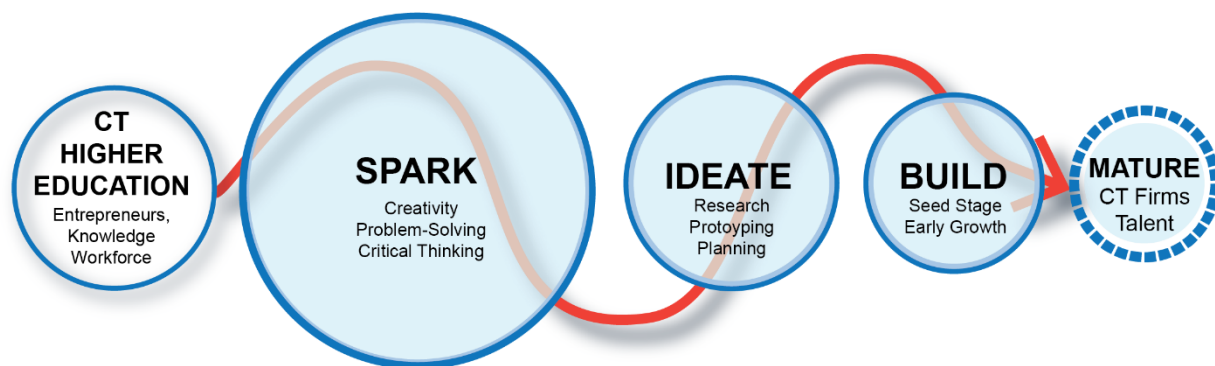# Entrepreneurship & Innovation in Connecticut's Higher Education System

A CATALYTIC ROADMAP FOR HIGHER EDUCATION COLLABORATION

CT HIGHER EDUCATION
Entrepreneurs, Knowledge Workforce

SPARK
Creativity
Problem-Solving
Critical Thinking

IDEATE
Research
Protoyping
Planning

BUILD
Seed Stage
Early Growth

MATURE
CT Firms
Talent

Connecticut Higher Education Innovation & Entrepreneurship Working Group
01 MAY 2017
PREPARED BY THE PENN INSTITUTE FOR URBAN RESEARCH

Entrepreneurship & Innovation in Connecticut's Higher Education System

A Catalytic Roadmap for Higher Education Collaboration

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Imagine

Julia grew up in Connecticut. She wants to stay close to her family but still be able to pursue her dreams. She decides to go to community college, and then transfers to Trinity College. It is 2019 and Julia is double majoring in neuroscience and biology. A professor urges her to take the idea she had in lab and see where it leads.

It is now the fall of 2020, her senior year, and she signs up to attend the Connecticut Catalyst Conference, the annual entrepreneur conference that was recently written up in *Entrepreneur Magazine* as the "next South by Southwest (SxSW) for entrepreneurs and innovators." She is excited! At the conference, she meets a pharmacy student from St. Joseph's and a researcher at UConn who was a semifinalist at Mass Challenge last year with a new startup specializing in neuro-technologies and social behavior: her new team. In the spring, Julia graduates and decides to stay in the Hartford area because it has all the business and industry connections she craves, and her new partners agree—they have located laboratory incubator space nearby that is an easy train ride for their new potential partner, a bio-polymer researcher at Cornell's Roosevelt Tech Campus in New York City. She's also impressed with all the investments the state has put into supporting entrepreneurs; she connects to services and mentors through the Hartford Hub and finds a strong social network and information about events at universities and colleges through CT Start-Up Revolution's website.

It is now 2022: With the progress made on her company's research, she decides it is time to get her master's degree. The 11-college Hartford Consortium has a unique entrepreneur program that she can tailor to address the challenges of the biomedical industry and fit into her busy schedule. Even better, it is free if she commits to three more years in the Hartford area.

It is 2028 and the company has hit it big: They have 300 employees in the Hartford area, a customer base of 500,000 in North America, and an office in Mumbai run by a graduate of University of Bridgeport they met at a CT Revolution event three years ago. Catalyst Conference now attracts 10,000 people from around the world and supports a huge summer festival. Grateful for their start, Julia and her partners are now Conference Platinum partners, and to celebrate its 10th anniversary, they commit $1 million to Manchester Community College, Trinity, UConn and the Hartford Consortium. They are happy to support the next generation of Connecticut entrepreneurs.

Hundreds of stories like this popping up around the state,
due to investments started in 2017.

Executive Summary

"There is no such thing as a new idea. It is impossible. We simply take a lot of old ideas and put them into a sort of mental kaleidoscope. We give them a turn and they make new and curious combinations. We keep on turning and making new combinations indefinitely; but they are the same old pieces of colored glass that have been in use through all the ages."
- Mark Twain, a Biography

Was Mark Twain, Connecticut's quintessential humorist, correct in his observation above? Possibly. But those old pieces of colored glass that he cites are now composite glass capacitors that respond to touch. They cover a palm-sized computer with chips Francis Pratt or Amos Whitney could not have imagined in 1860s when they invented precision manufacturing in Hartford. Nineteenth century Connecticut was home to some of the country's greatest entrepreneurs and innovators. William Hosley, a Connecticut curator and historian, wrote that Hartford was the "Silicon Valley of the 19th Century" in his book "*Colt: The Making of an American Legend*". The state got to that place in part because our colleges and universities responded to the pressures of the industrial revolution by radically transforming their curricula. These institutions helped produce Connecticut's industrialists, bankers, manufacturers, engineers and a workforce equipped with skills to move from farms to factories in places like Willimantic ('Thread City') or Waterbury ('Brass City').

Although historians emphasize the transformative power of labor-saving machines during the 19th century industrial revolution, knowledge and innovation was then, and remains today, the real engine of Connecticut's economy. If Twain wrote *A Connecticut Yankee in King Author's Court* today, he might be tempted to place its protagonist, Hank Morgan, in a Silicon Valley start-up. He would not need to, however, because there are still many "Hank or Henrietta Morgans" in Connecticut from whom he could draw inspiration. There will continue to be many more who will count on the leadership and vision of the state's colleges and universities to support their dreams of becoming software engineers, nanotechnology scientists, or entrepreneurs.

"If we teach today's students as we taught yesterday's, we rob them of tomorrow."
John Dewey, 19th Century Educational Reformist

Without a doubt, Connecticut is at an economic tipping point. Yesterday's manufacturing has largely fled, new industries and services are slowly taking its place – but they are not numerous enough to lift the state's economy and retain its work force. In these early years of the 21st century, Connecticut is faced with significant challenges requiring urgent solutions. Connecticut does have the capacity to begin to reverse this situation, but there are no quick fixes. Positive, substantial, and meaningful economic regrowth must begin by reestablishing and reenergizing the state's culture of innovation and entrepreneurship. Today's most prosperous centers of innovation and entrepreneurship, like Connecticut in the 19th century, rely on the collective power of their institutions of higher education as essential community anchors, a major force of economic vitalization and leadership, and the wellspring of their creative workforce.

Connecticut is fortunate in having 38 institutions of higher education poised to expand opportunities to nurture a new generation of entrepreneurs and innovators. Nearly half of the state's four-year degree-granting institutions currently offer concentrations, minors and/or majors in entrepreneurial studies. Some examples are Quinnipiac University, University of Hartford, University of Bridgeport, and UConn. Nine community colleges, such as Gateway Community College and Norwalk Community College, have either an Entrepreneur certificate or Small Business/Entrepreneurship concentration. The College of Technology (COT) helps students at 12 community colleges with Associates degrees in engineering or technology to transition to bachelor's programs in the state's senior colleges. COT's Next Generation Manufacturing Center, a National Science Foundation Center of Excellence, provides resources for both students and educators.

Research institutions are rapidly expanding their technology transfer and research commercialization infrastructure, developing new proof of concept centers and establishing innovation funds to help faculty and student innovators build their companies in Connecticut. With 80% of the state's R&D focused on biosciences, support for new ventures in the sector include UConn's Technology Incubation Program (TIP) in Farmington, Storrs, and Avery Point, and the CURE Commons, in Groton. Yale, which has twelve institutes in the biosciences, supports extensive bioscience innovation infrastructure, including the Blavatnik Fund for Innovation, with competitively awarded grants bridging the gap between early-stage life science research and biomedical product commercialization. Finally, as Part 2 of this report explains, institutions of higher education have been accelerating and expanding their support of entrepreneurship and innovation among students, faculty and alumni significantly over the past five years.

However, this seeming abundance of resources is not functioning as effectively as it could. Taken together the institutions have all the ingredients required to support a strong culture of innovation, yet they are not *operating* together. In practice, efforts are often fragmented: many institutions operate programs in isolation; others lack the administrative and financial capacity to move their students and faculty ideas to maturity. In this environment, institutions are not adapting effectively to the fast-moving entrepreneurial/innovative climate that characterizes their competitors in California, Massachusetts, and New York.

Public Law 16-3 provides the opportunity to remedy this situation. It can help catalyze the institutions of higher education to develop proactive, collaborative partnerships that will spark innovative ideas, incubate them in supportive environments, and attract investment to transform the fledgling businesses into mature firms supported by a well-educated workforce.   A company established this year by a faculty member, student, or alumnus could be helping to drive the state economy in ten years. There is no better time than NOW for higher education institutions to re-imagine and begin to demonstrate their collective power to catalyze Connecticut's innovation economy.

Our collective power is immense.

Institutions of higher education contribute significantly to the state's economy. According to the Connecticut Conference of Independent Colleges (CCIC), private institutions contribute 171, 000 jobs, more than $21.8 billion in spending, and 200,000 alumni, many of whom are engaged in entrepreneurial efforts. Public institutions are heavy contributors as well: UConn has added $3.4 billion to the state economy; the state universities, including

the community colleges, support nearly 30,000 jobs and enroll more than 90,000 students annually, creating a large alumni base. Higher Education institutions in Connecticut also have a collective advantage – the state's strong innovation workforce. In 2016, the National Science Foundation ranked Connecticut seventh in R&D expenditures and sixth for science and engineering doctorates in the workforce. The state is also sixth on the Milken Institute's State Technology and Science Index (2016). The state has two top ranked R1 Research Universities: Yale University and University of Connecticut (UConn). According to NSF data, UConn's R&D expenditures were $259,397,000 in 2015, a 15% increase from 2006. Yale's R&D spending grew 78% to nearly $803 million during the same period. Nine other institutions (Wesleyan, Fairfield, Southern Connecticut, Connecticut College, Trinity, University of Hartford, Eastern Connecticut, University of Bridgeport and Western Connecticut) add another $26 million in research expenditures, up 22% since 2006. Alumni start new businesses and work at major employers such as Aetna, Electric Boat, Pratt & Whitney, EMCORE, Eversource, Premcor, Priceline Group, Sikorsky Aircraft, United Technologies, Alexion, Pfizer, and Metronics. Despite the challenges of being located between Boston and New York City – both major global innovation ecosystems – the Working Group believes that Connecticut cannot squander these opportunities. It must be more audacious, and most importantly, it must cultivate the collective power of the state's higher educational system to see it become an example of the power of ingenuity to the world.

Creating a catalytic roadmap

This Working Group, composed of the presidents of 35 Connecticut higher education institutions, was established in Public Act 16-3 to create a masterplan to facilitate entrepreneurship and innovation in the state's higher education institutions and identify funding priority for entrepreneurship grants-in-aid, as outlined in Section 28 of the Act. The first meeting of the Working Group was a historic moment: the first remembered meeting of Connecticut's higher education presidents all in one room. The Working Group met four times from late 2016 to April 2017. Those meetings, plus extensive site visits and interviews, formed the foundation of this strategic plan.

The Working Group views this plan as an essential roadmap for understanding and strengthening the role of higher education in Connecticut's E&I ecosystem. The process of developing this roadmap revealed a large variety of initiatives supported by a diverse group of institutions. The Working Group values and believes that every institution has an important contribution: large or small, private or public, 4-yr or 2-yr. Connecticut, when viewed by geography alone, is a small state; when viewed as a collective however, it is a global hub of knowledge and innovation. It is stronger together when it forges new partnerships and collaborations. Only together will Connecticut's potential for innovation and entrepreneurship be fully realized.

To guide this vision of collective impact, the Working Group established four goals with criteria to be used to evaluate applications for the grants-in-aid, along with two broad initiatives that outline recommended funding priorities.

> **Goal 1: Establish Collaboration & Partnerships.** Partnerships provide a powerful mechanism for tapping into existing assets, empowering a shared sense of purpose, and creating a stronger community of students, faculty, researchers, and administration. The Working Group agreed that proposals for grants-in

aid should all include a minimum of two higher education applicants, preferably at least one public and at least one private.

Additionally, proposals may consider partnering with non-higher education organizations involved in local, regional, or state-wide entrepreneurship and innovation; creating regional or state-wide programs or initiatives that support all institutions of higher education or a significant subset with aligned interests; or, expand leadership and peer networks to promote state-wide cooperation and collaboration

Goal 2: Engage the 21st Century Economy. By 2020, 70% of jobs in the state will require post-secondary degrees. The state's economic success depends on the continued growth of companies that need this educated workforce. Applicants for grants-in-aid should consider ways to encourage innovation in growth-oriented industry clusters such as health/bioscience, insurance and financial services, advanced manufacturing, digital media and green technology; or ways to support the continuing vitality of Connecticut's "Main Street" businesses by catalyzing entrepreneurship skills and mindsets at the 'academy' for the benefit of local and regional communities.

Goal 3: Educate an Innovative Workforce. Achieving the dream of opportunity and social mobility in 21st century America requires preparing students to navigate new challenges, and a culture that fosters entrepreneurial and innovative thinking. To help achieve this goal applicants should consider: expanding the E&I community of practice to strengthen knowledge sharing and resources for staff and faculty; increasing E&I educational pathways and integrating it more broadly across institutions; enhancing non-credit learning environments and programs that support budding entrepreneurs; and, expanding local mentor programs that inspire and support the entrepreneurial spirit.

Goal 4: Expand 'Development' Infrastructure. Historically, U.S. research universities played a major role in stimulating innovation through basic research. Applied research development at universities has grown steadily since 1980 and tech transfer is now a major pathway for developing new companies and partnerships that result from university R&D. These efforts support the local economy and entice students and researchers to live locally. Applications focused on this goal should consider: creating state-wide faculty/staff resources to encourage knowledge sharing; promoting academic cultures of entrepreneurship; or, expanding access to commercialization infrastructure for all academic researchers, including proof of concept support and technology transfer services.

In pursuit of these goals, the Working Group outlined two broad initiatives, each with suggested funding priorities to be supported by the five-year, $10 million grants-in-aid program adopted in Public Act 16-3.

Initiative 1. Communication and Building Relationships. This initiative grew out of the collective recognition of two current issues that need remedying: 1) institutions tend work in relative isolation from each other, and 2) Connecticut's geography and largely suburban structure makes networks difficult to develop and sustain. Recommended funding priorities to improve these issues are: face-to-face convenings; peer knowledge sharing, and a state-wide portal for knowledge sharing.

Initiative 2. Building Capacity Through Collaboration. The second initiative evolved through consultations with the institutions of higher education about their work in entrepreneurship and innovation. This initiative identifies priorities that will catalyze inter-collegiate relationships and contribute to strengthening the entire state E&I ecosystem. Recommended funding priorities are: mentor programs that increase industry and alumni support; regional hubs that support a regional and statewide "feeder" system; E&I education to spark and support new ideas and entrepreneurs; and shared commercialization infrastructure to support research discoveries.

The planning process produced a few unexpected outcomes. Although these outcomes extend beyond the Act's requirements, they are worth noting here. The rich exchanges at the Working Group's meetings led to the attendees' call for an annual assembly of presidents to discuss strategic issues affecting higher education across the state. The structure of such an assembly is outside the scope of this project. The second unexpected outcome was a discussion around the state's "innovation culture". Although outside the scope of this project, Working Group members emphasized how innovation needs to become (again) an intrinsic element of Connecticut's identity. A statewide communications strategy could help tell the story of Connecticut's history and current accomplishments. The third unexpected outcome was a call for a sustainable multi-tier leadership structure to build a bridge between the five-year grant cycle and the larger vision of Connecticut's economic vitality. To quote participants, "everyone has his or her day job"; therefore, sustainable collaboration will take resources and time as well as political, administrative, academic and student leadership. To do this effectively, higher education needs the continuing support of the Connecticut State Legislature.

The legislature's leadership in enacting Public Act 16-3 presents an enormous opportunity to overcome the forces of regionalism and silos and forge a new direction in which the state's institutions of higher education can work together to build a prosperous future for Connecticut. Cultivating and strengthening innovation ecosystems is a global trend and Connecticut, through these new partnerships and collaborations, has an opportunity to be a leader.

"The pace of technological advancement has given rise to new ways to create and deliver both products and services – from doctor visits conducted through video to the way we shop. The creative disruption that technology has brought puts pressure on businesses and industries to innovate as incremental improvements alone are unlikely to survive in a competitive market. Maintaining the health of the whole innovation ecosystem is crucial to avoiding obsolescence."
Milken Institute Center for Jobs and Human Capital, April 2017

Introduction

This strategic plan is a roadmap for the State of Connecticut to facilitate entrepreneurship and innovation at institutions of higher education as mandated in Public Act 16-3. It is the product of the Working Group on Higher Education, composed of the presidents and senior leadership of 38 universities and colleges. The Working Group was tasked with: 1) Assessing the scope and scale of existing entrepreneurial programs and initiatives at such institutions in the context of best practices; 2) Addressing opportunities and risks to innovation and entrepreneurship resulting from existing and emergent conditions affecting such programs at higher education institutions, 3) Recommending initiatives that facilitate collaboration and cooperation among institutions of higher education on projects that address and strengthen innovation and entrepreneurship; 4) Providing for the provision of a state-wide intercollegiate business plan competition; and 5) Identifying funding priorities for higher education entrepreneurship grants-in-aid pursuant to section 28 of the act for projects that expand and enhance entrepreneurial programs and initiatives or projects involving partnerships. The Working Group met four times from late 2016 to April 2017. Those meetings, plus extensive site visits and interviews and the work of the Planning Committee, formed the foundation of this strategic plan.

Entrepreneurship and innovation (E&I) have become important answers to questions of how to handle the economic instabilities of the 21st century. If successfully crafted and implemented, policies that encourage E&I serve as proactive responses to trends gripping Connecticut and the world at large: ongoing globalization, immigration, the rapid rise of disruptive technologies, automation, and demographic shifts. Institutions of higher education face related pressures, expressed in declining enrollments, retention, rising costs, reduced state government funding, and flattening of federal research grants. E&I strategies that help higher education institutions support their research, teaching, and service missions and improve their fiscal stability, while more broadly providing for their communities sustained economic prosperity, are win-win. To help successfully navigate the 21st century, higher education missions are evolving to providing pathways that not only spark creativity, problem-solving and critical thinking, but also support students and faculty as they incubate new ideas in supportive environments, and attract investment to transform the fledgling businesses into mature firms
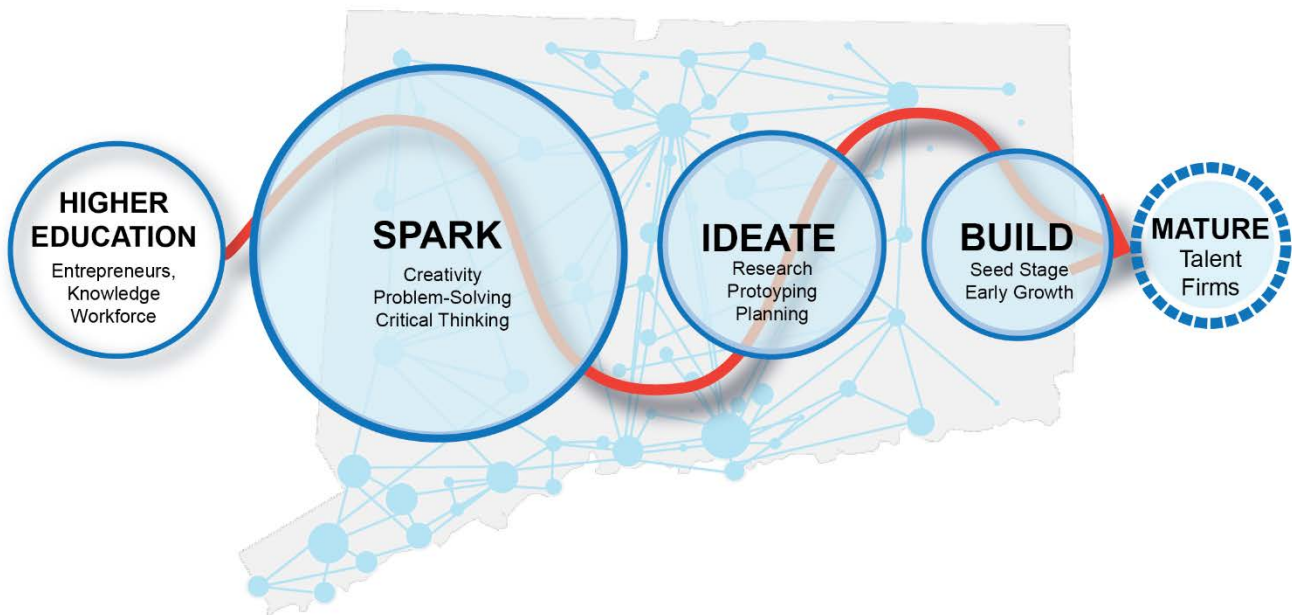
supported by a well-educated workforce. Higher education institutions are the gateways to innovation.

