and need mentoring from experienced executives with an intimate understanding of how to move a start-up through the stages of early development. Communities that are known for enabling new company creation typically share a critical mass of serial entrepreneurs that move from opportunity to opportunity within the community.

Creating a culture of entrepreneurship and a stronger platform for new company creation is essential to create an innovation economy. STAC believes the place to start is the creation of a targeted tax incentive to attract and retain successful serial entrepreneurs in Rhode Island.

*In FY 2006, STAC recommends that the Governor and General Assembly support the creation of a Science and Technology Entrepreneur Tax Credit targeted as an incentive to attract and retain serial entrepreneurs and Rhode Island investors engaged in approved start-up ventures.*

Rhode Island's leaders recently created a model for catalyzing economic growth in the movie industry, which can be applied to include science- and technology-based ventures (see sidebar on the recently-enacted Motion Picture Tax Credits). Creating a Science and Technology Entrepreneur Tax Credit will provide an immediate tax incentive to attract and retain successful serial entrepreneurs in the state and offer an incentive for Rhode Island investors to financially back their ventures.

Figure 9: Venture capital invested per \$1,000 GSP, 1995, 1998, 2001



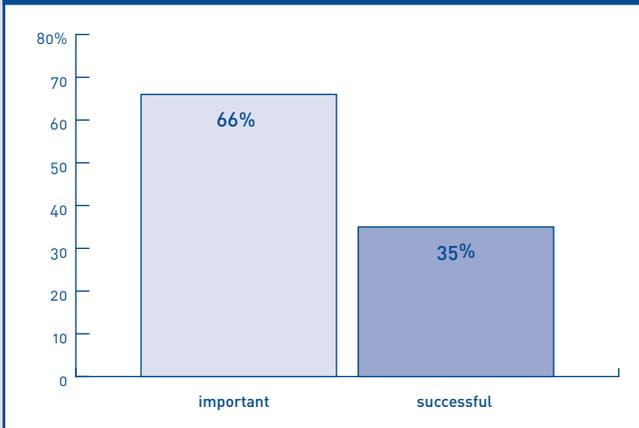
Based on data from the National Science Foundation.

In 2006, STAC will work directly with the Governor and General Assembly leadership to construct legislation that appropriately tailors the Motion Picture Tax Credit for this need. It will be drafted with input from state leaders to set specific credit mechanics and limits, as well as create detailed eligibility requirements and processes.

## Enabling Collaborative Innovation and Public/Private Partnerships

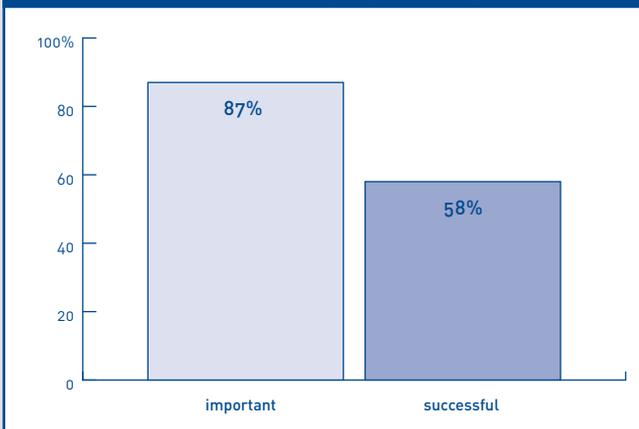
We must create an environment in Rhode Island that makes it easier to move away from disciplinary “stovepipes” in industry, government, education, and research to a multi-disciplinary, cross-organizational approach to problem solving that fosters partnerships across both the public and private sector.

Figure 10: Survey respondents’ views on engaging in collaboration with partners traditionally outside industry, 2005



Council on Competitiveness. Rhode Island Innovation Assessment data based survey returns.

Figure 12: Survey respondents’ views on developing new business models and new ways of delivering value, 2005



Council on Competitiveness. Rhode Island Innovation Assessment data based survey returns.

## Best Practice: Rhode Island’s Motion Picture Tax Credits

Rhode Island has long sought ways to enhance the state’s economic prosperity. In 2005, legislative leaders recognized that Rhode Island’s “natural beauty, the historical and architectural heritage of the state, its majestic natural resources including Narragansett Bay, and the independence and diversity of its citizens and neighborhoods” could provide an excellent setting for motion picture or television production. Leaders also recognized that the motion picture industry could bring an infusion of capital into economically depressed areas of the state and create lasting economic impact.

A film and television tax credit package was developed to attract private investment and encourage investment in multiple state-certified film and television projects. The long-term goals of the initiative included encouraging job growth within the motion picture industry in Rhode Island, increasing cooperation with other states with respect to developing economic development options within the industry, and encouraging new education curricula that provide for a labor force trained in all aspects of film production.

Since the enactment of the Motion Picture Tax Credits in July 2005, investment in motion picture production in Rhode Island has risen dramatically. Three major movie and television productions have been announced in the state since the inception of the tax credit. At the same time, the incentives have helped to infuse more than \$100 million into Rhode Island’s economy through job creation and new local business spending. This straightforward and manageable incentive has made Rhode Island far more attractive for filmmakers and motion picture investors.

