

Innovation and Entrepreneurship through Industry-Academic Collaborations: A Collegiate Model for Economic Development

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Nada Marie Anid, Ph.D., is the first female dean of NYIT's School of Engineering and Computing Sciences (SoECS). In this role, she oversees more than 80 engineering and computing sciences faculty members and approximately 3,500 graduate and undergraduate students at campuses located in Manhattan and Old Westbury, N.Y., the Middle East, and China. Her expertise is in Industry-academic partnerships; Entrepreneurship and Innovation; Emerging Technologies; Sustainability; Global Engineering Education; STEM K-12 Outreach.

Dr. Anid embraces NYIT's forward-thinking and applications-oriented mission and is working on several strategic partnerships between the School of Engineering and the public and private sector, including the creation of the School's first Entrepreneurship and Technology Innovation Center (ETIC) and its three labs in the critical areas of IT & Cyber Security, Bio-engineering and Health, and Energy and Green Technologies. She is a board member of several organizations including the Greater Long Island Clean Cities Coalition (GLICC), LISTnet, the Institute for Sustainability (IfS) of the American Institute for Chemical Engineers (AIChE), the Riverdale Conservancy, and the Environment and Public Health Network of Chinese Students and Scholars (ENCSS). Dr. Anid is a Program Evaluator for the Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology (ABET), and holds leadership positions in AIChE, the New York Academy of Sciences, the American Society for Engineering Education (ASEE), the US Deans Engineering Council and its Public Policy Committee, among others. She earned her Ph.D. in environmental engineering from the University of Michigan (Ann Arbor), and bachelor's and master's degrees in chemical engineering from the Royal Institute of Technology (KTH-Stockholm). Prior to joining NYIT, she was chair and graduate program director of the Chemical Engineering Department at Manhattan College.

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Abstract:

In March of 2015, the School of Engineering and Computing Sciences (SoECS) of New York Institute of Technology (NYIT) launched its Entrepreneurship and Technology Innovation Center (ETIC) with a mission to consolidate and expand the School's ongoing industry-academic partnerships, foster innovation and promote collaborations between industry, the academic community, professional organizations, and government. By having direct access to industry, students benefit from real-life experiential activities while gaining the foundational skills necessary to their integration into the workforce. As a source for talent, entrepreneurship, and innovation in technology, engineering and applied science, the Center supports Long Island's and the broader NY metropolitan region's economic growth and greater competitiveness in three critical areas: IT and cyber-security, bioengineering and medical devices, energy and green technologies.

This paper highlights NYIT's efforts to provide a modern, 21st century educational environment where entrepreneurship and innovation can thrive, and discusses various initiatives over the first year of operation of the ETIC. It provides an overview of the approach taken to recruit businesses to the Center, establish novel partnerships, and leverage industry association memberships. The paper includes examples of ongoing and planned academic – industry collaborations, indicating challenges to establish those and how to overcome them. The paper also presents a discussion about the creation of synergies and alliances with existing businesses starting with the establishment of a robust advisory board, as well as the selection criteria for companies based on their potential to support students' project-based learning, and to spawn innovation and economic development while boosting the regional economy.

Introduction

In March 2015, New York Institute of Technology (NYIT) and its [School of Engineering and Computing Sciences](#) (SoECS) unveiled a new [Entrepreneurship and Technology Innovation Center](#) (ETIC). The new 8,000 square-foot facility at NYIT's Old Westbury campus features a business accelerator, a collaborative entrepreneurial space, and laboratories for joint projects among industry, the academic community, professional organizations, and government. The Center focuses on three technological drivers of economic growth in the New York metropolitan region: IT and Cybersecurity; Bio-Engineering and Medical Devices; and Energy and Green Technologies. Funding for the Center, whose mission is to consolidate and expand NYIT's ongoing industry-academic partnerships, was first announced in June 2012. The federal and state agencies provided infrastructure funding, which was augmented by funds from NYIT and the support of numerous industry partners.