This report has four parts: **Part 1, The E&I Landscape,** gives an assessment of existing and emergent conditions affecting entrepreneurship and innovation programs at institutions of higher education. **Part 2, The Higher Education E&I Ecosystem in Connecticut,** describes the scope and scale of existing entrepreneurial programs and initiatives at Connecticut institutions in the context of best practices at state and national institutions of higher education that are leaders in innovation and entrepreneurship. **Part 3, Roadmap: Goals, Initiatives and Funding Priorities,** gives an overview of initiatives that facilitate collaboration and cooperation among institutions of higher education on projects that address and strengthen innovation and entrepreneurship and funding priorities for higher education entrepreneurship grants-in-aid. **Part 4, Unexpected Outcomes,** describes initiatives outside the scope of the grants-in-aid. Appended to the end of the report are acknowledgments of all the participating institutions and an inventory summary of the E&I assets of the Working Group members.

Part 1. The E&I Landscape

In the late 20th century, the explosive growth of Silicon Valley exemplified the power of a vibrant entrepreneurial and innovation ecosystem. Well recognized as the nation's premier technology hub, it is home to 39 Fortune 500 companies, employs a quarter of a million workers in information technology, benefits from the social and intellectual capital of 42 institutions of higher education, and is the recipient of a third of the nation's venture capital. Other powerhouses include New York and Boston, and smaller but emerging systems exist in cities like Seattle, Boulder and Austin (see Figure 8). They have arisen as the software revolution has transformed the E&I landscape, reducing barriers to entry by increasing access to market information, financing, education, and other services.

Despite the success and the phenomenal growth of a few companies ("unicorns") in Silicon Valley and the other centers, economic data underline some concerns related to the growth of the nation's entrepreneurial and innovation economies. The number of jobs created by establishments less than one year old in the United States decreased from 4.1 million in 1994 to 3 million in 2015. According to the U.S. Bureau of Labor Statistics (BLS), the survival rate of new businesses has declined. Moreover, since 1994, the share of private-sector employment has decreased for companies with fewer than 249 employees and has increased for those with 250 or more employees.

Building strong institutional partnerships and collaborations for entrepreneurship and innovation must address many external barriers presented by economic, social, political and geographic forces. The following section highlights emerging and existing trends and the associated risks and opportunities that may affect higher education institutions in Connecticut as they expand their engagement in and support of entrepreneurship and innovation.

The Innovation Economy

The 21st-century economy is creating complex and interconnected challenges that require new policy approaches such as those represented by federal, state and local government initiatives to support entrepreneurs and innovators. Beyond the multi-billion dollars of federal funding for university-based research and development, the federal government developed targeted E&I programs between 2007 and 2016. For example, President George W. Bush approved the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act of 2007 (America COMPETES), reauthorized in 2010 and in 2016 under President Barack Obama. This legislation carries several provisions to support STEM education; it awaits budget authorization under the current president. Other federal activities include the first White House–hosted Global Entrepreneurs Summit (2010); the National Network for Manufacturing Innovation (2012), which created nine regional hubs through public-private partnerships in four years, with six more planned for 2017; and the Regional Innovation Strategies Program (2013). In 2014, UConn received funding through that program's i6 Challenge.

State legislatures and regional actors have also adopted new policies and tools to support entrepreneurship. Examples of state efforts include Massachusetts' MassTech and Innovation Institute, New York's NYStar Centers, California's Innovation and Entrepreneurship Unit programs, and the Southwest Innovation Corridor, a coalition in

southwest Colorado started by the Telluride Foundation that covers an area bigger than the state of Massachusetts. In Connecticut, CT Innovations and CTNext serve similar functions.

Many cities have encouraged entrepreneurship and innovation through local economic development efforts. Efforts include New York City's $100 million international competition to attract university technology partnerships to build a new campus on city-donated land announced in 2011 and St. Louis's 200-acre Cortex Innovation Community formed in 2002 by five collaborating institutions (Washington University in St. Louis, BJC Healthcare, University of Missouri–St. Louis, St. Louis University and the Missouri Botanical Garden).

U.S. companies and foundations are also global leaders in entrepreneurship and innovation. The Kauffman Foundation's Global Entrepreneurship Network (based in Kansas City, Missouri) has members in 160 countries, and hosts 13 global programs ranging from summits to research platforms. The Skoll Foundation, founded by the first president of eBay, has awarded over $400 million in "impact entrepreneurism," which focuses on leveraging entrepreneurship to address global problems such as poverty or access to clean water.

Higher education institutions are already integrated into the global innovation economy. For example, the U.S. attracts students from around the world. In the 2015-6 academic year, international students accounted for 4.5% of U.S. undergraduate and graduate enrollment. (*Institute of International Education Open Doors Report, 2015*), a 7% increase from the previous year. In 2015-6, 32% came from China (up 8% from the previous year), followed by India at 16% (up 25% from the previous academic year) and South Korea (6%) (*Institute of International Education and Commerce Department)*. International collaborations in research are discussed in a later section.

Due to anticipated changes in national immigration policies, extended visas for STEM postdoctoral work (up to three years) and visas for skilled work (H-1B) are now uncertain, leading many to leave the country who might otherwise remain in the United States and contribute to innovative research. Students who return to their
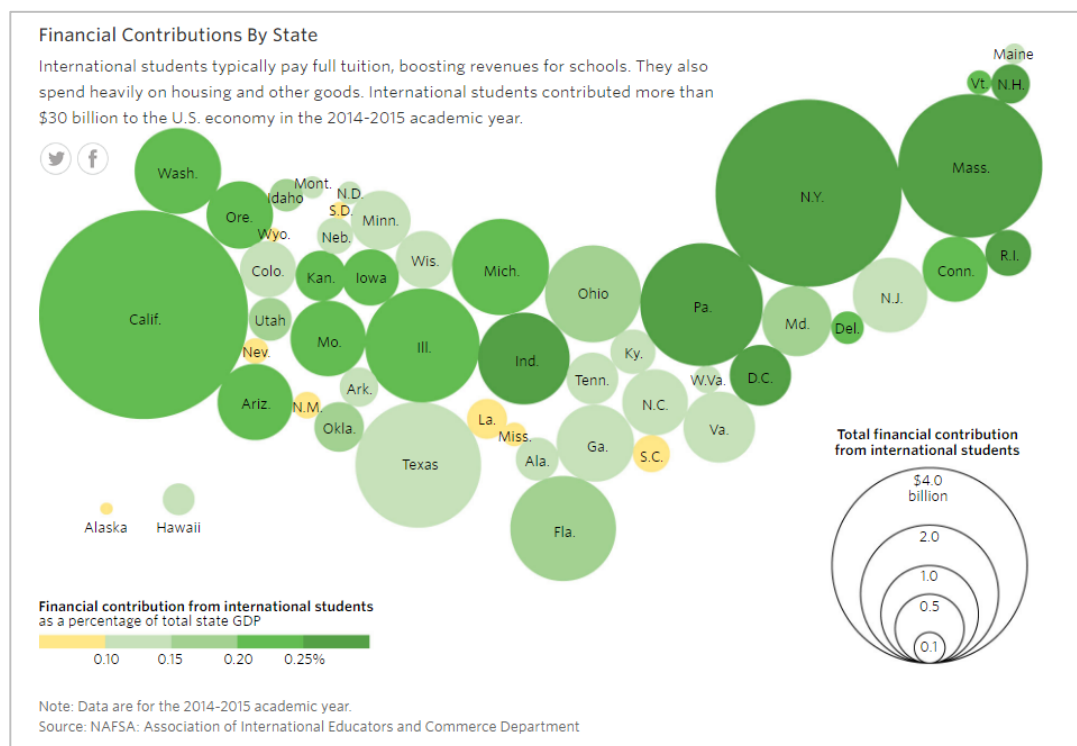

FIGURE 1. FINANCIAL CONTRIBUTIONS OF INT'L STUDENT BY STATE (WSJ)

home countries, however, present opportunities to build bridges to new economies. Quinnipiac University recently focused on such beneficial relationships in the conference "Building International Bridges in the Life Sciences: Hungary, Poland and the BioForum of Central Europe," held January 27, 2017, co-sponsored by the Center for Innovation and Entrepreneurship and the Central European Institute. Connecting to the state at large, the meeting included a presentation from Harry Penner, former chair of CURE (the state's Bioscience Innovation Network) and entrepreneur-in-residence at Connecticut Innovations.

Connecticut

In many respects, Connecticut is extremely well-positioned to support entrepreneurs and innovation. The state has an exceptionally well-educated workforce, numerous institutions of higher education, a strong cadre of advanced technology companies, and a high quality of life ranking. As Figure 2 indicates, Connecticut is also ranked among the top 10 states in categories such as healthy residents (first), advanced degrees per capita (third) and state innovation (fourth). In the

Connecticut Rankings in the United States[1]	
Healthy Residents	1st
Share of Finance & Insurance Jobs	3rd
Advanced Degrees per Capita	3rd
State Innovation	4th
Productivity per Capita	4th
Business Research & Development per Capita	5th
Scientists & Engineers per Capita	5th
Energy Efficiency	6th
Venture Capital Deals per 1 Million Residents	7th
Patents per 100,000 workers	7th

FIGURE 2. 2015 CT ECONOMIC DEVELOPMENT STRATEGY REPORT

latest State report from the Joint Economic Committee of the U.S. Congress (March 2017), Connecticut ranked above the U.S. average on indicators such as the current quarter's growth rate (3.6% versus 3.5%), median household income ($72,900 versus $56,500) and college enrollment (44.9% of 18–24 years old, versus 40.0%).

However, the state may suffer from a so-called Goldilocks syndrome—a little too big, a bit too small. Located between two powerhouse urban centers—Massachusetts with high-tech leader Boston, and New York State, with New York City and Brooklyn—Connecticut is a suburban state in a rapidly urbanizing world, and the Nutmeg State is finding this identity a tough nut. Entrepreneurs and innovators are attracted to urban centers. While the state is the fourth densest in the country (population by land area), its population is primarily suburban. Its major metropolitan areas lack density—Buffalo, Cleveland and Providence are more densely settled than New Haven, Hartford and Stamford. In contrast, Boston and New York City have the density of amenities—restaurants, open space, housing, transportation and networks of talent —that appeal to so-called knowledge workers. Thus, one consequence of Connecticut's lack of thriving cities is the failure to attract the creative workforce and funders an entrepreneurial economy demands. The Innovation Places initiative is meant to address this issue, distributing $30 million over five years to support catalytic projects to stimulate local innovation ecosystems around the state. Seven communities were announced as finalists in April 2017: Central CT, Danbury, Hartford/East Hartford, New Haven, New London, Norwalk and Stamford.

Nonetheless, being part of the Northeast Megaregion is good news for Connecticut. The Megaregion supports 20% of the U.S. GDP ($2.6 trillion), with 17% of the population (52.3 million) and 2% of the U.S. land area (60,000

square miles) (NIH, 2016). By 2050, those numbers are expected to grow to $7 trillion in GDP and 70 million citizens. Having 7% of the population and 9% of the Megaregion's land, Connecticut's share of the GDP, 9% ($253 billion), is disproportionate.

Despite overall losses in manufacturing in general, Connecticut has many advanced manufacturing firms linked to the nation's growth industries in aerospace and submarine construction. Firms such as United Technologies and Electric Boat bring in nearly $13 billion per year in defense contracts. In total, the state has more than 500 manufacturing firms that directly employ over 161,000 workers and provide $14 billion in wages (2014 *Survey of Connecticut Manufacturing Workforce Needs*, SBIA).

Figure 3. America 2050, Regional Plan Association

Institutions of higher education contribute significantly to the state and local economies. According to the Connecticut Conference of Independent Colleges (CCIC), private institutions contribute 171, 000 jobs, more than $21.8 billion in spending, and 200,000 alumni, some of whom can be engaged in supporting entrepreneurial efforts. Public institutions are heavy contributors as well: UConn has added $3.4 billion to the state economy; the state universities, including the community colleges, support nearly 30,000 jobs and enroll more than 90,000 students annually, creating a large alumni base.

Demographic Shifts

Demographic shifts affect economic competitiveness, innovation and entrepreneurship in many ways. The Center for Public Education points out that educational institutions are at the vanguard of this issue in fulfilling their responsibilities of preparing students for workforce participation in a changing world.

In the next decades, the world will see major demographic shifts that will resonate in the United States. An anticipated three billion people will be added to the worldwide population, primarily in urban areas in sub-Saharan Africa and Asia. At the same time, the European population is expected to shrink, while North America will grow slightly.

The U.S. Census projects that the Northeast will see moderate population growth (8%) through
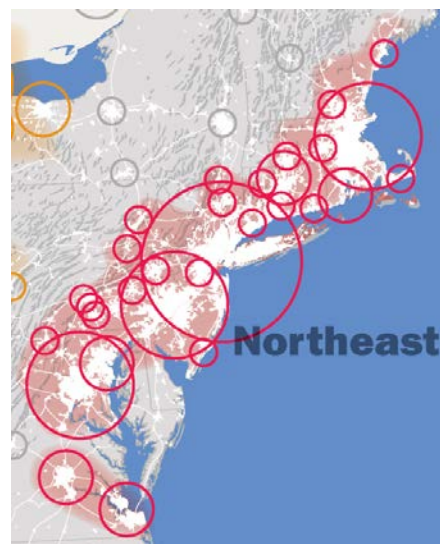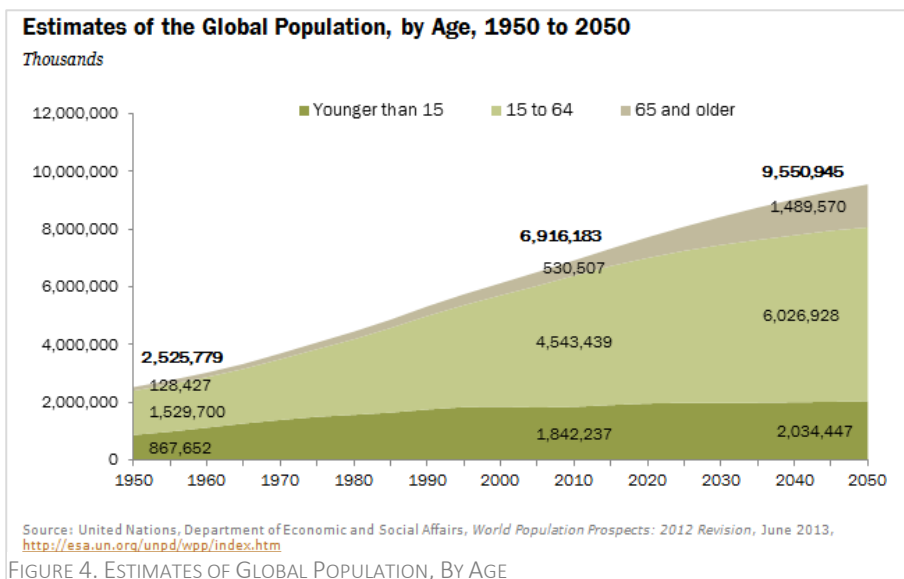

Figure 4. Estimates of Global Population, By Age

2030, while the South and West will see the most (43% and 46%, respectively). Connecticut, as discussed in the next section, is struggling to stabilize its population.

Changes in age cohorts are important to understanding the directions of future economic activity. According to Pew Research, millennials (born between 1980 and 2000) surpassed baby boomers in overall numbers by 2016 (75.4 million versus 74.9 million). More racially diverse (43% nonwhite) and slightly more male, they are on track to be the most educated group in the United States, yet they carry more student debt than previous generations. They are starting to enter their "peak" years for entrepreneurial activity—currently 17% of the adult population between 35 and 44 years old are entrepreneurs, the highest percentage of any age group (*Global Entrepreneurship Monitor Global Report, 2016/17*). In Connecticut, millennials made up 18.6% of the population in 2014 (census, 20- to 34-year-olds), slightly less than the national average of 20.6%.

Among entrepreneurs, the rate of men's entrepreneurship is one and a half times greater that of women, despite the fact that women make up 52% of the population. A recent national survey revealed that 62% of men believe they have the skills that enable them to start new businesses, compared with 50% of women (*Global Entrepreneurship Monitor Global Report, 2016/17*). This trend is relevant in Connecticut, where the latest business degree attainment data shows that of the 10,148 degrees awarded in Connecticut in 2015, only 37% went to women.
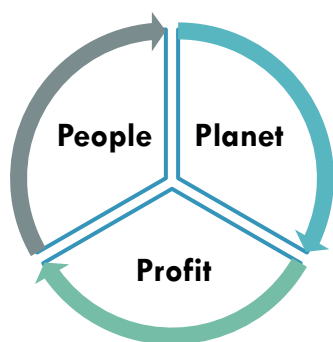
FIGURE 5. TRIPLE BOTTOM LINE

The principles of entrepreneurism and innovation are also used by change makers and entrepreneurs who prioritize the triple bottom line—people (social), planet (ecological) and profit (economics)— and aim is to solve global challenges or to evaluate their company performance in a broader perspective than simply profit. This type of entrepreneurism is called social entrepreneurism, and it is on the rise.

Nationally, 8% of Americans are leading a social enterprise, and 7% are trying to start one. The majority of these enterprises are less than three years old. Government funding is the most common funding source.

The global expansion of benefit corporations, known as B Corps, reflects a growing movement to make companies purpose driven—not just to be best in the world, but to be best *for* the world. Certification requires verified social and environmental performance, public transparency and legal accountability. Of more than 500 B Corps, two reside in Connecticut.

At colleges and universities, the push for embedding social impact into curriculum and education missions parallels efforts to encourage innovation and entrepreneurship generally, but more specifically in catalyzing cultural change across campuses.

Foundations such as Ashoka and Skoll also encourage and support the growth of social entrepreneurism to solve national and global problems, offering fellowships, grants and extensive networks to support innovators. However, Michael Zakaras, a U.S. venture strategist for Ashoka, wrote recently about unconscious biases in the field. An analysis of fellows from the four largest foundations revealed that 60% come from four cities: Washington, DC, San Francisco, New York City and Boston. Fellows have also been disproportionately white, male and highly educated. Zakara's insights into the foundations' often-unconscious bias prove to be a valuable reminder of the general need for diversity and inclusion in entrepreneurial infrastructure. "Entrepreneurs from different races or different regions can raise awareness of social problems that are otherwise invisible, and they can help others to see those problems in a different light." Zakaras, "U.S. Social Innovation: Let's Redraw the Map" September, 2016.

> *"An educational framework integrated across social change methodologies would offer depth of content and breadth of experience [....] To develop such a framework, faculty, staff, and industry professionals will have to become change makers themselves."* Marina Kim and Erin Krampetz," The Rise of the Sophisticated Changemaker", AACU, 2016

Connecticut

The state is fighting for population growth, especially among those with higher educational attainment. In 2014, the state net loss of 2,664 people (0.07%) was a small percentage, but the third-largest percentage population decrease after West Virginia and Illinois (see Figure 5).

In 2014, the greatest out-migration occurred among young adults ages 18–24: 18,367, or 42% of the total loss. However, census data reveals that Connecticut experienced a 0.1% increase between 2010 and 2015, likely caused by the state's high rate of international migration—the nation's seventh highest from 2014 to 2015. Notably, when evaluating migration loss by educational attainment, residents with post-secondary education are the largest out-migration segment (86%) (see Figures 5 and 6).