A majority of **innovate RI** survey respondents viewed engaging in collaboration with partners traditionally outside of their industries as important for success, but few respondents reported being successful in actually creating these collaborative relationships. Thus, it is no surprise that although an overwhelming majority of survey respondents viewed developing new and collaborative business models as important for their businesses, many fewer were confident that they could in fact do it. [See Figures 10 and 11]

Many **innovate RI** assessment interviewees reported that one major barrier to innovation, beyond financing, is the lack of entrepreneurial skills and the deeply embedded resistance to change found within most organizations. Although a majority of **innovate RI** interviewees believe that Rhode Island should be an easier place in which to collaborate, many expressed concern that there is not a deep culture of collaboration in the state.

These attitudes reflect an important reality: creating effective public-private partnerships is difficult – so difficult in fact that this topic is on the agenda at business schools, leadership forums and global business conferences across the country. Public and private sector organizations have different ways of doing business and teaching them to work together requires organizations to embrace radically new ideas about how businesses and organizations should operate.

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#### **RECOMMENDATION 4: Support the Rhode Island Wireless Innovation Networks Initiative**

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The Rhode Island Wireless Innovation Networks (RI-WINs) project presents a compelling model of this type of collaborative innovation. RI-WINs seeks to create a statewide border-to-border broadband wireless network that breaks down barriers to innovation, enables cross-industry collaboration, and establishes Rhode Island as an ideal place to test new business models. We believe that making Rhode Island the first state in the country with a border-to-border wireless network will significantly increase innovation in Rhode Island, as well as attract other businesses to the state that want to tap into this powerful resource.

Rather than looking exclusively to the state to create a network like this – an approach that has seen only limited success in other parts of the country – RI-WINs is using a unique public-private partnership model to build the network through cross-sector and cross-industry collaboration. Current partners in the RI-WINs project include Atrion Networking Corporation, Brown University, Cox Communications and Cox Business Services, CVS/Pharmacy, the Ocean State Higher Education Economic Development and Administrative Network (OSHEAN), the Rhode Island Department of Administration, the Rhode Island Economic Development Corporation, the Rhode Island Port Security Communications Network, Stratum Broadband, Verizon Communications, and Verizon Wireless.

*STAC recommends that the state invest \$500,000 to support the development and expansion of the RI-WINs project. By becoming a partner in RI-WINs, the state's leadership will make Rhode Island the first state in the nation with a broadband wireless network, a resource critically important to enabling 21st century innovation. In addition, state partnership in RI-WINs will position Rhode Island as a national leader in the creation of public-private partnerships.*

RI-WINs also will allow Rhode Island to explore wireless projects to improve our healthcare, education, government, and public safety services. For example, the RI-WINs pilot will provide wireless broadband connectivity to facilitate the Rhode Island Teacher Education Renewal project, a partnership composed of all approved teacher preparation programs in

Rhode Island. The Rhode Island Department of Administration, through the state's Chief Information Officer, also is partnering in the RI-WINs pilot to test innovative wireless solutions for activities at the Department of Environmental Management and the Department of Health.

## Next Steps

Creating an innovation economy in Rhode Island will require the deliberate and collaborative effort of Rhode Island's government, business, academic and community leadership. It will also take time.

This initial set of recommendations is intended to serve as a first step toward strengthening the state's science and technology infrastructure and repositioning Rhode Island's economy. Together with Rhode Island's leaders, STAC intends to build upon these recommendations each year and continue its efforts to create an innovation economy that benefits the people of Rhode Island.

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## RECOMMENDATION 5: Continue to Support the Rhode Island Science and Technology Council

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Continued support of STAC beyond 2006 will accelerate the state's evolution towards an innovation economy that is not only nationally and globally competitive but also better prepared to meet the present and future needs of its citizens.

STAC intends to continue to serve as a resource for information and education on key science and technology issues for Rhode Island leadership in support of their policy-making efforts.

*STAC recommends that the state invest \$200,000 to support continued council operations in FY07. This investment will enable STAC to implement its initial recommendations and work towards recommendations in FY07 that build upon this year's success.*

We believe that the tools to grow and support a vibrant innovation economy are well within Rhode Island's reach. Furthermore, we believe that Rhode Island, drawing strength from its closely connected and talent-rich communities, is at precisely the right place in its history to confidently overcome the challenges we face in making this new vision for Rhode Island a reality.

STAC urges Rhode Island's leadership to seize this opportunity to help Rhode Island create a new vision for the future – a future in which the state's citizens will reap the benefits of an economy better able to meet the demands of the 21<sup>st</sup> century.

# Who is STAC?

**Co-Chair, Jeffrey R. Seemann**, Dean of the College of the Environment and Life Sciences, University of Rhode Island

**Co-Chair, Andries van Dam**, Vice President for Research, Professor of Computer Science, Brown University

**Joseph Amaral**, President, Rhode Island Hospital

**David Bengston**, V.P. and General Manager, Rhode Island Operations, Amgen

**Paul Choquette Jr.**, Chairman/CEO, Gilbane Construction Company

**David Hibbitt**, Chairman, Hibbitt, Karlsson & Sorensen, Inc, Providence, RI

**Saul Kaplan**, Deputy Director, Rhode Island Economic Development Corporation

**Margaret Leinen**, Assistant Director for Geosciences, National Science Foundation

**Richard Nadolink**, former Chief of Technology, Naval Undersea Warfare Center

**Thomas Rockett**, Governor for Higher Education and Vice Provost, Emeritus, University of Rhode Island

**Thomas Ryan**, Chairman, President, and CEO, CVS, Inc.

**Cheryl W. Snead**, President and CEO, Banneker Industries

**Donald Stanford**, President, Stanford Scientific

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