The ETIC is an illustration of the SoECS' core beliefs and mission. The School's high-quality undergraduate and graduate programs prepare students for advanced studies and challenging positions in business, government, and industry. The SoECS is guided in this mission by the three tenets embraced by NYIT: 1) professional preparation of students; 2) applications-oriented research; 3) access to opportunity for all qualified students. To accomplish its mission, the SoECS offers a broad range of outstanding, accredited academic programs; supports faculty members who are effective teacher-scholars committed to a student-centered, stimulating learning and research environment; and engages students in applied projects, innovative design, and computing solutions to real industry questions. At the same time, the SoECS fosters connections and partnerships with employers, alumni, and the community at large; and, provides the physical space and modern facilities that befit a premier technology institute.

By bringing together industry, startups and government to collaborate with the academic community, the ETIC helps to promote new technology and generate startup ventures. NYIT students who participate in ETIC projects gain practical, on-the-job experience and develop entrepreneurial skills and professional networks that help them launch careers after graduation. The Center positions NYIT as an important idea incubator, a zone of exploration where entrepreneurship and risk-taking are promoted and creativity is rewarded.¹ The Center addresses two significant gaps within the regional economy: 1) training young professionals to have the appropriate skills to easily integrate into new technology innovation ventures, and 2) retaining talent on Long Island to support a nascent innovation ecosystem and the economic development of the region. The ETIC launch marked the completion of the infrastructure renovation phase and the beginning of the Center's programmatic activities.

The paper reviews strategies designed to support the center's programming and research and business partnership development, highlighting challenges faced during the first nine months of operation and how they are being addressed. An important strategy has been the creation of synergies and alliances with existing businesses starting through the

establishment of a robust advisory board. Another strategy has been setting up a clear path for business engagement, in particular the establishment of selection criteria for companies based on their potential to support students' projects, and spawn innovation and economic development while boosting the regional economy. We believe that the lessons learned are transferable to other nascent academic-industry partnerships and incubators.

Addressing Workforce Development through Enhanced Learning

The ETIC has been established at NYIT's Long Island campus in Old Westbury, located in Nassau County. Over the past few years, the County's Industrial Department Agency (IDA) has been actively working to attract state-of-the-art business ventures to the region by providing economic and other incentives, in three main clusters of opportunity: Information Technology, Life Sciences / Biotech, and Energy.² Yet, the region's success in attracting new businesses depends not just on economic incentives but also on meeting innovative companies' demand for a highly qualified workforce (e.g. engineers, computer scientists, and technicians). The Long Island economy has faced significant challenges in this respect, with recent reports indicating that companies on Long Island have been experiencing a dearth of "well-qualified workers" in the region and that companies have not been able to attract talent from elsewhere due to relatively high living costs on Long Island. Human capital development and retention have been the main reasons compromising local companies' ability to compete in regional, national and/or global markets.³

As our university embarked on addressing the challenge of graduating professionals who are ready to enter the work environment, we looked at models proposing a different educational paradigm – one that bridges the gap between skills that are very important in the workplace and those nurtured in the classroom. The disparity between knowledge taught at universities and that required by industry has been researched by Becker (2010).⁴ A summary of his surveys indicates that the greatest disparity is found in four categories: 1) hands-on know how; 2) methods, systems know how; 3) ability to work in teams; and 4) communication skills. The ETIC was created to address these gaps while responding to the regional economy's requirements for well-qualified workers. By having direct access to industry, students benefit from real-life experiential activities while gaining the foundational skills necessary to their integration into the workforce.

Progress to-date

Since the launch of the Entrepreneurship and Technology Innovation Center (ETIC) in March 2015, the School has put into action a strategic plan to nurture an entrepreneurial ecosystem at the new facility. All programmatic activities and industry-academic partnerships are being vetted according to two guiding principles: 1) whether they support the comprehensive professional development of our students, including their entrepreneurial skills, and 2) whether they contribute to foster the nascent entrepreneurial and innovation ecosystem on Long Island, which will help retain talent and contribute to the economic development of the region. In addition, the applicants must demonstrate

that their companies align well with the three focal areas of the ETIC: 1) IT & Cybersecurity; 2) Bioengineering & Medical Devices; and 3) Energy & Green Technologies.