Persistent achievement gaps influence educational attainment in Connecticut. In *A Talent-Based Strategy to Keep Connecticut Competitive in the 21st Century*, a report of the Connecticut Office of Workforce Competitiveness (OWC) observes: "Connecticut's future young workers are expected to be less prepared for the 21st century careers than those they are replacing in large part because nearly half of our future workforce will be coming out of the state's urban centers where a significant and stubborn achievement gap persists."
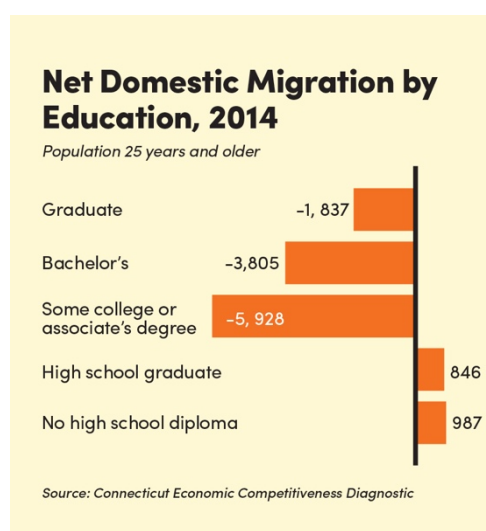

FIGURE 6. CONNECTICUT ECONOMIC COMPETITIVENESS DIAGNOSTIC, 2016

Further, the state is likely to experience the impacts of the so-called silver tsunami, a shorthand expression to note the effects of the retiring baby boomer generation. Today, more than one-third of Connecticut residents are over 50 years old, and by 2025, 25% of residents will be over the age of 65. This latter figure aligns with national averages: the Census expects that more than 20% of Americans will be over the age of 65 by 2030. However, by 2040, residents in Connecticut over the age of 65 will have grown by 57%, while those between 20 and 64 years old, the portion of the labor force supporting the elderly, is projected to have grown less than 2% (Connecticut Legislative Commission on Aging). This group, however, can offer new opportunities for institutions. Retired alumni can become a great source of mentors and a professional resource for training and certificate programs. Retirees are also a growing segment of entrepreneurs—"encore entrepreneurs"—with time to turn hobbies or professional expertise into new businesses.
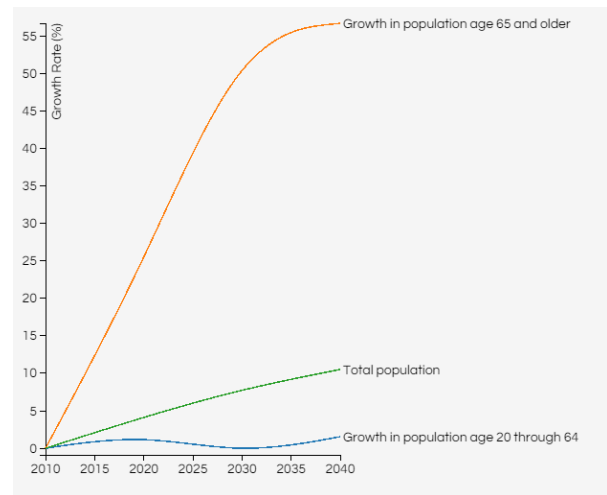

FIGURE 7. CONNECTICUT POPULATION PROJECTIONS

The data on aging puts additional strains on the state's institutions of higher education, which will need to educate a workforce that can take over and adapt companies to address 21st-century economic changes. The Connecticut institutions interviewed for this study, particularly community colleges and state universities, were deeply concerned with this issue. They realize that their students come from and tend to stay in local communities and that small businesses (those with one to 50 employees) make up 69% of companies in the state. They note that existing small business owners need to plan for post-retirement succession, and new owners need to know how to adapt business models to the challenges of the 21st-century economy.

Research & Development

In the postwar period, U.S. research and development (R&D) funding grew exponentially, fueled by federal government support, especially in health and defense, and by private-sector investments in product development. In the six decades for which data has been collected, R&D expenditures in the United States rose from 1.3% of the nation's GDP in 1953 to 2.8% in 2015. In the same period, total expenditures increased 12-fold, from $34 billion in 1953 to $455 billion in 2015 (2009 constant dollars); the federal portion shifted from $7.6 billion (22% of the total) to $48 billion (11%) as private sector funding increased. Of the federal funding in this period, higher education's share rose from 13% to 66% of the total. For research-intensive universities, this funding has been the primary support for research and laboratory facility development in schools of health (medicine, nursing etc.) and engineering. These institutions excel in basic research, an area that has increased 20 times in the past 60 years. These data demonstrate how the United States became a powerhouse in R&D, a phenomenon that has contributed to the nation's economic growth.

Data from the Organisation for Economic Co-operation and Development (OECD) from the past 25 years shows the U.S. R&D expenditures holding steady in terms of global performance metrics—2.5% of GDP in 1990, 2.8% of

GDP in 2015. But many other nations dedicate higher percentages of their GDP to research: Israel and Korea, more than 4%; Japan, Austria and Germany, more than 3%. In terms of dollar expenditures, the United States holds the lead, at $454 billion, but this is narrowing in the face of competition from China, whose research funding was $409 billion in 2015 (up from $13.5 billion in 1991, a 2,821% increase) (OECD, 2017).

However, the OECD reports that worldwide, budgetary pressure on rising expenditures in health, pensions and social services is contributing to some shifts in government-supported R&D. Some are leveling off expenditures. Others, seeking to improve the quality of research or to increase international recognition, are dedicating government dollars to support research excellence initiatives/centers of excellence approaches, incentivizing the creation of multi-university business-partnership arrangements.

Although most U.S. academic collaboration is domestic, international research collaborations have been growing recently due to a variety of reasons. The internet, with free features like Skype and Google Docs, facilitates global communications; inexpensive air travel eases international scholarly conferences and meetings; and international students form ties that continue when they return to their home countries. One indicator of this trend is from the Global Innovation Index (2016) on fund pass-through: R&D funds passing through universities to other universities or to non-academic institutions in the United States grew more rapidly than total academic R&D funding. (Between FY 2000 and FY 2009, pass-through funds grew by 171%, while overall academic R&D expenditures grew by 82%.)

Between 1990 and 2015, as overall U.S. R&D expenditures increased 100%, spending for basic research grew only 57%, and for applied research, 69%. Nonetheless, during this time, institutions of higher education increased their basic research expenditures by 129% and their work in applied research by 162%. While in recent years, research-intensive universities have undertaken increasing dollar amounts of applied research, since 1990, they have maintained a relatively constant division of between the two types of research: 65% basic, 26–28% applied (NSF, 2017).

Drilling down to state expenditures, National Science Foundation data for 2014 (the latest available) reveals that some states dominate. The top three states in overall research expenditure were California ($115 billion), Massachusetts ($28 billion) and Texas ($20.8 billion). Connecticut, ranked 14, has total research expenditures of $10.2 billion. In the top three states, calculating higher education expenditures as a percentage of the total results in a different ranking: Texas (higher education is 22% of the total), Massachusetts (13%), California (7%). In this analysis, Connecticut at 10% compares well. Connecticut also compares well when measuring expenditures per capita: total is $2,845 per capita and higher education is $295; only Massachusetts has higher figures, at $4,140 total and $518 higher education.

The growth of tech transfer and commercialization of university R&D requires access to venture capital markets and investors. Although venture capital deal density is still highest in the San Francisco and Boston areas (see Figure 8), the United States is experiencing an increase in angel investing and crowdfunding across the country. As the barriers to entry and overall costs of starting a new firm (especially in media and software) lower, fewer firms need VC-level investment. Angel investors, affluent individuals who take an equity stake for seed funding, usually invest up to $100,000 into a new startup. The number of angel groups in

FIGURE 8. EARLY-STAGE VENTURE CAPITAL: MORE REGIONS GET IN ON THE ACTION, BROOKINGS INSTITUTE, 2015

the United States increased by more than 30% from 2009 to 2013, and individual angel investors increased by 22% over the same period. Although not all angel funding is disclosed, the Center for Venture Research at the University of New Haven has reported that the U.S. angel market grew from $17.6 billion in 2009 to $24.1 billion in 2014. The Center for Venture Research also reported that angel investments funded Software (18%) followed by Healthcare Services/Medical Devices and Equipment (16%), Biotech (13%), Industrial/Energy (11%), Retail (10.6%) and Media (9%). Angel investors generated 270,200 new jobs in the United States in 2015 (3.8 jobs per angel investment). High-risk crowdfunding, once the domain of friends and family, has become a global source of funding for startups because of the internet. Unlike the stock and bond markets, crowdfunding allows a startup to pre-sell its products or services without offering debt or equity stakes. Crowdfunding levels have grown at an annual rate of more than 110% to almost $70 billion in 2015. Although there are well-known crowdfunding sites that use donation, reward or royalties to attract large numbers of small investors, most of the "crowd" in the marketplace actually consists of institutional investors.

Connecticut

In 2016, the National Science Foundation ranked Connecticut seventh in R&D expenditures and sixth for science and engineering doctorates in the workforce. The state is also sixth on the Milken Institute's State Technology and Science Index (2016). The state has two top-ranked R1 Research Universities: Yale University and University of Connecticut (UConn). According to National Science Foundation (NSF) data, UConn's R&D expenditures were $259,397,000 in 2015, a 15% increase from 2006. Yale's R&D spending grew 78%, to nearly $803 million during the same period. Nine other institutions (Wesleyan University, Fairfield University, Southern Connecticut State University, Connecticut College, Trinity College, University of Hartford, Eastern Connecticut State University, University of Bridgeport and Western Connecticut State University) add $26 million in research expenditures, up 22% since 2006.

Characteristic	Connecticut		U. S.
	Value	Rank	
All employed SEH doctorates, 2013	10,800	23	717,600
S&E doctorates awarded, 2014	564	23	40,588
SEH post-doctorates in doctorate-granting institutions, 2014	1,431	13	63,446
SEH graduate students in doctorate-granting institutions, 2014	7,558	23	588,952
Total R&D performance, 2014 ($millions)	10,219	14	451,631
State R&D expenditures, 2015 ($thousands)	55,817	7	2,210,820
Business R&D performance, 2014 ($millions)	9,093	10	331,222
Academic research space, 2015 (thousands sq. ft.)	3,782	19	214,575
Higher education R&D performance, 2014 ($millions)	1,032	20	63,721
SBIR awards, 2015	65	18	4,534

TABLE 1. NATIONAL SCIENCE FOUNDATION, 2016

In contrast to the four-year trend of declining federal research funding, the state of Connecticut increased its research funding, from $47,405,244 (2014) to $55,816,52 (2015). In fact, Connecticut was one of five states that accounted for 66% of the $582 million of "intramural" R&D performed by state agencies in FY 2015: New York ($242 million), California ($55 million), Florida ($45 million), South Carolina ($22 million) and Connecticut ($22 million).

NOTES: U.S. total reflects all 50 states and the District of Columbia. The five states listed reported the largest amount of intramural R&D.
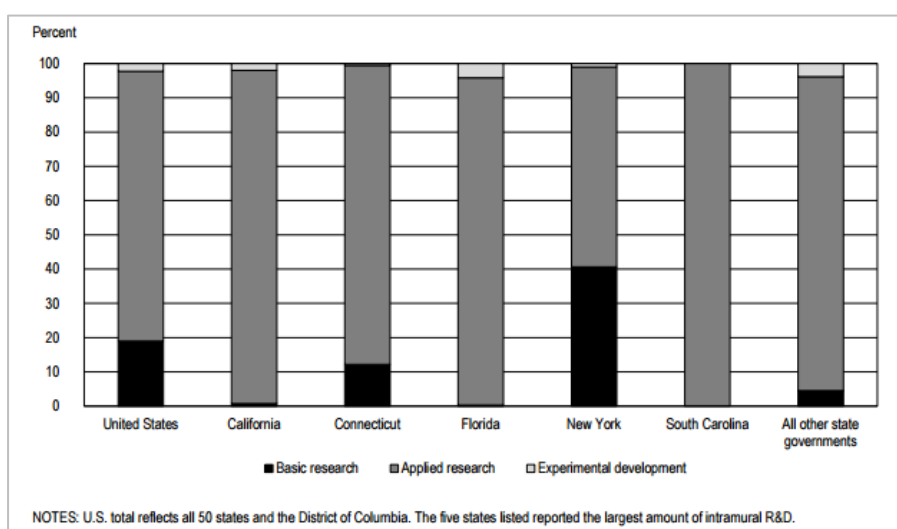
FIGURE 9. STATE GOVT INTRAMURAL R&D FUNDING, BY TYPE.
INFOBRIEF, NCSES, DECEMBER 2016

The Changing Nature of Work

Innovation in the form of rapid technological disruption has transformed many industries almost overnight. Job creation and growth industries today are fundamentally different than they were 30 or 40 years ago. The fastest-growing industries, such as biosciences, software and engineering, require post-secondary education in the STEM fields, and U.S. degree production in those fields is not keeping up with demands.

Simple manufacturing jobs, now automated or exported, have nearly disappeared, leaving behind jobs that require skills and training beyond high school, but an education system that is more expensive and often perceived as unattainable for many. Although service industry jobs provided the bulk of the post-recession recovery, they do not provide the wages or middle-class stability that STEM-related jobs provide. Technology and global wage competition have also created "gig economies," upending "one job for life" baby boomers and replacing them with self-employed "consultants" with multiple jobs and low job security. Large companies, to keep pace with competition and technology and to develop new products, have flattened their structures and increasingly expect their employees to be "intrapreneurial."

In its 2015 Executive Opinion Survey, the World Economic Forum emphasized this trend, noting "the changing nature of work is among the most important trends influencing economic stability worldwide." The impact of changing work was followed by the effects of mobile internet/cloud (34%) and the use of big data (26%). Respondents also indicated that effects are felt almost immediately (in one to five years).

Industries

Knowledge products are now driving today's markets. In 1980, tangible assets like buildings, equipment and inventory made up 80% of the S&P Index. In 2016, intangible assets—patents, trademarks, brands, research and software—represented almost 80% of the S&P 500 Index. This is seen clearly in surveys of global economic competitiveness.

U.S. Council on Competitiveness, 2015 Trends	OECD Science & Technology Outlook, 2016 Trends
Internet of Things	Additive Manufacturing
Energy Efficiency	Advanced Energy Storage Technologies
Materials, Alloys, Metals	Artificial Intelligence
Ceramics, Composites	Neuro-technologies
Advanced Robotics	Nanomaterials
AI and Machine Learning	Macro and Nano Satellites
3D Printing	Synthetic Biology
Critical Materials (Clean Energy	Internet of Things
Bio-based Polymers	Blockchain (cryptocurrency)
Virtual Design, Prototyping, Augmented Reality	Big Data Analytics

In 2015, the U.S. Council on Competitiveness interviewed hundreds of executives to develop a list of the most promising global industry trends. "Predictive Analytics," "Internet of Things" and "Advanced Materials" were considered the most promising in the United States. The OECD also released its global science and technology outlook in 2016. Both lists are driven by STEM research and software.

Workforce

Innovation is critical for company competitiveness, but companies cannot innovate without a trained workforce, especially STEM professionals. In 2014, the President's Council of Advisors on Science and Technology estimated that the United States would need approximately a million more STEM professionals over the next decade than currently projected, to retain competitiveness in science and technology. According to the National Science Foundation, the proportion of Science and Engineering (S&E) degrees compared with the general pool of bachelor's, graduate and PhD degrees has remained roughly constant over the past 20 years.

Nevertheless, in its report *Revisiting the STEM Workforce,* the National Science Foundation emphasized the critical need for a broad pathways approach to education in the United States that can adapt to rapidly evolving workforce needs.

"Innovation is not the sole province of R&D workers. Although companies engaged in R&D activities report a higher incidence of innovation, most of the innovation in the U.S. occurs in firms that are not significantly engaged in R&D." —National Science Foundation

Creating new pathways that support entrepreneurial students and faculty can be an opportunity for higher education institutions to attract and retain students. According to the Kauffman Foundation, in 1985, there were only 250 courses offered in entrepreneurship in the United States. In 2008, that number had grown to 5,000. These courses have become so much of a draw that *U.S. News & World Report* now ranks business schools' entrepreneurship programs. Schools such as Babson College have turned entrepreneurship into a flagship program with a global reputation. Teaching innovation as a mindset university-wide is a growing trend around the country. Preparing students to be innovative and entrepreneurial is not restricted to business schools anymore. Students ranging from nurses to artists may want to open their own businesses or patent new ideas.

Connecticut

The state's largest economic clusters are primed to take advantage of nearly all of these global industry trends. Health care/bioscience, advanced manufacturing, digital media and green technology clusters in the state of Connecticut are major drivers of the state's economic development strategy. Major employers include Aetna, Electric Boat, EMCORE, Eversource, Premcor, Priceline Group, Sikorsky Aircraft, United Technologies, Alexion, Pfizer and Medtronics.
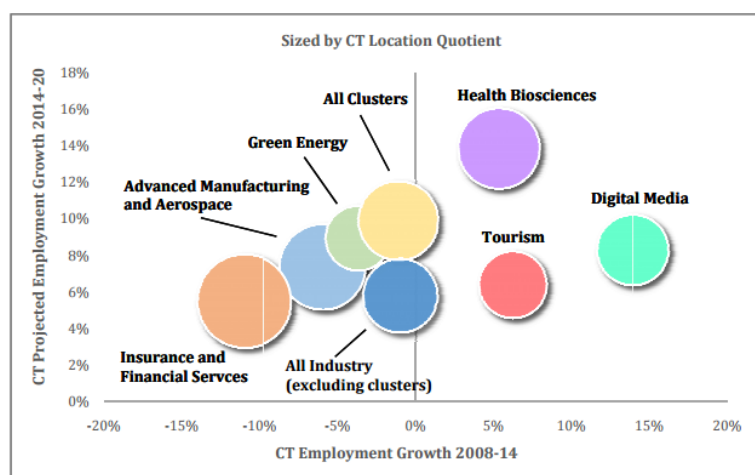
FIGURE 10. CONNECTICUT ECONOMIC RESOURCE CENTER, 2015

The growth of STEM-related industries and the development of related companies are both strong factors in workforce development strategies broadly, and in particular, in Connecticut. Talent shortages mean companies formed by in-state research efforts may decide to locate to Boston, New York or even California. Despite being the "insurance capital of the world," the Global Insurance Accelerator—a mentor-driven business accelerator designed to foster startups in the global insurance industry—is in Des Moines, Iowa.

The state supports extensive workforce development efforts, including STEM-related efforts such as OWC's Skills21 STEM curriculum program, the Eastern Connecticut Manufacturing Pipeline Initiative, and Connecticut Innovations' Technology Talent Bridge program. With more than 35,000 biosciences jobs in the state, groups like CURE help connect companies with talent. The state has also been connecting small businesses to the global market; the Department of Economic and Community Development (DECD) has awarded grants for export-related activities allowing small businesses to travel, for example, to Germany to participate in Medica, the leading international medical device trade show, and Hannover Messe, the world's largest industrial technology trade show.

Higher education institutions across Connecticut have been focusing on increasing STEM-related degree programs, increasing STEM literacy across their campuses and supporting efforts to build a pipeline of interested students from middle and high schools such as the Danbury STEM Academy and the Connecticut Center for Arts and Technology (ConnCAT). Universities are also investing in STEM initiatives such as BioScience and Next Generation Connecticut.

> ## University of New Haven
>
> Since 2011, the University of New Haven has been an active member of a select group of institutions in the Kern Entrepreneurial Engineering Network (KEEN), which fosters an entrepreneurial mindset in engineering students. The goal is for KEEN schools to identify, nurture, and develop entrepreneurially minded engineers who will contribute to our national economic prosperity and secure individual fulfillment. Examples of initiatives include:
>
> KEEN Integrated e-Learning Modules
>
> Imagination Quest
>
> Engineering Curriculum Model

Supporting entrepreneurship and innovation at higher education institutions is part of the solution. No longer just an attractor for business students, E&I is increasingly integrated across university departments, emphasizing critical thinking and experiential learning. Students outside of business schools learn that they can start a business doing what they love. University-wide entrepreneurship centers and makerspaces, new curriculum initiatives and events like business plan competitions encourage students to think creatively about career possibilities.

Starting in the 1980s, technology transfer offices were tasked with protecting the intellectual property (IP) created by university researchers through patents or copyrights, and licensing these technologies to private-sector companies. Today's tech transfer offices retain these responsibilities, with many broadening their roles to include active marketing of university IP to the private sector, more active management of IP once it is licensed, and negotiation of research partnerships with industry players. These offices have evolved from largely reactive, transactional centers to far more proactive entities.

University of Bridgeport

The School of Engineering, with over 20 research centers and laboratories, has quadrupled its sponsored research funding in the last few years. Research examples include: Applied Computational Fluid Dynamics; Sustainable Energy and Environment; Cloud Computing; CNC Milling; Robotics, Intelligent Sensing and Control; Nanomaterials & Nano Biomaterials Engineering; Renewable Energy; Hybrid Unmanned Vehicles and Projectiles.

A new Student Innovation Center (SIC) will open in the spring 2018 with Student Entrepreneur Center, International Trade Office, Alumni Incubator space, Professional Assistance Office and Makers Space.

Connecticut's universities have a proven record of successfully supporting companies developed from research discoveries. Faculty entrepreneurism is good for economic development: new companies strengthen business networks and local economic clusters, seed new ones, and attract more students and faculty to the state, creating positive feedback loops.

These existing and emerging conditions shape the socioeconomic climate in which higher education institutions must adapt to educate a 21st-century workforce and support research discoveries that may help shape a thriving Connecticut economy. Like a species that finds itself in a quickly changing ecosystem, the imperative is "adapt, or die."

Part 2. The Higher Education E&I Ecosystem in CT

Introduction
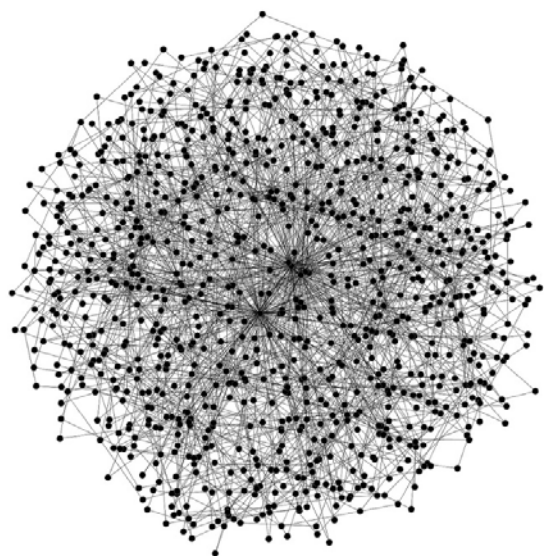
The E&I ecosystem is complex. No two institutions, states or countries have the exact same framework, goals or elements, evolving and adapting to their environment. Like the internet, the system is dynamic: nodes and links shift and grow, formed by professional interests, shared resources, policies, even friendships. The system includes universities, investors, small businesses, foundations, government agencies and industry organizations. Support services can be capital (grants, seed funding, investors), space (co-working, labs, makerspaces), and advisers and mentors (accelerators, tech transfer offices, entrepreneurs-in-residence, peer networks, internships). Nodes and hubs vary in size, and collaboration varies too. Sub-networks develop, creating hubs around specific industries or products, company stage or just geographic location.

Although higher education ecosystems vary, a 2014 benchmarking study out of the MIT/Skoltech Program identified two ecosystem typologies. Research universities support top-down ecosystems, focused on research commercialization and technology transfer. Bottom-up systems, found at all types of universities, focus on education and developing the "spark" of innovation and entrepreneurism in their communities. The study suggests that, despite differing priorities, the two models can work together in the following area:

- Expanding university or regional E&I metrics beyond research outputs to measure culture, capacity and connectivity.
- Leveraging the power of strong grassroots and student entrepreneurial movements. They make strong connections with local and international networks.
- Reducing isolation and combine resources. Many universities work in isolation from each other and from the community, each struggling to build capacity and connections on their own.

Successfully integrating these models, however, calls for developing common objectives and formal infrastructure that leverages, but does not rely solely upon, informal networks. The Kauffman Foundation recommends purpose-focused "catalytic

> **MIT/Skoltech Analysis of Ecosystems**
>
> **Bottom-up:** Focused on regional capacity; usually led by students, alumni and entrepreneurs in the regional economy with a desire to stimulate regional economic growth and create jobs.
>
> **'Top-down':** Focuses on income from university research, driven by a strong technology transfer office. Building on university research strengths, this model focuses on university policies, budgets, incentives, and curriculum.

events" such as business plan competitions or conferences to strengthen partnerships and involve local alumni networks.

Focusing on regional economic development also ties the two models together in a virtuous circle. New companies—whether built from ideas in research labs or student centers—help support the economy. Institutions depend on the existence of healthy local economies to attract students, and communities need healthy anchor institutions to support local businesses and enrich the community. The University Economic Development Association (UEDA) and the Association of Public & Land Grant Universities (APLU) strongly support regional economic development. In 2015, they jointly published a report called *Higher Education Engagement in Economic Development: Foundations for Strategy and Practice* laying out principles and strategies for higher education engagement in economic development. The framework consists of three overlapping elements: Talent, Innovation and Place. Six of their 10 guiding principles focus on innovation and entrepreneurship, explicitly linking them to institutional missions and active economic engagement.

UEDA and APLU Higher Education Engagement in Economic Development
Principles related to E&I:

- Embed Engagement, Innovation, and Entrepreneurship across Institutional Missions;

- Value and Promote Scholarship across a Continuum of Discovery and Application;

- Engage in Regional Innovation Ecosystems;

- Facilitate 21st century Knowledge Creation at the Intersections, Collusions, and New Fusions of Academic Disciplines;

- Affirm that, In Innovation and Engagement, Humanities, Arts, Social sciences, and STEM Disciplines are Vital;

- Innovate Continuously in Teaching and Learning Practices.

Elements of a successful system

Without clear pathways and strong nodes, navigating the ecosystem can be confusing because system is inherently unpredictable, with variables such as new markets and disruptive technologies creating new risks, and few guarantees of success. Despite the stories of the "lone wolf" in a garage, in reality, a successful venture requires advice, teams, resources and human networks. In higher education institutions, students are usually new to the ecosystem, and research faculty are typically not interested in transforming their research into a company. However, as vibrant, densely linked education communities, institutions are ready-made gateways into Connecticut's innovation ecosystem. With partnerships and collaboration, higher education institutions can leverage their resources even further to create a statewide network in which students and faculty benefit from the strengths of other nodes and the economies of scale that stronger networks provide.

A successful ecosystem creates a dynamic, dense culture of entrepreneurism that includes many nodes and pathways that encourage ideas and collaborations, eventually leading to new companies and a workforce that intensifies Connecticut's economy. A dynamic state system must have a dense churn of companies, talent and industries. Colleges and universities celebrate knowledge and education—in a knowledge economy, they are greenhouses where seeds of discovery and new ventures grow and new talent nurtured. As nodes, colleges and universities create the opportunity spaces in which students and faculty navigate through four major stages of the ecosystem before creating or working for new companies in Connecticut:
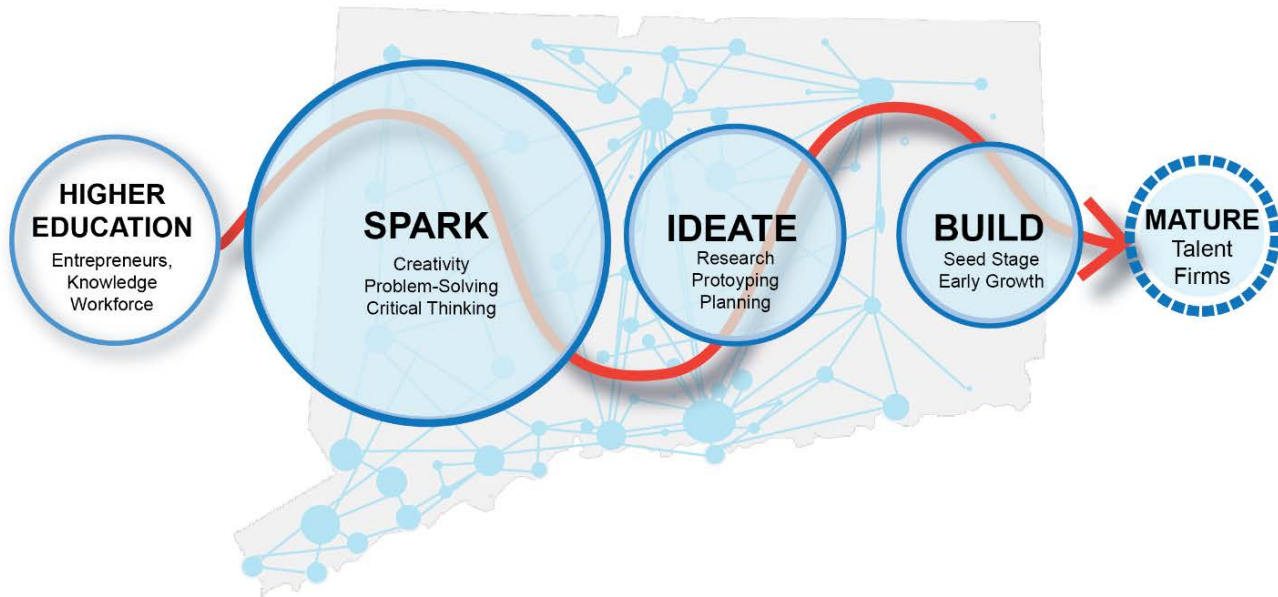
1. **Spark**—Colleges and universities provide exposure to the values, mindset, skills and exciting potential of innovation and entrepreneurship. These nodes create a campus culture of innovation through education opportunities, experiential learning, events, innovation centers and mentoring programs.

2. **Ideate**—Not every idea turns into a discovery or new venture, but people need to learn how to work as teams, plan and test their ideas to explore those ideas successfully. Students and faculty can capitalize on programs at campus entrepreneurship or small business centers, institutes and makerspaces. At this stage, they can get the focused attention of faculty, entrepreneurs-in-residence, alumni and other contacts that may help them move their ideas toward reality.

3. **Build**—Building up sources, particularly financial, is essential for a team or inventor to scale up the proof of concept into a viable business. Once the idea has viability as a business plan, many ventures need the financial and support services found in incubators, accelerators and technology transfer offices, and access to national funding networks and capital markets.

4. **Mature**—New firms that stay in Connecticut must find a knowledge workforce with people who are innovative, critical thinking problem solvers who understand the dynamics of the 21st-century economy.

The CT Ecosystem

The analysis of Working Group meetings, interviews, site visits and written survey responses (80% response rate) across the state reveal that the Connecticut higher education E&I ecosystem is extensive, and growing.

The system consists of 38 institutions, including 19 private institutions and 17 in CSCU (Connecticut State Colleges & Universities), UConn and the Coast Guard Academy (federal). Together, these institutions have 168,000 students (131,000 undergraduate, 30,000 graduate) and employ 48,000 residents (12,000 faculty, 36,000 staff). Participants from 35 institutions attended the Working Group meetings.

The greatest strength and weakness of Connecticut's higher education E&I ecosystem is its variety and diversity. The mix of public and private institutions around the state supports a diverse economy, which in turn means increased stability, resiliency, flexibility and economic development. Each institution translates innovation and entrepreneurship through a lens made of its unique combinations of resources, students and faculty. In fact, innovation and entrepreneurship are themselves lenses through which to assess the education and service missions of higher education. From that perspective, every institution has courses and programs that develop critical thinking and problem solving—essential to an entrepreneur. During interviews over the past four months, stakeholders revealed that new programs and entrepreneurship center programming are in development, and tours of science and engineering labs revealed exciting research projects and industry partnerships with the potential for breakthrough products. New and expanded degree and certificate programs prepare students for starting new companies, and for careers in STEM employment sectors. Students, faculty and administrators expressed enthusiasm for and commitment to the value of innovation mindsets on campus as well as the need to support new ventures that grow the state economy.

However, surveys and interviews also revealed an uneven, relatively young ecosystem with inconsistent or sporadic linkages between nodes and hubs. Although some organizations' and campus initiatives' ecosystems are firmly established, many are new or need promotion. Some are still under development or stalled due to lack of funds or support. Many of the non–higher education components of the system are also new or evolving.

The strength of institutions as nodes and the density of linkages are stymied by a variety of challenges, reflecting Connecticut's attributes, organizational structures of higher education, and the nature of E&I ecosystems. In Connecticut, the system exists in a largely suburban state structured around small towns and regional identities. This poses a challenge for any group endeavoring to build a statewide entrepreneurial culture and identity. Partnerships and collaborations must cross barriers including distance and transportation, regional economic disparities, and a simple lack of awareness of each other's strengths.

Many institutions are building their E&I network in relative isolation, reflecting the insularity of campuses and university cultures. E&I investments and regional economic development also compete with traditional education mission imperatives and fiscal priorities. Institutions' efforts often rely on the passion of individual leaders to champion E&I with relatively limited administrative resources; many observed that the entrepreneurial spirit is alive in these champions, who have doggedly pursued new opportunities for their students and faculty despite the barriers. A disadvantage of a bottom-up structure with limited top-down infrastructure parallels the plight of entrepreneurs: without access to resources and stronger networks, expansion is thwarted.

Isolation also means fewer linkages and communication channels. The kickoff meeting for this planning process was the first time in memory that all the university presidents in the state got together to discuss a statewide topic of common interest. The success of this Working Group presents an important opportunity to launch a

larger discussion on how the academic mission must adapt to the challenges of the knowledge economy and how to incorporate innovation and entrepreneurism into the academic mission. With increased administrative awareness of the E&I ecosystem comes the opportunity to gain greater leadership support to pursue partnerships and commitment for infrastructure investments.

Another "top-down" barrier that institutions must address is academic department endorsement. Most interviewees highlighted the importance of developing a culture of entrepreneurism and innovation across all departments. Successful partnerships will need both academic and administrative infrastructure support to grow programs.

With the state trending toward net losses of prime student-age residents aged 18–24, the real or perceived competition for students or income was an anticipated challenge that did not materialize. Although some schools do compete for the same pools of local students, and every institution has budget constraints, no one interviewed thought they were significant barriers to collaboration. They all recognize that certain types of programs or initiatives need a critical mass of students or researchers that their campuses cannot provide. No one disagreed that their institutions could benefit from larger networks and strong collaborative partnerships.

Higher education partnerships and collaboration that leverage all of these resources and create new linkages would help strengthen the entire ecosystem and build new pathways for growing talent and new firms in Connecticut.

The following section breaks down the existing assets of the state's higher education E&I ecosystem via their roles along the E&I pathway. "Spark" includes education, training, campus events, mentor programs and student-run organizations. "Ideate & Build" includes centers, incubators, accelerators and commercialization infrastructure. Although many of these may overlap programmatically, the pathway reflects the movement down the "funnel" from the wider effort to build a culture of innovation, exploration and entrepreneurship down to the selective and focused programs created for entrepreneurs who launch companies.

Spark
Education

Education provides the spark for innovation and entrepreneurship. In addition to coursework that develops entrepreneurial business skills, institutions have been integrating innovation and entrepreneurship across campus.

Higher education in Connecticut has responded to the increased demand for entrepreneurial courses by offering entrepreneur studies, in the form of certificates, minors or majors, around the state. The 19 schools of business throughout the state handle the bulk of entrepreneurship-based support services and related coursework, and others have new programs under review.

Nearly half (11 of 21) of the state's four-year degree-granting institutions currently offer concentrations, minors and/or majors in entrepreneurial studies. Most institutions offer degrees through their business schools. Examples include Quinnipiac University School of Business, University of Hartford Barney School of Business and University of Bridgeport Ernest C. Trefz School of Business. A few have started to expand the concentration to all students. UConn and University of Hartford business schools, for example, give all students access to the minors in entrepreneurship.

Nine community colleges, such as Gateway Community College and Norwalk Community College, have either an entrepreneur certificate or small business/entrepreneurship concentration, generally housed within business administration programs.

Endowed faculty positions and funds also reflect the value of entrepreneurship and innovation in education in Connecticut: UConn has the Wolff Family Chair in Strategic Entrepreneurship at the School of Business. At Yale, there is the Yale School of Management Shanna and Eric Bass '05 Director of Entrepreneurship and the Blavatnik Fund for Innovation. Western Connecticut State University (WCSU) has the Constantine S. Macricostas Entrepreneurial Endowment Fund. In addition, the *New England Journal of Entrepreneurship* is published twice annually by the Jack Welch College of Business at Sacred Heart University.

Institutions are also incorporating experiential classrooms into their curriculum. Some experimental classrooms and centers include: Trinity's Investment Club, Fairfield's Business Simulator (BEST) Classroom and the Ancell Learning Commons at WCSU. Yale recently opened the Center for Teaching and Learning, to gather students from all disciplines to collaborate. Gateway Community College has one of the 25 Connecticut SCORE centers on campus, an example of collaboration between education and business support services. Other ideas include the incorporation of new technology, such as the 3D Innovation & Entrepreneurship course at Central Connecticut State University.

At Fairfield University, engineering students must participate in the Walk on Water Competition. Teams of students put their skills to the test in a kinetic, project-based design challenge that has them build a contraption that must "walk on water" to get across a pool in record time.

Manufacturing Training

Many of the community colleges have sought out collaborations and partnerships with local manufacturers, often tied to the advanced manufacturing programs on campus. Manufacturing programs are also seeking out ties to the maker movement, which celebrates the creativity and value of making **things**. When surveyed by the Small Business Investor Alliance (SBIA) in 2014, manufacturers cited the top six needed workforce skills: critical thinking and problem solving (98%), engineering (94%), robotics and automation (93%), CNC programming (93%), CAD/CAM (92%) and technical writing/comprehension (91%).

In addition to offering training certificates, the CSCU's Advanced Manufacturing Technology Centers reach out to technical high schools and have a strong relationship with the Smaller Manufacturers Association. The Eastern Connecticut Advanced Manufacturing Technology Center at Quinebaug Valley Community College is another example of how community colleges are leveraging their local assets. The College of Technology (COT) consortium brings together students from the 12 Connecticut community colleges with associates in engineering or technology to transition to bachelor's programs at the CSCU, Fairfield University, University of Hartford, UConn and University of New Haven. COT's Next Generation Manufacturing Center is a National Science Foundation Center of Excellence, providing resources for both students and educators. The Regional Center for Next Generation Manufacturing (RCNGM), in partnership with the Connecticut Business & Industry Association, has held two Maker Faires at Tunxis Community College.

> **Fairfield University**
> **Entrepreneur-in-Residence (EIR)**
>
> Now in its fifth year, Fairfield University Dolan School of Business hosts an Entrepreneur-in-Residence who mentors students in the Fairfield StartUp Competition, advises investors, guest speaks in entrepreneurship classes and lines up other mentors to engage with students. This year, the EIR is Scott DePetris FU '99, a founding member of Portware, LLC, now part of FactSet, Inc., and a serial entrepreneur.

UConn is also building the new Connecticut Manufacturing Simulation Center (CMSC). CMSC, working on a subscription model, will give small and medium-sized manufacturing businesses access to modeling technology for a fraction of the cost of installing their own equipment. The center will provide advanced computational design, modeling and simulation equipment in state-of-the-art facilities.

In addition to coursework and training, institutions in Connecticut are fostering campus-wide innovation and entrepreneurship through mentor programs, campus-wide open events and competitions, student-run programs, clubs, university-wide institutes and centers, business incubators, and accelerator programs.

Mentor Programs

Nearly every school surveyed as part of the Working Group analysis described an established system for connecting interested students with mentors. While some are ad hoc career services assistance, others host more formal programs tied to other E&I programs across campus. Schools of business or campus incubator centers offer most offer formal mentor programs for curious entrepreneurs. Some programs are implemented campus-wide as soon as students enter their first semester, while other institutions connect students with mentors

through their degree programs, through internships or fellowships, or specifically when they seek out advice on business ideas and planning. Mentors can be faculty members, senior students, alumni, entrepreneurs-in-residence or local business owners.

Ov ore than 15 two-year and four-year institutions have established mentor networks. Yale University, using the licensed MIT Venture Mentoring Service, has a very successful mentor program that has also helped strengthen local alumni ties. UConn and Fairfield have modeled their own programs on Yale's, and others hope to set up similar programs. University of Bridgeport and Connecticut College are both examples of institutions with intensive four-year programs designed to link students with mentors at the very start of their college careers. Albertus Magnus's Practica program and internships network students with over 60 vetted business mentors. Asnuntuck, Quinebaug Valley and Northwestern Community Colleges manage networks of local manufacturers who serve as mentors to advanced manufacturing students.

> **MIT Venture Mentoring Service** uses A team mentoring approach with groups of 3 to 4 mentors sitting with the entrepreneur(s) in sessions that provide practical, professional advice and coaching. VMS mentors are selected and matched to students and faculty based on their experience, as well as their enthusiasm. Mentors are required to subscribe, in writing, to a Statement of Principles.

Eight institutions currently have dedicated entrepreneur-in-residence programs. The programs support experts who are given a yearlong or two-term residence to support students and faculty interested in starting businesses.

Student-run Organizations

Twenty-four institutions in the Working Group survey responded that they have a student-run organization focused on business, entrepreneurship or social justice; 13 organizations have dedicated entrepreneur clubs. UConn hosts a variety of student-run organizations such as the UConn Consulting Group (UCG), International Business Society (IBS), Student Entrepreneurial Organization (SEO) and Women in Business (WIB). Trinity's Investment Club gives students access to a real fund and the responsibility to invest in various stocks, bonds and companies.

Southern Connecticut State University (SCSU) hosts the Connecticut branch of Conscious Capitalism, a national organization with state chapters that focuses on developing businesses that are ethical and noble and inspire people to do good. Conscious Capitalism frequently hosts public events that bring panelists from all sectors of business together to discuss how to improve the state and local area. KAI Wesleyan is a student-run nonprofit organization that focuses on promoting social entrepreneurship on campus. KAI supports an internal fellows program offering additional support services to student social initiatives and projects.

Campus Events

New Venture Challenge

Participating schools:

1. Albertus Magnus College
2. Central Connecticut State University
3. Fairfield University
4. Gateway Community College
5. Housatonic Community College
6. Quinnipiac University
7. Southern Connecticut State University
8. University of Bridgeport
9. University of Hartford
10. Western Connecticut

Three-quarters of institutions around Connecticut host campus-wide entrepreneurism-related events. Examples of events include lecture series, week-long summer intensives, boot camps and networking series. Six institutions host Startup Weekends, which are collaborative and give participants from all majors the opportunity to attend lectures, speak with local entrepreneurs, participate in competitions and network with like-minded peers from other schools. An example of widescale collaboration is the 10 institutions who participate in the New Venture Challenge. It is organized by members of the Connecticut Consortium of Entrepreneurship Educators (CCEE). The spring 2016 challenge included 110 students from eight colleges and universities.

Other programs, like Fairfield University's StartUp program, are based on Lean LaunchPad. Lean LaunchPad's fall event focuses on recruitment, engagement and active learning experiences in professional networking, business modeling and pitch making. The spring semester prepares students for the StartUp Showcase in early April. Connecticut Innovations (CI) also launched an accelerator program in 2012 with the Westport-based co-founders of Lean LaunchPad.

Competitions are popular events that bring together students from all different backgrounds to create new ideas, make stuff, pitch business plans and network. Half of the survey respondents stated that their institution participates in the statewide business plan competition run by the Entrepreneurship Foundation, the Shipman and Goodwin Elevator Pitch Contest, or the Connecticut Technology Council's Connecticut Skills (coding) Challenge. In 2016, Central Connecticut State University, Eastern Connecticut State University, Fairfield University, Norwalk Community College, Quinnipiac University, Sacred Heart University, Southern Connecticut State University, University of Bridgeport, University of Connecticut, University of New Haven and Western Connecticut State University all participated in the Skills Challenge. Students and faculty startups also attend national competitions such as Watson Analytics Global Competition (WAGC) and MassChallenge. Some institutions host internal competitions for their students. Students also attend other competitive events such as hackathons. The Stamford Hackathon hosted by the Stamford Innovation Center in 2016 focused on smart city transportation software, and its success led to two more: the first was hosted at the University of Bridgeport and the second at MakeHaven, a makerspace in New Haven. UConn's Entrepreneurship and Innovation Society hosted its second HackUConn in 2017. At Sacred Heart, students in the Intro to Business course team up to work on a business plan presented to a panel of faculty judges. The selected top nine or 10 groups go on to present their plans to local entrepreneurs and business leaders.

Students and faculty may also attend events hosted by groups such as the Inventors Association of Connecticut (IACT), the Crossroads Venture Group (CVG) and Angel Investor Forum, the Connecticut Technology Council and CTNext.

Ideate & Build
Centers, Incubators and Accelerators Programs
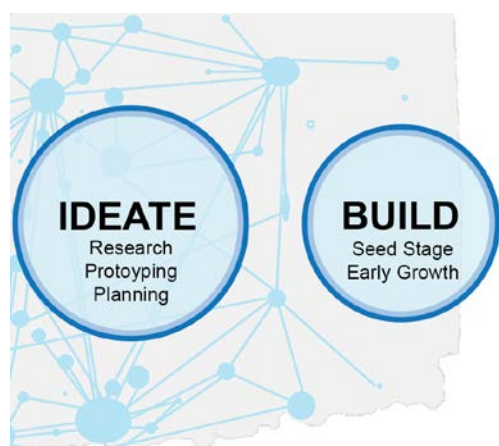
Many higher education institutions in Connecticut have turned entrepreneurship and innovation into a campus-wide initiative, with institutes and centers that serve as hubs for education, business services, events and mentors, as well as serving as pathways to incubators and accelerator programs. Incubators are nonprofits (on or off campus) that provide work and lab space for early-stage ventures at reduced rents and offer business support services such as legal advice. According to the National Business Incubator Association, there were over 1,250 incubators in the United States in 2012, up from only 12 in 1980. Ventures "graduate" when they grow (or fail). Traditional campus incubator centers are generally open to all enrolled students and, in many cases, to the local community. Services offered to the local community can include marketing and branding advice, tax preparation and workshops. Incubators are not co-working spaces, which are designed to build communities for consultants and contractors who want office space outside their home. Accelerator programs are designed to move early-stage ventures into the next phase with intensive (weeks- or months-long) programs that help them build their companies, give them a network of founders, and introduce them to new funding opportunities. Some, like Y Combinator in Silicon Valley, provide seed funds and services for an equity stake. Others, like Yale Entrepreneurial Institute's Fellowship Program, provide stipends but not equity funding.

University-wide hubs are growing in Connecticut. There are already more than 10 in the state, with four more planning to open in 2017 at the University of Bridgeport, SCSU, WCSU and Northwestern Connecticut Community College (NCCC). Existing campus centers include UConn's Connecticut Center for Entrepreneurship and Innovation and the Connecticut Entrepreneurship and Innovation Consortium, the Yale Entrepreneurial Institute (YEI), the Quinnipiac Center for Innovation and Entrepreneurship, and the Viscogliosi Entrepreneurship Center (VEC) at Manchester Community College. Yale University hosts a number of student-focused innovation centers, including InnovateHealth Yale, Yale Center for Business and the Environment, and the Yale Center for Engineering Innovation & Design. All of these organizations provide opportunities for entrepreneurial students from every department to interact and work together. Some, like the Entrepreneurial Center at the University of Hartford, the Small Family Business Center at the University of New Haven, and the SCORE center at Gateway Community College, are open to community members as well. The UConn Technology Incubation Program

> The YEI Fellowship is an 8-week intensive summer bootcamp for incubating ventures. Approximately 10 teams are chosen each year in a highly competitive process.
>
> **Each accepted team receives:**
> - $15,000 stipend
> - Mentors
> - Legal, accounting, marketing advice
> - Introductions to venture capitalists
> - Pitching instruction, opportunities
> - Weekly speakers, Community building activities

currently supports around 35 companies that include ventures from UConn startups as well as ventures from Yale, MIT, Harvard, University of Vermont, Notre Dame and community entrepreneurs. Thanks to Google Hangouts, Small Business Development Centers (SBDC) are able to make services available for students, faculty and alumni throughout the state, although they do not specifically target students or early-stage ventures.

Centers like the Patricelli Center at Wesleyan and the Holleran Center at Connecticut College focus on social entrepreneurism, supporting "practical idealism" among students who want to address the world's social and environmental problems. They offer seed grants and fellowships to help get social initiatives off the ground. Other institutions, such as Yale, UConn and ECSU, support events or programs on social entrepreneurism.

In Bridgeport, Comradity is a shared incubator space between Sacred Heart University (SHU) and the University of Bridgeport (UB). The University of Bridgeport also supports the incUBator. SHU also has a campus incubator center that houses the Welch Experience Program. This university-supported initiative hosts five to six student-run startups per year and provides student-run businesses access to funding, mentoring, concept development and marketing services. UConn and the University of Hartford are supporters of Innovation Destination; Hartford, a regional consortium. The Viscogliosi Center at Manchester Community College, the GREAT Center at Gateway, and the soon-to-open (2017) Entrepreneurial Center of Northwest Connecticut are examples of incubator centers at the community college level. Using the resources at campus centers and mentor programs, students and faculty can also tap into the statewide incubator network, which has 13 members, including Hubcap in Wallingford, reset (social enterprises) and CTECT, at Science Park in New Haven.

Proof of Concept Support, Technology Transfer, Commercialization

Proof of concept support, technology transfer and commercialization services focus largely on supporting faculty innovation and laboratory discoveries. Five institutions (UConn, SCSU, Yale, University of Bridgeport, Fairfield University) offer faculty services for the licensing of intellectual property, while three others have systems in place to provide services via outside consultants or on a case-by-case basis. The reason is simple—the vast majority of Connecticut's colleges and universities do not support research, or perform enough to warrant dedicated offices of support.

UConn's Technology Incubation Program (TIP), with 32,000 square feet of wet labs and office space, had a record year in 2016, attracting $39.9 million in debt and equity.

Frequency Therapeutics $9.1 million; 2017, $32 million Series A funding announced; **Diameter Health**, $2.3 million; **CaroGen Corp**., $2 million **Agrivida**, $21 million, Series E funding

With 80% of the state's R&D focused on biosciences, support for the sector goes beyond intellectual property (IP) and licensing support to incubator and accelerator programs, including UConn's Technology Incubation Program (TIP) in Farmington and Avery Point, and the CURE Commons in Groton. They support new commercial ventures, including (but not limited to) biosciences, with affordable laboratory space, extensive services and access to programs like CURE, the Program in Innovative Therapeutics for Connecticut's Health (PITCH), and funding sources like the Connecticut Bioscience Innovation Fund (CBIF). Yale, which has 12 institutes in the biosciences, supports extensive bioscience innovation infrastructure, including the Blavatnik Fund for

Innovation, which bridges the gap between early-stage life science research and biomedical product commercialization with competitive grants of up to $100,000. The Yale Entrepreneurial Institute has a business workshop series just for biotech researchers.

UConn's Technology Commercialization Services (TCS) is the university's technology transfer enterprise. As part of the Office of the Vice President for Research, TCS and its network collaborate to support technology transfer and venture development based on student and faculty innovations. TCS works closely with the UConn School of Business and the Center for Entrepreneurship and Innovation (CCEI) to operate Accelerate UConn and the UConn NSF I-Corps Site. TCS provides services for entrepreneurial training, intellectual property protection, technology licensing, mentorship, business startup, technology incubation and connections to the investment community. At the University of Bridgeport, the Division of Graduate Studies & Research provides leadership, guidance and management for university-sponsored research, as well as providing faculty with seed money for early-stage research. The University of Bridgeport School of Engineering has quadrupled its sponsored research funding in the past few years. Sponsored research studies have focused on such areas as applied computational fluid dynamics, sustainable energy and environment, nanomaterials and nano biomaterials engineering, renewable energy, hybrid unmanned vehicles and projectiles, signal processing, and wireless and mobile communications.

Yale's Office of Cooperative Research (OCR) is responsible for supporting and managing the university's extensive E&I ecosystem, technology transfer services, portfolio of intellectual property, local and industrial relationships, and other venture development services. Yale supports new ventures with the YEI Fellowship (a boot camp for startups), the YEI Innovation Fund (pre-seed funding) and prize competitions.

Fairfield University does not take equity stakes in startups developed on campus but does have explicit guidelines for the commercialization of products developed by faculty using campus resources. The University of Hartford (UHart) has an established network of outside consultants brought in ad hoc to help with the licensing of intellectual property.

Examples of products or start-ups

- **Asnuntuck Community College**: Asnuntuck's Advanced Manufacturing Technology Center (AMTC) used its additive manufacturing technology to provide the company Senior Aerospace Connecticut with prototype parts that ultimately led to the campus purchasing additional equipment to further develop parts.
- **Charter Oak State College**: Charter Oak launched eTutoring.org and ePortfolio, programs that were designed, produced and marketed on campus.
- **The College of Technology:** This collaboration of all 12 Connecticut community colleges and eight public and private institutions led to many concepts in 2016, including:
  - Embedded Microcontroller Design Project (University of Hartford, Quinebaug Valley, Tunxis, Norwalk, Central Connecticut State University, University of Connecticut)
  - Traveling Oasis (University of New Haven, Gateway, Quinebaug Valley)
  - Smart Guitar V2 (Gateway, Middlesex, Tunxis)
- **Fairfield University**: Fairfield's FUEL Center currently hosts Cometa Works, Crowdflik and eSolutionsOne and since its inception in 2013 has supported over a dozen different startups/companies.

- **Quinnipiac University:** Products developed at Quinnipiac have included treatment for microvillus inclusion disease (MVID), a check samples system, a diagnostic system for pancreatic cancer, a product to treat cervical incontinence, and a game to help young women choose a birth control method.
- **Sacred Heart University**: The Welsh Experience Program at SHU currently supports six student-run startups: The Peak (ice cream shop and student lounge), Nantucket Buckets (clothing and beach apparel), Twin Tides (clothing), Sonus (digital music remastering software), Madely Clean (residential cleaning service) and Agora Bookshelf (textbook exchange service).
- **University of Bridgeport:** UB patents include a bike helmet with right and left signal blinkers, My Air Streamer, Cross Cultural Education, Yayci Nail Lacquer, Tuccipolo, Men's handmade shoes, and breakthroughs in areas like facial recognition software, reduced gravity tools, and biological nanostructures.
- **UConn:** UConn holds over 500 patents and more than 75 active technology licenses with industry. A list of selected patented technology and startups can be found at the Innovation Portal. UConn startups include Lambdavision, Mobile Sense Technologies, ActualMeds Corp and Amastan.
- **University of Hartford**: UHart developed a patented Rehab Walk Assist System currently installed at a hospital in New York City, is funding three patents from faculty research, and has a four-year design process in the School of Engineering that encourages students to design viable products during their four years of coursework.
- **University of New Haven:** Research at UNH has led to rapid detection technology for Lyme disease, the Tri-sol (three-in-one) solar energy pane, solar-powered traffic lights and a device for rapid analysis of health of HVAC ducts.
- **Yale:** Yale's Office of Cooperative Research website has a list of current and previous ventures. The current cohort of student Venture Creation programs includes HemoState, Shopthisfeed, Practice Portal and Zerit.

How CT Stacks Up Against National Best Practices

Entrepreneurship and innovation can be unleashed anywhere. When asked, most people identify Palo Alto (Silicon Valley), Boston (MIT) and New York City as hot spots for entrepreneurship and innovation—but they are not the only hot spots anymore. The trend to harness the potential from technological disruption has spread around the globe, a race to capture growth and job creation at local and national levels. The White House hosted the first Global Entrepreneurship Summit in 2010, and this year the summit was held in India. In 2009, the Kauffman Foundation hosted the first Global Entrepreneurship Congress in Kansas; this year, representatives from 173 countries were at the ninth Congress, held in South Africa. Nationally, every state is trying to tap into the entrepreneurship and innovation field as the new lodestone for economic development. In Connecticut, CT Innovations runs seven funds for startup capitalization, and CTNext provides guidance, resources and networks to accelerate growth.

Underlying this transformation is a workforce that needs to tap into post-secondary education to take advantage of these opportunities. By 2020, 70% of new jobs will require education beyond high school. As a result, higher education has a large role in the growth and success of entrepreneurs and an innovative economy.

Resources and networks for promoting student entrepreneurism and innovation as well as research commercialization have grown exponentially over the past 15 years. More than 2,200 universities offer E&I programs, and the Kauffman Foundation's Campus Initiative (2003–13) leveraged $100 million to develop interdisciplinary entrepreneurship education at schools ranging from small liberal arts colleges to large research universities. The foundation observed that campus-wide shifts in mindset and cultural changes encourage educators to think of themselves as "change agents" who can use E&I to create social and intellectual, not just economic, value.

With so many technology transfer programs and educational offerings across the United States, how does the higher education ecosystem in Connecticut stack up? The short answer is good, but it could be better. There are many examples of best practices in the state ripe for more peer-to-peer knowledge exchange. Some institutions like Yale and UConn have extensive ecosystems of their own, with resources for both students and scientists tied into national networks like the National Science Foundation iCorps program. Most institutions in the state have some research activity, but not on a scale that warrants extensive commercialization support services. Other institutions are starting new programs or expanding their offerings on shoestring budgets. Most institutions are in the middle, with small but active campus programs for students. Entrepreneurial centers and makerspaces are expanding campus outreach beyond business schools and tapping into the creative ideas of chefs, engineers, artists and students who might not otherwise think of themselves as entrepreneurial. Institutions are tapping into national resources like the Kauffman Foundation or MIT's Venture Mentoring Service, going to national conferences, investigating new pedagogical ideas, and adopting and modifying best practices to meet the needs of their students and faculty. There are over 25 examples of existing partnerships that point to a growing higher education network in the state. A couple are statewide, many are collaborations of more than two institutions, and a few reach out to their local communities. But a network with strong nodes and limited connections is more accurately a collection, not a true system. Broadening and deepening the statewide network is critical to address economic development needs.

Promoting Statewide Ecosystems

The American Jobs Project, a national research project from the Berkeley Energy and Climate Institute, developed a database of best practice policies that help strengthen state innovation ecosystems. The following are examples of best practices that could be used to support higher education partnerships:

Innovation Voucher Programs. State governments provide funding for competitive application processes that connect businesses with in-state research scientists. The New Mexico Small Business Assistance Program helped 2,341 businesses gain access to technology at the Sandia or Los Alamos National Labs. In Tennessee, the state's $2.5 million innovation voucher program connected businesses to Oak Ridge scientists.

Equity Crowdfunding Portals. Crowdfunding provides an alternative to state-financed venture funds or a workaround to address reduced levels of federal research dollars. Examples include Wisconsin's CraftFund and crowdfunding portals at Penn State and the University of California at Santa Cruz. Researchers can raise funds directly on sites like Experiment.com and scifundchallenge.org. These resources do not always have the checks

and balances of federal research funds, but they can fill gaps for young scientists who find it hard to compete for federal funding.

State-Matching Grants for Federal Funding. These grants match funding by the federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. Kentucky, Virginia and North Carolina are examples of states with these programs. Connecticut Innovations/CTNext from 2012 thru 2016 provided matching funds to SBIR/STTR federal awardees to help fill the gap and further advance the commercialization of technologies. While the matching program has been paused due to the transition of CTNext as a wholly owned subsidiary of Connecticut Innovations, CTNext continues to provide comprehensive technical assistance to companies cultivating a strong pipeline of SBIR/STTR companies winning federal R&D grants. In addition, the State of Connecticut has been awarded a Federal and State Technology (FAST) Partnership Program grant consecutively for the past seven years, ensuring access to underserved and under-represented communities within the SBIR/STTR program.

Foundation Liaisons. Foundations award billions of dollars that could be tapped to support strategic E&I ecosystem initiatives. In Michigan, the state legislature created a cabinet-level, nonpartisan position to work with elected officials, the business community and foundations to build partnerships and strategic collaborations. The program could be extended to coordinate with higher education institutions to leverage their foundation and corporate relationships and community investment strategies.

Innovation Districts. Innovation districts encourage sustainable "town-gown" relationships and strategic collaboration on innovation district initiatives. CTNext's Innovation Places grant program is currently in the competitive implementation application phase.

Promoting Student and Faculty Entrepreneurship and Education

Connecticut institutions are already using best practices; they are just not all widely adopted yet. Connecticut has an extensive list of education options, including entrepreneurism majors, minors and certificate programs, available for business majors and non-business majors. Schools also offer a wide array of programs that promote E&I to students and faculty. Universities already use best practices like **Lean LaunchPad (VentureWell)**. Multiple schools and the Connecticut Consortium of Entrepreneurial Educators (CCEE) partner with local companies and foundations like the **Kauffman Foundation** to sponsor non-credit events like Startup Weekends, business plan competitions and hackathons modeled after national programs. Over 10 schools support entrepreneurial centers, and more centers are on the drawing board. Startup incubators range in size and resources, tapping into local entrepreneurs in addition to university students and researchers. Many institutions have formal mentor programs. The **Yale Entrepreneurial Institute** has many examples of best practices, including its mentor program, based on the **MIT Venture Mentoring Service**.

Other great examples in Connecticut that could be expanded or illustrate case study include:

- [Accelerate UConn](#) (NSF I-Corps Site)
- [Advanced Manufacturing Technology Centers](#)

- CCEI Mentor Program
- Consortium of Entrepreneurship Educators, New Venture Challenge
- Fairfield University Entrepreneur-in Residence and Investor-in Residence program
- Gateway GREAT Center
- Norwalk Community College's Entrepreneurship & Workforce Development Initiative
- Patricelli Center for Social Entrepreneurship
- Quinnipiac Center for Innovation and Entrepreneurship
- Sacred Heart's Lisa Powell Memorial Endowed Scholarship Fund (female entrepreneurs)
- Southern Connecticut State University BioPath
- University of Bridgeport Faculty Research Day
- UConn Entrepreneurship Bootcamp for Veterans with Disabilities (EBV)
- UConn Minor in Creativity Innovation and Entrepreneurship
- UConn IQ Competition
- University of New Haven E-learning Modules Supporting Entrepreneurially Minded Learning
- University of New Haven Kern Entrepreneurial Engineering Network
- WCOB Innovation Center's Problem-Based Learning Lab
- Yale Entrepreneurial Institute

Promoting Research, Technology Transfer and Commercialization

The state has two R1 Research Universities, Yale University and the University of Connecticut. Five institutions (UConn, SCSU, Yale, UB, Fairfield) explicitly offer their faculty services for the licensing of intellectual property, while three others have systems in place to seek out these services via outside consultants or on a case- by-case basis. The largest are UConn and Yale. At UConn, its Technology Commercialization Services (TCS) has successfully launched over 50 companies. As part of the Office of the Vice President for Research, TCS works closely with the UConn School of Business's Connecticut Center for Entrepreneurship and Innovation (CCEI) to operate Accelerate UConn, the UConn NSF I-Corps Site. TCS provides services for entrepreneurial training, intellectual property protection, technology licensing, mentorship, business startup, technology incubation and connections to the investment community. The UConn SPARK Technology Commercialization Fund supports innovative proof-of-concept studies with grants of up to $50,000 to support one-year projects. The UConn Innovation Fund provides investments of up to $100,000. The three 2017 first-round beneficiaries are Torigen Pharmaceuticals, Bioarray Genetics and Shoreline Biome.

Yale's Office of Cooperative Research is responsible for managing a portfolio of intellectual property covering more than 12 areas, including biotechnology, medical devices, medical diagnostics, photonics and microsystems, energy and the environment, information technology, nanotechnology, therapeutics and biological tools like mice models and cell lines. There are currently 50 new bioscience-related ventures and 41 products in the pharmaceutical pipeline, including six drugs that have gone to market for HIV/AIDS, hepatitis B, cancer, Lyme disease and ADHD. OCR offers consulting and support for scientific discoveries and inventions, and connects researchers with industry partners such as Johnson & Johnson and GlaxoSmithKline. OCR also manages the Yale

Entrepreneurial Center and the Blavatnik Fund for Innovation at Yale, which bridges the gap between "innovative, early-stage life science research and successful development of high-impact biomedical products."

The smaller scale of research at other institutions makes it more difficult to support commercialization infrastructure. Five other universities have IP policies and support discoveries with ad hoc services using outside consultants.

Examples of Multi-University Consortia:

Georgia Research Alliance. GRA is a nonprofit organization that works with Georgia's Department of Economic Development and universities to seed and shape startup companies that come out of university research. Partners include the University of Georgia, Augusta University, Emory University, Clark Atlanta University, Georgia Institute of Technology, Georgia State University, Mercer University and Morehouse School of Medicine.

Ohio Research Network. The Ohio Federal Research Network leverages the strength of 10 world-class public and private research universities, industry and four federal labs to help revitalize the state's economy for the 21st century.

ICorps Nodes. Unlike ICorps Sites, Nodes are multi-university consortia that support regional needs for innovation education, infrastructure and research. Both Sites and Nodes are part of the National Science Foundation's National Innovation Network, created in partnership with VentureWell. Regional Nodes are found in Massachusetts (MIT, National Collegiate Inventors and Innovators Alliance) and New York (CUNY, Cornell).

Southern Tier Startup Alliance. The Southern Tier Startup Alliance is a consortium of university, state and business incubators in southern New York with the purpose to support growing companies in the region. The incubator partners include Cornell University, Binghamton University, Rev in Ithaca, Corning Ceramics Corridor Innovation Centers, Ithaca Start-up Works and The Center.

Virginia Innovation Partnership. Funded as part of the U.S. Department of Commerce's i6 Challenge in 2012, the Virginia Innovation Partnership brings together 17 universities and community colleges with corporations, investment capital and other resources. The partnership has a yearly goal of funding 20 projects at the $40,000–$80,000 level, or about $800,000 a year.

Ben Franklin Technology Partners. Ben Franklin seeds innovation and economic growth in the Greater Philadelphia region. The partnership has invested $170 million, launched over 1,750 companies and created 3,900 jobs since 2001. Partners include 29 regional university partners.

A flourishing higher education E&I system needs the same resources as a startup company: access to dense communities and networks of like-minded individuals, a strong network of mentors, and a structured "accelerator program" to help it tap into resources and funding to grow, test and broaden its market reach. There are examples of existing partnerships that all point to a growing higher education network in the state. A network with many nodes but limited connections, however, is more accurately a collection, not a network. In the following section, the Working Group establishes goals and recommends initiatives and funding priorities that can

broaden and deepen the statewide community, strengthen relationships, build up resources that help the system grow, and engage more deeply with the state's critical economic development needs.

Part 3. Roadmap: Goals, Initiatives and Funding Priorities

The Working Group was tasked with identifying initiatives that facilitate collaboration and cooperation among institutions of higher education on projects that address and strengthen innovation and entrepreneurship, and identifying funding priorities for higher education entrepreneurship grants-in-aid, as outlined in Public Act 16-3. The goals are designed to establish the larger strategic imperatives of this roadmap and highlight the urgency for stronger higher education engagement and alignment with the state's economic development goals, challenges and opportunities for growth. Goals include preferred grant criteria that the Working Group would like to see used to help determine whether proposals are addressing the strategic goals. The two initiatives and their respective funding priorities establish the Working Group's desire for stronger relationships between institutions and the expansion of the E&I ecosystem among the state's colleges and universities. Recommendations are a "roadmap," and not intended as a prescriptive list of programs or specific partnerships or collaborations.

Goals

The Working Group established four goals to ensure that projects are created that advance the state E&I ecosystem .

Goal 1. Establish Collaboration & Partnerships

Building a robust ecosystem for entrepreneurship and innovation in Connecticut requires cooperation and collaboration among the state's institutions of higher education. Partnerships provide a powerful mechanism for tapping into existing assets and scaling up limited resources. They also empower a shared sense of purpose, and create a stronger community of students, faculty, researchers and administration.

Preferred Grant Criteria

- <u>A minimum of two higher education applicants per proposal, preferably one public and one private;</u>
- Partnering with non-higher education organizations involved in local, regional, or state-wide entrepreneurship and innovation; or
- Create regional or state initiatives that support all institutions of higher education or a significant subset with aligned interests (such as a state-wide intercollegiate business plan competition); or
- Expand leadership and peer networks to promote state-wide cooperation and collaboration.

Goal 2. Engage the 21st Century Economy

Higher education institutions are a major economic force in Connecticut, providing jobs and services as well as serving as the wellspring of the state's workforce. Today, like every economic sector, higher education faces disruptions and challenges due to global economic trends, national policies and technological innovation. By 2020, 70% of jobs in the state will require post-secondary degrees, and those jobs need new skills to compete in the 21st-century economy. The state's fastest-growing industries, such as healthcare/bioscience and digital media, as well as crucial "Main Street" businesses—our local, established businesses typically with 50 employers or less—need entrepreneurial skills, and the state's economic success depends on their continued growth.

Preferred Grant Criteria

- Encourage student and faculty innovation in growth-oriented industry clusters (identified in the 2016 Connecticut Economic Development Strategic Plan): health/bioscience, insurance and financial services, advanced manufacturing; digital media; and green technology; and/or,
- Support the vitality of Connecticut's "Main Street" businesses by catalyzing entrepreneurship skills and mindsets at the 'academy' for the benefit of local and regional communities.

Goal 3. Educate an Innovative Workforce

Achieving the dream of opportunity and social mobility in 21st-century America means adapting to trends like the growth of STEM jobs (6.2% of all U.S. employment in 2015) and the impact of technological innovation on traditional business models. Preparing students to navigate this environment requires a culture that fosters entrepreneurial and innovative thinking. The 2015 Strategic Master Plan for Higher Education in Connecticut laid out the essential skills ("educational outcomes") required for an innovative workforce: inquiry and analysis, critical and creative thinking, written and oral communication, quantitative literacy, information literacy, and teamwork and problem solving.

Preferred Grant Criteria

- Expand E&I Community of Practice to strengthen knowledge sharing, collective learning, and resources for staff and faculty; and/or
- Increase E&I educational pathways and integrate E&I more broadly across institutions; and/or
- Enhance non-credit learning environments and programs that support budding entrepreneurs; and/or
- Expand local mentor programs that inspire and support the entrepreneurial spirit.

Goal 4. Expand 'Development' Infrastructure

Historically, U.S. research universities played a major role in stimulating innovation through basic research while private industry–dominated R&D. Applied research development at universities has grown steadily since 1980 (through the Bayh-Dole Act), and tech transfer is now a major pathway for connecting universities with industry partners. New companies and partnerships that result from university R&D support the local economy and entice students and researchers to live locally. Connecticut, with two R1 universities, 18 of the Fortune 500 companies and a workforce ranked among the top five for education in the country, takes advantage of these opportunities. However, capitalizing on the statewide economic potential of research requires additional infrastructure and resources to identify products and promote faculty entrepreneurialism.

Preferred Grant Criteria

- Create state-wide faculty/staff resources to encourage knowledge sharing; and/or,
- Promote academic cultures of entrepreneurship; and/or,
- Expand access to commercialization infrastructure for all academic researchers, including proof of concept support and technology transfer services.

Initiative & Funding Priorities

The Working Group selected two initiatives with respective funding priorities that will build relationships and increase statewide capacity.

Initiative 1: Communication and Building Relationships

Working Group members acknowledged that linkages between higher education institutions are uneven and often missing. Inter-institutional relationships must overcome institutions' natural focus on their mission and, despite the small size of the state, entrenched regional cultures and limited public transportation networks. Building stronger peer relationships creates the necessary conditions to encourage new collaborations for capacity building, the second priority of the group.

> **Initiative 1: Communication & Building Relationships**
>
> **Priority 1:** Face-to-Face Convenings
> **Priority 2:** Peer Knowledge Networks
> **Priority 3:** State-wide 'Portal' for Higher Education

Priority 1. Face-to-Face Convenings

Members suggested regular, more structured networking and learning platforms for face-to-face peer interactions. These events should capture as many participating institutions as possible to broaden relationships and help build a statewide culture of entrepreneurship. A broader network, in turn, will lead to new ideas for partnerships and opportunities for students and researchers to meet and explore collaborations beyond their respective institutions. Preferred initiatives include: formal state conferences (multi-track), regional symposia and thematic workshops. Examples of best practices include the Ashoka Foundation Exchange, the Global Entrepreneurial Summit and SXSW.

Priority 2. Peer Knowledge Sharing

A key driver of capacity development is knowledge sharing. There is incredible diversity and knowledge embedded at institutions across the state, but limited means for sharing best practices or resources to help educators learn how to integrate E&I into their curriculum, in their departments or across their campuses. Opportunities to attend educate-the-educator conferences and training, as well as increasing peer-to-peer interactions, will help sustain and build upon the new collaborations or partnerships. Educate-the-educator best practices are exemplified by the Babson College Hub for Entrepreneurship.

Priority 3. State-wide 'Portal' for Higher Ed Resources

Although many institutions have created their own institutional portals, there is currently no statewide portal for all higher education E&I assets and programs in the state of Connecticut. The Working Group agreed that a statewide platform would help foster awareness and collaboration as well as communicate to prospective students, researchers and companies the breadth of Connecticut's E&I ecosystem. Examples of best practices include the Yale Entrepreneurial Institute, the Connecticut Center for Entrepreneurship and Innovation at UConn, Harvard's iLab and NYU Entrepreneurship.

Initiative 2: Building Capacity through Collaboration

Initiative 2: Building Capacity Through Collaboration

Priority 1: Mentor Programs
Priority 2: Regional Hubs
Priority 3: Innovation Education
Priority 4: Commercialization Infrastructure

The E&I ecosystem in Connecticut is a network of networks, with extensive institutional programs found around the state. Building capacity through collaboration allows institutions to take advantage of economies of scale and invest in programs or assets that would otherwise be difficult to support or expand separately. Underserved populations gain access to services and resources, and new pathways open up to support new business ventures and innovative ideas across the state.

Priority 1. Mentor Programs

Recruiting and maintaining strong mentor networks is invaluable for supporting entrepreneurs and innovators. Higher education institutions have the unique capability of tapping into deep alumni networks and industry experts locally, nationally and internationally. The benefits extend from students and scientists to the university at large, which can benefit from drawing alumni networks back to campus to work with students or new ventures. Programs could include monthly "coffee with an entrepreneur" events; periodic legal, tax and leadership advice; commitments to incubators/accelerator programs; or one-on-one mentoring. Critical to any mentor program is a carefully crafted system to vet, match and manage mentors to ensure alignment of skills and expectations with startup needs. Preferred initiatives: licensing and training for faculty and staff, expanding industry mentor programs to more institutions. Examples of best practices include: MIT Venture Mentoring Service, Blackstone Launchpad at NYU and GRA Ventures. Mentor programs also bring alumni back to campus and engage them with current students, which has significant value for development and admission offices. Increasing local bonds with students also helps convince them to stay in the area after graduation.

Priority 2. Entrepreneurship & Innovation Education

By being more entrepreneurial in their academic and administrative practices, universities can help students become independent and innovative risk-takers. The more comprehensively students encounter entrepreneurial concepts and behaviors in their college experience, the more likely they are to assimilate them. A more explicit educational focus on innovation and its implementation—in ways that respect the integrity of the varied academic disciplines—would help encourage university faculty and academic departments to adopt, apply and assess methods of teaching and learning that foster creativity and originality. Examples of best practices include Baldwin Wallace Center for Innovation and Growth (KCI), Purdue University Burton D. Morgan Entrepreneurship Center, Oberlin College Creativity and Leadership (KCI) and Lean LaunchPad (VentureWell).

> *"The teaching of entrepreneurship has moved from the margins of higher education closer to the mainstream, developing rapidly."* Kauffman Foundation, Entrepreneurship Education Comes of Age on the Campus (2013)

Priority 3. Regional Hubs

Regional hubs can serve as "one-stop" centers and support a regional "feeder" system. Entrepreneurial centers are physical hubs dedicated to building the E&I community through shared equipment, services and programming and the happenstance of opportunity that occurs when you have a dense hub of like-minded people. In addition to leveraging limited funding at separate institutions, shared facilities can help students and researchers engage with the community beyond campus, encouraging them to explore and stay after graduation. Regional hubs can function as part of a statewide "feeder system." After students and researchers with business plans grow beyond the services offered at their respective institutions, regional and state hubs offer advanced venture support services and can connect them to other state and national networks.

Hub ideas include regional or joint makerspaces, joint hubs with non-academic organization partners, programs that connect the local community to students and services (e.g., high school students), and programs that encourage interaction through experiential learning and problem solving. "Feeder" hubs include venture support services such as fellowship programs, incubators and accelerators. Hubs may also be largely programmatic, organizing events such as statewide business plans, conferences, or workshops. On-campus examples include the Harvard iLab, New York University Berkeley Innovation Labs, and the Yale Entrepreneurial Institute. Regional examples include the MIT Regional Entrepreneurship Acceleration Program (MIT REAP), the Innovation Institute at Mass Tech and non-profits such as Base 11, which "connects employers, academic institutions, and entrepreneurial opportunities with high-potential, low-resource students".

Priority 4. Shared Commercialization Infrastructure

The ability to promote technological innovation at higher institutions is highly dependent on the capacity to demonstrate the commercial potential and market value of a discovery. Successful business plans and commercialization strategies require timely identification of IP, an ability to determine patentability and market opportunity, and access to early funding. Preferred initiatives include:

- Proof of concept funding that fills gaps between demonstrated research potential and commercialization feasibility.
- Expanded statewide commercialization infrastructure, including technology transfer services: IP policy training, technology transfer services, statewide business mentoring opportunities for scientists, partnering events to support formation of commercialization teams and training, and incubator support that promotes access to R&D infrastructure (core research facilities) statewide.

Measuring Impact

The urgency to improve the E&I ecosystem is tempered with the knowledge that new relationships and collaborations take time to develop and grow strong roots. These grants are intended to serve as catalysts for sustainable change, so how well these roots take hold and affect the entrepreneurial culture and economic base of the state is an important issue. Researchers admit there are no standard qualitative or quantitative metrics for the whole system. Proxies for research commercialization, such as patents or new companies per year, can be used to estimate the impact of research universities and technology transfer efforts. To gauge student interest and access to education, the growing attendance of courses, events, and conferences could be used.

A baseline study, starting with the data collected during this report, is recommended to establish a set of reporting metrics that are aligned with criteria and funding priorities. Examples for measuring increased communication, relationships and network density include user engagement with a state higher education portal each year, surveys of E&I faculty and staff, the increase of face-to-face convenings and events involving multiple institutions, or the growth of professional networks. Examples of measuring collaborations and partnership impacts could include the number of students from multiple institutions attending events, or the outputs of increased access to commercialization resources such as number of patents from non-research universities, or increases in institutional policies that incentivize faculty entrepreneurship.

Part 4. Unexpected Outcomes

As part of the conversations around funding priorities, Working Group members consistently raised three issues that have direct impact on the success not just of this roadmap and its ability to catalyze sustainable impact, but the role of higher education in Connecticut's communities and economy. These issues fall outside of Public Act 16-3's grant program, but are important because they reflect the Working Group's recognition that education, innovation, entrepreneurship, culture and the economy interact in multiple ways and should be addressed holistically.

Higher Education Presidential Leadership

The first meeting of the Working Group was a historic moment: the first remembered meeting of Connecticut's higher education presidents all in one room. By the fourth session, attendees all agreed that sustained regular leadership convenings would be invaluable not just to discuss entrepreneurship and innovation, but to build stronger relationships and to discuss higher education engagement in strategic issues that impact the state at large. The presidents and their senior staff agreed to continue discussing how to form an annual "Presidents Assembly."

Connecticut's Innovation Identity

The Working Group raised concerns around the state's real and perceived lack of "entrepreneurial culture," by citizens and the world at large. Connecticut's "culture of entrepreneurism" and the story of ingenuity and innovation as a core element of Connecticut's history and "identity" needs to be strengthened. Today, the story of Connecticut's innovators, entrepreneurs, and talent is frequently not loud enough to be heard over the success stories coming out of New York City and Boston. Working Group members also admitted that they did not always know what was going on at other institutions around the state and were often surprised at the quality and quantity of great ideas being generated by Connecticut's students and faculty. The story of Connecticut's higher education ecosystem, therefore, could also benefit from a statewide communications campaign. Group members identified a couple of next steps to address these concerns:

- Tell the story of innovation and entrepreneurship in the state, specifically at higher education institutions, more loudly. Great storytelling also helps create a shared culture and community. With community comes a shared sense of purpose that sparks new relationships and collaboration ideas, creating positive feedback loops that sustain and grow the community. A communications strategy that includes stories

out of the state's colleges and universities can raise Connecticut's profile as an entrepreneurial and innovative state with its citizens, as well as nationally and globally.

- Increase state leadership and support for higher education's critical role as nodes in the E&I ecosystem. Consider ways to expand Connecticut Innovations and CTNext collaboration with higher education institutions. This could take the form of dedicated initiatives, staff that can support higher education coalitions, and strategies to increase communication and website linkages to higher education, such as the dedicated website portal listed in the funding priority section. Other ideas include expanding support for higher education and private-sector collaborations and new venture-friendly business policies.

E&I Leadership Infrastructure

During meetings, the Working Group emphasized the need for long-term sustainable leadership structures. The state cannot afford for new collaborations to die on the vine or languish as well-intentioned pilot programs. The urgency of transforming Connecticut's economy requires higher education leadership beyond five-year funding programs, and commitments to integrate within the state's E&I ecosystem and economic development strategies. The group discussed, but did not decide on, ways to shape a multi-institutional leadership framework, debating the merits of bottom-up and top-down approaches that could engage senior administrators, faculty and students. Ideas included but were not limited to: a state convener or convening body, a standing administrative working group and/or network to champion campus E&I, expanded faculty and staff networks to create and sustain new partnerships and collaborations, and finally, more ways to engage students as state leaders. Working Group and Planning Committee members agreed to continue discussions and formulate a preferred framework this year.

Conclusion

Connecticut is extremely well positioned to support entrepreneurs and innovation. The state has an exceptionally well-educated workforce, a strong cadre of advanced technology companies, and a high quality of life ranking, and institutions of higher education that are committed to supporting Connecticut's innovation ecosystem. The Working Group was encouraged to learn of higher education's collective power and immense potential to cultivate and strengthen innovation and entrepreneurism across the state. What we lack in density can be made up for by our diversity, and our abundance of rather fledgling activities can be made up with the same qualities found in our state's entrepreneurs: determination, confidence, and a willingness to take risks, learn from our mistakes, and keep going. Our four goals are bold because the continued vitality of our state and our institutions demand bold vision and swift action coupled with strategic insight and acceptance that new collaborations and a strong culture of innovation takes time. There is no better time to start than now.

Goal 1: Establish Collaboration & Partnerships. Partnerships provide a powerful mechanism for tapping into existing assets, empowering a shared sense of purpose, and creating a stronger community of students, faculty, researchers, and administration. <u>The Working Group agreed that proposals for grants-in aid should all include a minimum of two higher education applicants, preferably one public and one private.</u>

Additionally, proposals may consider partnering with non-higher education organizations involved in local, regional, or state-wide entrepreneurship and innovation; creating regional or state-wide programs or initiatives

that support all institutions of higher education or a significant subset with aligned interests; or, expand leadership and peer networks to promote state-wide cooperation and collaboration

Goal 2: Engage the 21st Century Economy. By 2020, 70% of jobs in the state will require post-secondary degrees. The state's economic success depends on the continued growth of companies that need this educated workforce. Applicants for grants-in-aid should consider ways to encourage innovation in growth-oriented industry clusters such as health/bioscience, insurance and financial services, advanced manufacturing, digital media and green technology; or ways to support the continuing vitality of Connecticut's "Main Street" businesses by catalyzing entrepreneurship skills and mindsets at the 'academy' for the benefit of local and regional communities.

Goal 3: Educate an Innovative Workforce. Achieving the dream of opportunity and social mobility in 21st century America requires preparing students to navigate new challenges, and a culture that fosters entrepreneurial and innovative thinking. To help achieve this goal applicants should consider: Expanding the E&I Community of Practice to strengthen knowledge sharing, collective learning, and resources for staff and faculty; Increasing E&I educational pathways and integrate E&I more broadly across institutions; Enhancing non-credit learning environments and programs that support budding entrepreneurs; And, expanding local mentor programs that inspire and support the entrepreneurial spirit.

Goal 4: Expand 'Development' Infrastructure. Historically, U.S. research universities played a major role in stimulating innovation through basic research. Applied research development at universities has grown steadily since 1980 and tech transfer is now a major pathway for developing new companies and partnerships that result from university R&D. These efforts support the local economy and entice students and researchers to live locally. Applications focused on this goal should consider: Creating state-wide faculty/staff resources to encourage knowledge sharing; Promoting academic cultures of entrepreneurship; or, expanding access to commercialization infrastructure for all academic researchers, including proof of concept support and technology transfer services.

In pursuit of these goals, the Working Group outlined two broad initiatives, each with suggested funding priorities to be supported by the five-year, $10 million grants-in-aid program adopted in Public Act 16-3.

1. Communication and Building Relationships. This initiative grew out of the collective recognition that two current issues that need remedying: 1) institutions tend work in relative isolation from each other, and 2) Connecticut's geography and largely suburban structure makes networks difficult to develop and sustain. Recommended funding priorities to improve these issues are: Face-to-Face Convenings; Peer Knowledge Sharing, and State-wide portal(s) for knowledge sharing.

2. Building Capacity Through Collaboration. The second initiative evolved through consultations with the institutions of higher education about their work in entrepreneurship and innovation. This initiative identifies priorities that will catalyze inter-collegiate relationships and contribute to strengthening the entire state E&I ecosystem. Recommended funding priorities are: Mentor Programs that increase industry and alumni support; E&I education to spark and support new ideas and entrepreneurs; Regional Hubs that support a regional and statewide "feeder" system; and, Shared commercialization infrastructure to support research discoveries.

The Working Group's largest take-away from this process is the potential of the combined power of our institutions, and our capacity to be the gateways and hubs for innovation across the state. No program, initiative or project can tackle these goals single-handedly. However, these recommendations serve not just as a roadmap for evaluating an grant-in-aid application's ability to address Section 27 of Public Act 16-3, but to inspire a cultural shift and a call-to-action. Higher education leadership and collaboration in innovation and entrepreneurship is an extraordinary opportunity to creating sustainable solutions that can tackle challenges such as demographic shifts, the changing nature of work, and the growth of knowledge-based industries. Each of our institutions offer important contributions to this vision of an innovative and entrepreneurial Connecticut: whether large or small, private or public, 4-yr or 2-yr, through our collective mission to teach, research and serve we are all building Connecticut's future, together.

"If we teach today's students as we taught yesterday's, we rob them of tomorrow."
John Dewey, 19th Century Educational Reformist

Appendix

A. Acknowledgements

Thank you to all the colleges and universities who attended the Working Group Meetings and contributed to this report.

Consolidated List of All Participating Institutions	
Albertus Magnus College	Northwestern Connecticut Community College
Asnuntuck Community College	Norwalk Community College
Capital Community College	Penn Institute for Urban Research
Connecticut Conference of Independent Colleges	Post University
Central Connecticut State University	Quinebaug Valley Community College
Charter Oak State College	Quinnipiac University
Connecticut College	Rensselaer Polytechnic Institute
CT General Assembly	Sacred Heart University
CT Innovations	Southern Connecticut State University
CT State Colleges & Universities	St. Vincent's College
CTNext	Three Rivers Community College
CT Department of Economic and Community Development (DECD)	Trinity College
	Tunxis Community College
Eastern Connecticut State University	University of Bridgeport
Fairfield University	University of Connecticut
Gateway Community College	University of Hartford
Goodwin College	University of New Haven
Housatonic Community College	University of Saint Joseph
Manchester Community College	Wesleyan University
Middlesex Community College	Western Connecticut State University
Mitchell College	Yale University
Naugatuck Community College	

B. State Inventory by Institution

Albertus Magnus College
New Haven

Interested students at Albertus Magnus College can find support services at the Center for Teaching and Learning Excellence as well as a variety of mentor and internship opportunities through the Career Services Department. Wayne Gineo currently serves as the Entrepreneur in Residence. Recent campus events included an Experimental Learning Day where students were able to network with alumni and faculty as well as show off their projects. Albertus Magnus offers a bachelor's degree in management with an entrepreneurship concentration. Various course offerings focus on the management and the development of small business, and students also have the opportunity to join the student-run Business Club.

Asnuntuck Community College
Enfield

ACC's Business Administration department has partnered with the Connecticut Small Business Association to offer no-cost seminars and a few credit-free classes for local small business owners. Through the Advanced Manufacturing Program, ACC collaborates with local manufacturers to provide students with on-the-job training. ACC hosts an event series called Career Chats with Cat in which students can network and hear about ways to improve their business skills. In the past, the Advanced Manufacturing department worked with local businesses to create aerospace parts, which led to the department purchasing additional equipment that generates revenue for the institution. Students will have access to a variety of equipment at the Advanced Manufacturing Technology Center, which is currently under construction and slated for a spring 2017 opening. Internships can be obtained through the Career Services Center. ACC offers an entrepreneur certificate and a business administration associate degree.

Capital Community College
Hartford

Students at CCC have the opportunity to get involved with the Hartford Heritage Project, which partners with local businesses and projects in the surrounding Hartford area. CCC has a partnership with Guardian Insurance and opened the Financial Independence to Reach Success and Transformation (FIRST) Center, which provides the community with financial education, coaching, information and referral services, as well as internships for low- and moderate-income individuals. Students receive hands-on experience and can seek mentors through this project and at the Advising or Career

Services offices. CCC students can pursue an associate degree in management with an entrepreneurship concentration.

Central Connecticut State University
New Britain

CCSU's Institute for Technology and Business Development, located in downtown New Britain, serves as the university's incubator center. The institute provides a variety of support services to both the local community and students. Faculty in the Entrepreneur-in-Residence program, specifically Mike Nicastro (EIR), can also provide guidance and connections to resources, both internally and externally, for all curious students. Students at CCSU have the opportunity to participate in the annual Shipman & Goodwin Elevator Pitch Contest, an event that challenges students to come up with a pitch for a business and deliver it in a short period of time with no visual aids to a panel of judges. CCSU offered an intensive for-credit Entrepreneurship Program course during the summer of 2016. CCSU provides cash prizes and in-kind services to students starting businesses through an internal business plan competition, and students also have the opportunity to participate in the statewide Connecticut Collegiate Business Plan Competition, offered in partnership with the Connecticut Consortium of Entrepreneurial Educators. In addition, students have the option to join the Entrepreneur Club.

CCSU offers a bachelor's degree with a management–entrepreneurship concentration through the School of Business. Students complete specific entrepreneurship courses that focus on the management of small business. Resources to develop business plans are available through the School of Business's Service Center, and all students can seek internships as well as mentors through the institution's Leadership Development Program.

Charter Oak State College
New Britain

Charter Oak State College offers an online bachelor's degree in business administration with a small business concentration. Because Charter Oak is an online college, students have the opportunity to be instructed by a variety of professors with real-world business experience. Charter Oak has launched products such as eTutoring.org and ePortfolio that were designed, produced and marketed by the school. The college has also created and sold both versions of the eTutoring software and versions of a learning management system for an online K-12 high school. Career advancement services are managed through the College Unbound Program as well Career Services. Students can network at various fundraising events hosted throughout the year and join the Student Association.
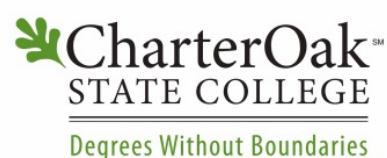
Connecticut College
New London

Connecticut College offers extensive opportunities and resources for students interested in starting their own businesses. At the institution's Holleran Center for Community Action and Public Policy, students can find a variety of resources to develop social entrepreneurship ideas as well as attend hosted events, such as the daylong LaunchPad event about entrepreneurship, innovation and socially impactful design. Students can join the Launch Club Organization if they are interested in meeting with like-minded student entrepreneurs. Conn College's fully funded summer internship program allows students to get hands-on job experience with a variety of different organizations and businesses. Conn College manages an extensive network of alumni entrepreneurs and provides opportunities for students to interact with these alumni. Obtaining an economics degree will give students the skill set to analyze how markets function.

Eastern Connecticut State University
Willimantic

ESCU partners with various state entrepreneurial organizations and has a campus Entrepreneur Club. ECSU's Center for Community Engagement helps students to connect with their local community through volunteer services as well as meet local business owners. The institution also provides key faculty in various disciplines to serve as mentors both inside and outside of the business school to help develop entrepreneurial concepts. The Business department and Career Services department have programs that connect students with business mentors on and off campus.

ECSU has an active collaboration with the Northeast CT Economic Alliance, a regional nonprofit 501(c)3 economic development corporation that uniquely serves small businesses in northeast Connecticut by providing loans to new and existing businesses primarily unable to obtain funding from traditional lending sources, and houses these offices on campus. In addition, ECSU collaborates with the local chamber of commerce and business, and provides loans and business development resources to both startup and existing businesses in the 21-town region of Northeast Connecticut. ECSU hosts a campus work hub of a major insurance company that provides students with paid jobs and valuable business experience. The Business department hosts various lectures and events throughout the year that can help students develop their skills and give them the opportunity to learn from the local business community.

ECSU is grounded in a liberal arts experience and seeks to offer students a variety of learning experiences in the hopes that they will learn to think independently, a crucial skill for the entrepreneur. The Liberal Arts Work program further provides students with valuable work experiences. ECSU's Center for Internships and Career Development also offers students the opportunity to complete internships and a chance to work with

established co-ops and campus partners. ECSU offers a bachelor's degree in business administration, and students in their third and fourth years can take advanced courses such as Business Concepts and Entrepreneurial Applications.

Fairfield University
Fairfield

Fairfield University's Startup Program is a year-long program of events and lectures designed to foster young entrepreneurial talent at the university through engagement with mentors and investors drawn from alumni and local business communities. Fairfield's Startup Program offers support services for up to five or six student-run ventures per year. The program culminates each year with the StartUp Showcase, where students negotiate live with investors for seed money to start their businesses. Various events include a pitch contest, a business plan competition and the opportunity for students to meet and network. Fairfield also has a Business Education Simulation and Trading Classroom that gives students the experience of interacting with the business world through a variety of computer based software programs.

Fairfield University Entrepreneurship Laboratories (FUEL), housed on campus, is a co-working space and accelerator program serving Fairfield University and Town of Fairfield communities. Since its founding in 2013, FUEL has been home to over a dozen small companies. Current companies in residence are Cometa Works, Crowdflik and eSolutionsOne. FUEL also offers office space and mentoring to Fairfield StartUp companies in the FUEL Summer Fellows program. FUEL has generated 10 full-time jobs, $500K in investment, 14 partnerships and over 20 student internships to date. Fairfield has heavily developed technology transfer systems that have helped faculty to further patent and develop their concepts. Fairfield has created a rich symbiotic relationship with its host town and fully engrained itself into the local community through work with the local police department, bookstore and chamber of commerce. FUEL's openness to serve both the local community along with the campus has been critical to its success. Fairfield leverages a serial Entrepreneur in Residence and an Investor in Residence (both alumni) to further the institution's efforts to foster entrepreneurial spirit within their community.

Students can obtain internships through the Professional Development Program as well as seek out mentors at the School of Business. Students can also interact with their like-minded peers at the Entrepreneurship Club. Curious future entrepreneurs can pursue a management bachelor's degree with a minor/concentration in entrepreneurship at the Charles F. Dolan School of Business. The School also helps provide internships and encourages most students to complete at least one during their undergraduate studies A deep variety of management courses are available, including Managing a Family Business and Technology Ventures.

Gateway Community College
New Haven

Gateway Community College delivers extensive programs and services that provide a synergy of entrepreneurial and innovation-based experiences for the students. Gateway offers an entrepreneurship-related associate degree which seeks to prepares students to approach innovation and entrepreneurship as vital elements in their emerging career. In addition, the programing at Gateway's Resource, Education and Training Center (GREAT Center) offers sequenced, non-credit-based courses in business and leadership.

To these ends, The GREAT Center offers fast paced training in high-growth occupations and builds customized programs to suit the scheduling, budget and professional development needs of local business. The Center streamlines specific training services that are essential to running a business.

Complementing these services are also innovative courses and entrepreneurial programs delivered through the college's academic division. A variety of business, management, and communication courses deliver essential skills needed for running a business. The college also offers hands-on experiences that permit students to apply learned skills through Gateway's Leadership Development Program and the Students in Free Enterprise organization on campus.

Students can also utilize the Small Business Center where they can network and find resources for developing their entrepreneurial concepts. Gateway's Small Business Center Workshops are offered all year long through its collaboration with New Haven SCORE. SCORE provides a variety of resources to help student concepts get off the ground.

SCORE's workshops focus on topics such as Business Planning, CT Tax Regulations, Insurance, Legal Considerations, Financing, Marketing, Bookkeeping, and Websites. Students can also attend Pre-Business Workshops and can benefit from SCORE's partnerships with organizations like the Veteran's Association Vet Biz, Small Business Association, Women Entrepreneurs, the City of New Haven, and Yale University's Computer Science Department. Through these collaboration students also have the opportunity to be assigned mentors in the local business community and attend a variety of business-related events.

The variety of business and management experiences offered by the college empower Gateway's aspiring entrepreneurs to acquire the skills needed to run a business and achieve an associate degree in entrepreneurial studies, signaling their readiness to engage and grow Connecticut's small business community.

Goodwin College
East Hartford

Goodwin College houses the bulk of its entrepreneurial programming within the Business and Manufacturing Center, which opened in 2015. This 60,000-square-foot facility houses classrooms, technology space, specialized labs, CNC and quality training labs, as well as a collaboration space for students. The hallmark of the center is the Advanced Manufacturing Mobile Training Lab, which has partnered with the State of Connecticut Department of Economic and Community Development (DECD), the Connecticut Center for Advanced Technology (CCAT) and Pratt & Whitney. The lab has also visited the many of the state's technical middle and high school, offering seminars and service learning experiences. Future plans for the Training Lab include creating a makerspace and a formal incubator center.

In the past Goodwin has hosted the CT Invention Convention as well as the Startup Weekend: Education. In addition to these events, the college currently sponsors the Vital Voices: The T. Boone Pickens Endowed Lecture Series in Education, Innovation, and Entrepreneurship. Guest speakers included Onyx Moonshine's co-founders who are owners of this local Connecticut startup. Goodwin is also involved with the Connecticut Manufacturing Advisory Council. Students can find a variety of resources as well as seek out internships and mentors at the Career Services Office. Goodwin has a unique student-run Women Achieving Voices of Empowerment (WAVE) Club that is dedicated to helping women find mentors and creating networking opportunities.

Goodwin College offers a robust Entrepreneurship Program through its Business Administration office, where students can pursue an associate's degree, bachelor's degree or certificate. It offers specific entrepreneurship courses that focus on management, communication, people skills, critical thinking, problem-solving and perseverance.

Housatonic Community College
Bridgeport

Housatonic offers two programs that include a business administration–small business management/entrepreneurship option (certificate also available) and an accounting–small business option associate degree. Students can join the student-run Business Club as well as participate in the annual Elevator Pitch Contest. Students looking to develop their skills can access internship opportunities at Career Services or participate in the Experimental Learning Program.

Manchester Community College
Manchester

Students can access a variety of networking events and workshops managed by the Viscogliosi Entrepreneurship Center. The Center provides entrepreneurs and small business owners with opportunities to explore and develop their passion and vision, and hopes to create responsible leadership and viable businesses through innovative, informative educational and networking programs. Students can also participate in the Voluntary Action Program, where they will connect with the local community as well as community organizers and businesses. Students at MCC have access to a variety of networking events and workshops available through the Academic Support Center. MCC also participates in the CONNTAC program, which can offer students additional career planning and mentorship opportunities. MCC offers a business administration associate of science degree with an entrepreneurship option as well as an entrepreneurship/small business certificate. Internships are managed by its Career Services office.

Middlesex Community College
Middletown

Students can pursue an entrepreneurship certificate program or a business administration associate of science degree at Middlesex Community College. Their certificate program has been sanctioned by the United States Small Business Association and helps students develop a combination of liberal arts skills and practical business management skills. The lead marketing professor at MXCC engages her classes in several marketing/fundraising events each semester, giving them the opportunity to learn about acquiring startup funding and gathering resources. MXCC is also involved with the Innovation Places program and has representation on both the Middlesex and MidState Chambers of Commerce. Resources are available for career development through the Self-Paced Career and Education Planning Tool program. Students also have the opportunity to get hands-on experience at the Center for Civic Engagement, which provides opportunities to work closely with the local community. MXCC also participates in the CT Make a Difference Week, which offers students further chances to connect within the community. Internships can be obtained through the Career Development and Counseling Center.

Mitchell College
New London

Mitchell offers a bachelor's degree with a concentration in business administration entrepreneurship. Students will take a variety of business-specific courses geared toward managing and operating a small business. Mitchell offers students a variety of resources at the Integrative Career Development Office, which partners with leading southeastern Connecticut organizations to enhance its academic programs and increase pathways to professional employment for students. Students can become members of the National Society of Leadership and Success, where further networking can occur.

Naugatuck Valley Community College
Waterbury

NVCC recently outlined a new strategic plan for the next 10 years that aims to further develop innovation-focused programming on campus. NVCC plans to expand seed funding for staff/faculty initiatives as well as other programming that supports innovation on campus.

NVCC is working closely with area partners on a variety of new initiatives. President Daisy Cocco De Filippis is currently serving as an adviser to the City of Waterbury on the "Waterbury Innovates Now" Innovation Places grant from CTNext. De Filippis is also a member of the Connecticut Technical High School System Board and works closely with Superintendent Nivea Torres and the technical high schools in the region to share space and ideas about partnerships. NVCC has a robust manufacturing program that is deeply connected to the local community. Through these partnerships many students have the opportunity to get involved with their manufacturers. The school is also helping to create a pipeline of workers that will support the development of these ventures.

NVCC hosts a lecture series called Campus Conversations, encouraging students to connect with a variety of people. By joining the Accounting, Legal, and Finance Club, students can meet like-minded peers. Job placement and internship services are handled by the Center for Job Placement and College Opportunities. NVCC offers an associate's degree and a certificate in business management. Students can join the Alpha Beta Gamma Business Honors Association, where networking and additional services can be accessed. Additional support services can be found at the Center for Academic Planning & Student Success.

Northwestern Connecticut Community College
Winsted

In the fall of 2017, NCCC intends to start a new Entrepreneurial Studies program. Students will be able seek out resources at the new Entrepreneurial Center of Northwest Connecticut and at the NCCC Center for Workforce Development. Programming at the center will include a boot camp as well as support services for students participating in various state competitions such as the New Venture Challenge. The NCCC advisory board for the Entrepreneurial Center of Northwest Connecticut has been meeting since the summer of 2016 to develop a vibrant and connected network of entrepreneurs throughout northwest Connecticut. The strategic goal is to connect established and new entrepreneurs to the ECNWCT and provide business development support, education and training to students and the community. Advisers include entrepreneurs, municipal governments, financial institutions, SCORE and the NWCT Chamber of Commerce. NCCC supports the ongoing efforts of the Northwest Connecticut Manufacturers' Coalition as well as other organizations and individuals considered to be key stakeholders in the area. Northwestern offers a business and management associate degree, and the courses are taught by professors with real-world small business experience. Students can seek out resources with ECNWCT. Faculty advisors handle the bulk of internship placement and additional student services are offered through Career Services.

Norwalk Community College
Norwalk

Norwalk has made a commitment to infusing the entrepreneurial mindset on campus through a variety of programming. It starts with their joint membership with the National Association of Community College Entrepreneurship (NACEE) and the Entrepreneurship Task Force of the Norwalk Community College Foundation. The task force consists of a mix of NCC faculty and board members from the Norwalk Community College Foundation. This task force meets monthly to discuss campus programming. As of 2016 the NCC Foundation is in the third year of sponsoring a pitch contest and a scholarship program for entrepreneurial-minded students. Screening for the scholarship is based on the student's ambition to open a business within 12 to 24 months of graduating. The 15 recipients are each awarded a full-year scholarship and up to six coaching sessions with a mentor who tasked with aiding the development of their concepts.

In 2016/17 Chip Weismiller, former owner of Ultra Pure a bulk distillery located in Connecticut, volunteered 20 hours a week for the purpose of helping to evaluate as well as mentor student entrepreneurs at NCC. He has established the five phases of concept development that offer a framework for students to develop their business ideas around. Additional programming at NCC comes in the form of an intensive Summer Entrepreneurship Institute that is offered to current students and alumni of NCC. At the institute students

will receive instruction on how to turn ideas into real businesse and earn a 30-hour certificate. Scholarships for this intensive are available for up to 15 students. A new "Fab Lab" is also in development, which will be managed by the new head of the engineering department and will serve as an incubator space on campus. Plans are in place for it to be open to the community and ultimately function as the Innovation Hub for the Fairfield County Community.

Norwalk offers a business administration degree geared toward a student who intends to transfer to a four-year institution, as well as an entrepreneurial studies certificate. Norwalk hosts a variety of alumni-student networking events that provide opportunities to make connections with business owners and the local community. The school offers every student the Start2Finish program, which can match students with mentors as well as provide training for skills needed to pursue career plans. Interested students can join the Accounting Club and find internship opportunities through the Department of Counseling.

Post University
Waterbury

Post University has an extensive faculty of former and current business owners on hand to help foster the entrepreneurial spirit on campus. Through their partnership with Nextt, students have access to a proprietary online platform where they can conduct an experiment to test business ideas. These experiments are designed to get student's ideas out into the world quickly and generate actionable data/feedback with minimum investment. Students have an informal network of advisory board members, faculty and alumni to seek as mentors as well as on campus events to connect with other like-minded students. The Robotics competition is currently in its third year and encourages teamwork and problem solving. Students at Post can pursue an entrepreneurial focused concentration in either the undergraduate or graduate level business degree programs.

Quinebaug Valley Community College
Danielson

QVCC faculty members participate in a Makerspace event at Woodstock Academy each year. QVCC believes that their Advanced Manufacturing Technology Program will be the most logical way for their students to hatch entrepreneurial ideas, and it has established the Eastern Connecticut Advanced Manufacturing Technology Center to function as a central hub for innovation and design. The center includes a machine lab, mechatronics and metrology lab, classroom, conference space and offices and offers training to both students and local manufacturers. Students at QVCC can pursue an associate of science degree in business administration: management. They will take a variety of business courses, such as BUS 218-Entrepreneurship, intended to help learn the skills necessary to open a small business. All internships and mentor services are managed by Career Services.

Quinnipiac University
Hamden

Quinnipiac University offers students access to an on-campus incubator at the Quinnipiac Center for Innovation and Entrepreneurship, through several resources and programs for students, faculty and alumni, the center aims to help turn ideas into viable business solutions. Quinnipiac offers the curious future entrepreneur multiple opportunities to compete at both on campus and national entrepreneurial competitions. QU's entrepreneurial culture embraces multiple disciplines, as the university has supported ventures outside the business school, including viable products created in both the Engineering and Medical Schools. Examples of concepts and products supported include a diagnosis system for pancreatic cancer, a cervical incontinent product, a Cryogenic cell prep device and a game to help young women chose birth control methods. In 2017 a QU student won the EO: Connecticut Business Competition and will represent the state at the nationals in Kansas City later this year.

Students at Quinnipiac University can pursue a bachelor's degree in entrepreneurship and small business management at the Lender School of Business. QU offers specific entrepreneurship courses, such as Business Plan Competition and Business Plan Creation. The university employs a number of staff who either currently or formerly ran their own businesses. Quinnipiac also has a variety of student-run clubs and organizations and a dedicated Career Services department in the School of Business.

Sacred Heart University
Fairfield

SHU's Jack Welch Business School offers a variety of hands-on learning opportunities for students, including the WCOB Innovation Center's Problem-Based Learning Lab. The Innovation Center was created to help establish connections within the local business community and give students an opportunity to network within these collaborations. SHU also offers students the opportunity to help manage the on-campus SHU Creamery, an ice cream bar and dairy. Recently, SHU acquired the former headquarters of GE and has plans to create an innovation campus that will focus on developing new technology, expanding STEM field studies and partnering with local healthcare providers.

The bulk of entrepreneurial-focused activity and events are managed at the Jack Welsh Business School. SHU also funds student-run businesses through the Welch Experience Program, where support is offered to students through the business creation process. Currently they have six businesses under their umbrella, with applications in review for two more. The Peak (ice cream shop and student lounge), Nantucket Buckets

(clothing and beach apparel), Twin Tides Clothing, Sonus Digital Music Remastering Software, Madely Clean (residential cleaning service) and Agora Bookshelf are examples of ventures supported by the institution.

An example of programming that introduces students to entrepreneurship early is the BU 121, Intro to Business, course offered each semester. During the semester, nine or 10 sections of the course run at once, and each section has five teams that compete with one another to be chosen as the finalist for that section. The nine or 10 finalists compete in a business plan presentation where they get to present their concepts to local investors/entrepreneurs. The remaining 36 to 40 teams all create posters and compete in a poster session competition where winners are chosen. SHU has multiple outlets that serve as incubator centers that offer students the opportunity to develop ideas. Along with the Welsh Experience, the school recently got involved with the Chrome Cherry, an international business incubator with a local office where students can intern and work with real-world business owners. SHU even recently became involved in a media promotion collaborative with the Town of Fairfield to help attract businesses to the Fairfield area.

Students also have the option to join the Entrepreneurship Club and must complete an internship as a core requirement for graduation. SHU manages a network of alumni entrepreneurs that students can interact with. SHU offers a small business management and entrepreneurship minor for declared business major students.

Southern Connecticut State University
New Haven

The Business Success Center as well as a new center in development through the School of Graduate Studies are locations of where students can find support services to develop their entrepreneurial concepts. SCSU offers a Professional Development Series, specifically designed for business students, that can help students find mentors and partner with local businesses. In addition, students can utilize the Business Advisory Council to find more resources on concept development. SCSU has established a close relationship with Mike Roer of the Entrepreneurship Foundation, who has helped consult on the development of some of SCSU's entrepreneurship initiatives. The School of Business regularly hosts networking and lecture events. Students at SCSU have the opportunity to also participate in the Connecticut Venture Capital Investment Competition, and there are a variety of student-run organizations, including the Accounting Society, American Marketing Association, Business School Student Ambassadors, Delta Mu Delta and the Finance Trading Team to join. Students can seek out internships with local businesses at the Internship Job Board located at Career Services in the School of Business. SCSU offers a bachelor of science in business administration at the School of Business. Students can choose from a variety of concentrations, including courses specifically geared toward the management of small business.

St. Vincent's College
Bridgeport

SVC is a nursing school that offers programming for students who want to pursue the business end of the medical profession with its healthcare management (online) certificate. Course work focuses on the management of various healthcare services and offices. Students also have access to a skills laboratory as well as a Career Service Department that can help them obtain internships in this field. SVC offers a variety of Career Development Workshops as well as an extensive network of internship sites for undergraduates.

Three Rivers Community College
Norwich

Three Rivers offers a certificate and an associate's degree in business administration with a small business and entrepreneurial studies concentration. Students can access various resources at the school's Advising and Counseling Services Center. The school's Service Learning Center gives students the opportunity to interact with the community through a variety of nontraditional academic assignments and independent studies. Students also can join the student-run Business Club, where they can participate in campus events. Internships and mentors can be sought out at the school's dedicated Career Services Center.

Trinity College
Hartford

Trinity has many resources to connect students with the Hartford community, including a new downtown space in Hartford that will accommodate entrepreneurship programming. The space will be co-located within Trinity's planned new Liberal Arts Action Lab. The Community Learning Initiative and the Center for Global and Urban Studies provide further opportunities for students to work both inside and outside the classroom with active projects in the surrounding Hartford area. The Investment Club at Trinity College offers students the opportunity to work with a real investment fund and experience the impact of investing in various real-world companies. Trinity has also hosted a campus-wide Entrepreneurship Contest (2014) facilitated by the Career Services Department. Students had the opportunity to submit their ideas and

compete for a cash prize during this competition. Recently, Trinity got involved with the Innovation Places program, which seeks to create hubs where people can seek out the resources and space to open their own businesses. Trinity has an established minor in formal organizations with a track in entrepreneurship. Trinity's Career Services department can help students obtain internships as well as connect with mentors.

Tunxis Community College
Farmington
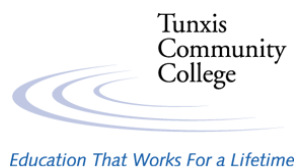
Students at Tunxis have access to a variety of resources through the Business Administration Department Advisory Committee, a group of professors assigned to provide resources for student growth. TXCC also has a mandatory Eportfolio Program and a Center where students can create the online portfolio. The portfolio program can also be used to pitch ideas to potential employers and investors. The student-run Business Club serves as an incubator center for students to interact with the local business community. The club manages a variety of events throughout the year both on and off campus. TXCC also offers a Job Shadowing/Mentorship Program so students can get real-world experience before graduating. Internships are available through the Business Administration Office. TXCC offers a business associate degree for students looking for the skills to manage a small business.

University of Bridgeport
Bridgeport

The University of Bridgeport supports entrepreneurship, innovation, intrapreneurship and related research through the Schools of Business, Engineering, Design and its Health Science Division which offer undergraduate, graduate, and PhD courses and concentrations in entrepreneurship, new technology venture creation, intellectual property, new product commercialization, finance, and business planning and related topics, as well as seed grants for related research.

The Division of Graduate Studies & Research provides leadership, guidance, management for sponsored University research, as well as seed money for early-stage research. Since 2008, the Division has assisted in the award of more than 31 faculty research grants. Grants have been awarded to faculty in engineering education, natural sciences, health sciences, business, and design and an increasing number of research teams are interdisciplinary.

The School of Engineering has quadrupled its sponsored research funding in the last few years. Select examples include: Applied Computational Fluid Dynamics; Sustainable Energy and Environment; Cloud

Computing; CNC Milling; Robotics, Intelligent Sensing and Control; Multi-Media Information Systems; Nanomaterials & Nano Biomaterials Engineering; PLC Controls & IC; Renewable Energy; Hybrid Unmanned Vehicles and Projectiles; Signal Processing and Wireless and Mobile Communications.

In 2010, UB, in partnership with CT Innovations, created the counties only university-based CTech IncUBator. The Student Entrepreneur Center (SEC) at The Ernest C. Trefz School of Business was co-located within the CTech IncUBator in 2015. The SEC has accepted 104 applicants to date, which has resulted in 10 legal businesses, of which 8 have gone to market. UB also hosts business plan competitions, pitch competitions and the Annual Research Day.

A new Student Innovation Center (SIC) opens in 2018 and will include a student entrepreneur center, international trade office, alumni incubator space, professional assistance office and a makerspace with equipment including photo/film green screen, wet and dry labs, and a 3d-printer. The SIC will be staffed with a dedicated director and will support students with local entrepreneurial mentors and professional services.

University of Connecticut
Storrs

The University of Connecticut offers students a wide array of entrepreneurial programs and innovation services. For example:

- Technology Commercialization Services is the University of Connecticut's technology transfer enterprise and has successfully launched over 50 companies. As part of the Office of the Vice President for Research, TCS works closely with internal and external stakeholders, and maintains a particularly close affiliation with the UConn School of Business's Center for Entrepreneurship and Innovation (CCEI) to jointly operate Accelerate UConn, the UConn National Science Foundation (NSF) Innovation Corps (I-Corps) Site. TCS and its network collaborate to support technology transfer and venture development based on student and faculty innovations. TCS provides services for entrepreneurial training, intellectual property protection, technology licensing, mentorship, business startup, technology incubation and connections to the investment community. As one of the state's centers of entrepreneurship, TCS provides these resources to external stakeholders as well.
- The Technology Incubation Program (TIP) is a part of TCS, offering incubator facilities at three locations across the state: Storrs, Farmington and Avery Point. TIP offers technically based startup companies access to a unique range of unparalleled resources, including incubator facilities featuring wet labs and access to instrumentation; the opportunity to collaborate with scientific experts; technically trained student interns, employees and graduates; the University of Connecticut's world-class library resources; and customized business education events, planning assistance and mentoring.
- The Connecticut Center for Entrepreneurship and Innovation (CCEI) helps students and faculty become successful entrepreneurs. CCEI has a number of programs aimed at achieving this purpose:
  - Accelerate UConn is UConn's NSF I-Corps Site, with a $300,000, three-year grant awarded in February 2015 to help catalyze entrepreneurial teams whose technology concepts are likely

candidates for commercialization. Educational programs share the principles of the I-Corps Curriculum on Lean Launchpad methodology. With the support of Accelerate UConn, teams will learn firsthand about entrepreneurship and explore the transition of their ideas, devices, processes or other intellectual activities to the marketplace. This is a partnership between Technology Commercialization Services within the Office of the Vice President for Research and the Connecticut Center for Entrepreneurship and Innovation.

- o The Biomedical Entrepreneurship Initiative allows for graduate students from medicine, engineering, bioscience, nursing, pharmacy and management to take a class to develop entrepreneurial skills, forming teams to launch biomedical companies. This initiative was founded by CCEI faculty director Tim Folta, who was also the founding director of BIOMEDSHIP, a partnership with Purdue's Weldon School of Biomedical Engineering and Indiana University's School of Medicine to train graduate students around "BIOMEDical entrepreneurship."
- o The Summer Fellowship Program awards $15,000 summer grants for teams to move their businesses forward, along with providing access to professional services and Lean Launchpad training.
- o Through the Innovation Accelerator, students from different disciplines are placed in teams and assigned a real problem to tackle for a local startup.
- o Through the VERGE Consulting Program, graduate students work within CCEI to help UConn-related startups overcome the hurdles of entrepreneurship. This is a partnership with the Small Business Development Center.

- Other UConn programs include:
  - o The Entrepreneurship Bootcamp for Veterans with Disabilities
  - o Family Business Program
  - o Project Mentors
  - o SPARK Proof of Concept Program (Supporting Innovative Translational Research and Pathways to Commercialization). The program has a two-phase proposal process and $400,000 of available funding.
  - o University Prototype Fund, used to fund commercially viable technology developed by students and faculty.
- UConn also hosts events that foster entrepreneurial spirit, such as Connecticut's Conference for Women in Innovation, Technology and Entrepreneurship and the Wolff New Venture Competition. Students can join various student organizations, including the International Business Society, the Student Entrepreneurial Organization and Women in Business.

UConn offers a bachelor's degree in management with an entrepreneurship concentration at the dedicated School of Business. Students completing the entrepreneurship concentration enroll in specific courses that focus on the unique skills needed to manage a small business. UConn has a full staff of dedicated professors with a variety of backgrounds in many aspects of business.

University of Hartford
Hartford

Students at the University of Hartford have access to a variety of resources, including the Entrepreneurial Center which has been in operation for over 30 years. The Student Resource Center and the Women's Business Center are two more locations where students can seek out support services. UHart has hosted the Successful Creative Entrepreneur Program and the InnovateHER Business Challenge. Both events offer students opportunities to compete for various prizes and interact with nationally recognized entrepreneurs. UHart's Career Ready Program hosts various networking and campus events dedicated to developing small businesses.

UHart is committed to the development of business in the city of Hartford through various collaborative efforts.
An example of this work is through their involvement with Innovation Destination: Hartford. At ID:H a coalition of entrepreneurs and service professionals are dedicated to enhancing the Hartford region's ability to support startups and second-stage entrepreneurs. ID:H has a Partner with a Professor program that connects entrepreneurs with professors for the purpose of technology transfer. Currently, ID:H lists UConn, CCSU and University of Hartford among partners. ID:H provides support services in accounting, case studies, exiting, funding, growing, human resources, legal, marketing and public relations

UHart has successfully funded startups and products. In the past year it funded three patents as well as set up a patented Rehab Walk Assist System at the Rehab Department at Montefiore Hospital in Bronx, New York. This system was designed on campus by faculty and students and is considered commercially viable. UHart encourages students in all disciplines, not just business school students, to think like entrepreneurs. An example of programming outside the traditional business school is the four-year design sequence in the engineering college. The program challenges students to develop a concept fit for commercialization during their undergraduate studies.

Internships are managed through a dedicated Career Services office at the School of Business, and students can join many clubs and organizations, including the Young Entrepreneurs Society and the Innovators Group. Students at UHart can complete a bachelor's degree in entrepreneurial studies at the Barney School of Business. UHart staffs diverse faculty who specialize in management. Some unique entrepreneurship-focused courses include Small Business Finance, Seminar in Entrepreneurship, and a mandatory internship.

University of New Haven
West Haven

The University of New Haven's newly created Entrepreneurship & Innovation Program is a university-wide collaboration for undergraduate and graduate students that offers a cross-disciplinary ecosystem that unleashes student passions through curricular and co-curricular activities, such as competitive challenges and events, workshops, courses as well as a student entrepreneurial organization that nurtures the entrepreneurial mindset.

In the fall, the university hosts an annual Charger Startup Weekend, where students from all its colleges as well as students from other institutions participate in a weekend of workshops on ideation and customer discovery, culminating in a pitch competition. Similarly, in the spring, the university conducts and hosts a New Venture Pitch Competition that entails a series of weekly workshops with entrepreneurial mentors and faculty members culminating in a pitch competition with financial awards for the top teams to jump-start the commercialization process. Both events, along with the program's workshops, provide students with engagement opportunities with faculty and successful community- and regionally based recognized entrepreneurial mentors. Through the Tagliatela College of Engineering, the university also participates in the Kern Entrepreneurial Engineering Network (KEEN), which supports innovation and entrepreneurship through a series of programs initially designed for engineering students, but extended, consistent with the university's mission of a multidisciplinary approach to identifying and solving real-world problems, to students in all university disciplines. The Entrepreneurship & Innovation Program also offers students an opportunity to network and engage with as interns and advise as consultants to local enterprises, in addition to engagement through the Center for Family Business and the recently created Non-Profit Institute, where students are encouraged to put their heart into business. Career development services are available through the Professional Enrichment Program in Career Services. Students also serve as business academic mentors to the local magnet school, the Engineering and Science University Magnet School in West Haven.

While the university currently offers an entrepreneurship minor through the College of Business, the Department of Entrepreneurship and Innovation expects to offer a minor for academic year 2017–2018 by incorporating courses from faculty across the university that are designed to foster the entrepreneurial and intrapreneurial mindset, followed soon thereafter with a major consistent with its cross-disciplinary mission. The University of New Haven is expanding on its commitment to provide facilities to support this entrepreneurship and innovation mission. In particular, students have access to a recently created maker space in the Tagliatela College of Engineering. In addition, the university recently announced a 2020 campaign celebrating the university's 100th anniversary to, among other things, create a new cutting-edge academic building specifically to foster inspiration, imagination and innovation, for multidisciplinary student and faculty collaboration.

University of Saint Joseph
West Hartford

At USJ, students can pursue a bachelor's degree in business management. Students will take a variety of management classes along with the core curriculum. All senior management students are required to complete an internship that is facilitated through the Career Services department. USJ also has the student-run Accounting and Business Society. Every year the school awards one alumni of the program with the Business and Entrepreneurial Award. The event allows students the opportunity to network with entrepreneurs and business owners.

Wesleyan University
Middletown

Wesleyan's Patricelli Center for Social Entrepreneurship supports Wesleyan student entrepreneurs, intrapreneurs and changemakers in a variety of ways. Students may participate in the Seed Grant Challenge, which awards $5,000 seed grants to fund the launch or early-stage growth of a Wesleyan-connected project, program or venture, as well as various other grants. The Patricelli Center also has a competitive Fellowship Program where students develop a variety of business plans and ventures in teams with other fellows. Students can also find ways to connect with mentors at the Patricelli Center and the Kai Entrepreneurship Club. Students can access various resources through the Kai Wesleyan Entrepreneurship Program. The for-credit program places students together to solve problems and develop plans over the course of four weeks. Wesleyan manages student internships through the office of Career Services. Wesleyan offers a bachelor's degree in economics for students seeking employment in business.

Western Connecticut State University
Danbury

WCSU provides many opportunities for students to develop an entrepreneurial mindset by attending lectures and events geared towards fostering entrepreneurship and innovative thinking. Examples include the Constantine S. Marcicostas Entrepreneurial Endowment sponsored Entrepreneur of the Year and the bi-annual Entrepreneurial Arc Panel Discussion which showcases the skills of WCSU alumni business owners.

Academically, the Kathwari Honors Program is designed to expose students to the importance of an interdisciplinary approach to exploring a topic or issue through innovation, and the Center for Compassion, Creativity and Innovation supports the importance of these values in daily and professional life. Other innovative programs include the annual Election Connection broadcast staffed by students, and run out of the new media & TV production studio. The program offers opportunities for students to engage in entrepreneurial activities in communications media. The WCSU Institute for Holistic Health Studies has programing for students interested in opening their own health promotions businesses. The entrepreneurial culture on campus spreads into the School of Visual & Performing Arts, where students are prepared to enter the "gig" economy and make an impact through recording music, designing innovative theatre venues, running art galleries, and managing the not-for-profit Ives Concert Park during the summer season.

Many resources to develop student ideas are available through the Alumni Mentor Program at the Ancell Learning Commons. The Ancell School of Business also hosts the Center for Business Research and the Agency@Ancell which is part of the Marketing Club and offers branding assistance for local businesses.

WCSU is in the development phase of a new space on campus that will house the Center for Entrepreneurship, Research, Innovation and Creativity (ERIC@THEGARAGE). ERIC will provide support services to new ventures and help student business get off the ground. The space plans to house a co-working/program/event space that will provide mentoring and other resources for student startups as well as support small and family businesses in transition. ERIC intends to serve the entire University including students, faculty, staff and alumni, as well as the greater Danbury community. In order to develop these resources and mentorships, WCSU currently collaborates with community partners such as the Danbury Hackerspace, the Danbury region SBDC, SCORE, the Danbury area WBDC, and the Danbury Chamber of Commerce.

Faculty member Dr. Pauline Assenza, Co-Vice Chair of the CT Consortium of Entrepreneurship Educators (CCEE), promotes the CT Business Plan competition on campus and helped pilot an innovative course on Creating New Ventures. This programming is a result of the collaboration between the institution and CCEE and shows WCSU's commitment to expanding focus on E&I programming. WCSU offers a bachelor's degree in business management with a small business and entrepreneurial concentration. Students can expect to take a variety of courses specifically focusing on the unique set of skills needed to manage a small business. Internships at both corporate and local small businesses provide skills and opportunities for overall career development. Theses internships are actively encouraged and managed through the office of Career Services.

Yale University
New Haven

Yale University offers students a wide array of entrepreneurial programs and innovation services. For example:

- The Yale Entrepreneurial Institute (YEI) is a university department that helps entrepreneurs and innovators at Yale start scalable new ventures. YEI offers three dedicated programs for accelerating ventures at Yale from early-stage conception to investable startup: the Venture Creation Program, the YEI Fellowship and the YEI Innovation Fund, which provides $100,000 in pre-seed funding. YEI is dedicated to fostering entrepreneurship across all schools at Yale and providing opportunities for students and faculty to test their ideas, develop them with expert guidance and launch companies that can make an impact in their respective industries. YEI resources include a 150-plus mentor network; resident entrepreneurs; access to in-kind services from corporate partners in legal, accounting, financial, IP, communications and branding; connections to the angel and venture community; and connections to campus and community entrepreneurship partners. YEI serves as one of Yale's incubator centers and hosts numerous events throughout the year that foster entrepreneurial spirit.
- The Center for Engineering Innovation and Design serves as the hub for collaborative design and interdisciplinary activity at Yale University. Its goal is to enable the design, development and actualization of ideas, from the whiteboard to the real world. Students, staff and faculty from across Yale have access to CEID resources, participate in courses and events, and collaborate with CEID staff on a wide range of projects. See the one pager for more details about the program.
- Yale Office of Cooperative Research (OCR)'s mission is to facilitate the translation of research from Yale's labs into products and services that benefit society. Since its founding in 1982 it has built a significant portfolio of inventions and patents and has grown into an engine of regional economic development. OCR is recognized as a leading force for catalyzing economic growth by identifying, counseling and nurturing early-stage technologies and guiding the transition into robust companies.
- Yale offers a graduate degree in entrepreneurship through the School of Management. This program more specifically teaches students skills to work on developing and understanding the complexities of managing small business while also supporting a growing network of student entrepreneurs.
- Internships are accessible in a variety of ways, including directly through YEI and also at Career Services.