Business Engagement

One of the first steps has been to establish a process for business engagement. After benchmarking the process followed by other incubators across the nation, NYIT's SoECS developed a package of documents to guide applicants who are interested in taking residence at the ETIC. The application process includes completing the following:

- An Application Form,⁵ which is the first step toward participating in the ETIC. It includes a brief description of the product / innovation that the applicant is working on, and details the stage of product development.
- Interview by the selection committee. After the application form is reviewed by the ETIC staff, a selection committee meets with the applicant. The committee is formed by NYIT staff and key advisory members). This interview provides an opportunity to discuss how the applicants' mission aligns with the two guiding principles outlined above.
- A Non-Disclosure agreement, if necessary, usually depending on the stage of product development. The NDA is signed by all parties involved, including the company affiliates and NYIT personnel.
- The Space Usage Agreement, which stipulates space assigned in the business hoteling area of the ETIC, associated fees, liability insurance, and other requirements. All affiliates must compensate the Center for the use of the space by paying a monthly fee, which depends on the square footage used and/or the timeframe (e.g., part-time; full-time; week-day or weekend use, etc.). At the same time, affiliates are ensured desk space separate from other affiliates, and have access to private conference rooms.⁶
- The Scope of Work Document, to define what particular projects the applicants would be working, such as research project with NYIT faculty, research or prototyping projects with graduate students, undergraduate students' senior design projects, and/or mentoring of students.
- The Services Form, for applicants to detail specific IT needs in addition to WiFi, such as lab equipment use, 3-D printing, laser cutting, clean room, etc.

Business Recruitment

The ETIC's leadership team has been leveraging existing relationships and developing new collaborations, in order to recruit industry and other partners into the Center. Several strategies has been put into place to support the business recruitment effort. The most significant ones are outlined below to illustrate the type of strategies available to centers such as the ETIC.

An important strategy has been the creation of synergies and alliances with existing businesses starting with the establishment of a robust advisory board,⁷ in order to engage executives representing companies in the ETIC's three focal areas (i.e., IT & Cybersecurity, Bioscience & Medical Devices, & Energy and Green Technologies). Many of these companies have been taking an active role in working with faculty members to develop projects for the students. Specific projects have been established under Scope of Work forms, and Non-Disclosure agreements; many involving beta testing or prototyping, while, at this stage, only two have been structured to advance R&D. While the NDAs usually follow a template, Intellectual Property (IP) agreements are established on a case-by-case basis, as some partnerships involved only faculty, others only students, and some both, NYIT's IP committee includes members of the School's legal department. Whenever an IP question arose, the committee has worked with new partners to protect the IP interests of all involved.

Board members also participate in sub-committees, focusing on "Entrepreneurship," "Technology and Interoperability," "Strategic Planning," and "Fundraising." The School also engages members of the Industrial Advisory Boards (IABs) for each Department, thus extending the number of companies involved at the ETIC.

A key recruitment strategy relies on our partnership with many local organizations that are regularly referring businesses and startups to apply to the ETIC, including the Nassau County Industrial Development Agency (IDA), Empire State Development Corporation (as a member of Long Island Regional Economic Development Council), as well as the Long Island Capital Alliance (LICA), the LI Angels Network and LaunchPad-Long Island, which is currently affiliated with the ETIC.

Bringing added visibility to the ETIC so that practitioners and students are aware of the resources and talent available thru the Center is another important recruitment strategy. Therefore, we organized periodic events to attract startups and businesses, including Pitch Nights, events with investors, and an Entrepreneurial Education Seminar Series. We have also opened our doors to professional organizations that regularly meet at our campus, such as IEEE or the Association of Energy Engineers, to assist them in their mission while also providing professional development opportunities to our students.

ETIC Affiliates Selection

The selection criteria for companies is based on their potential to support the ETIC's mission. Each company or startup interested in joining the ETIC completes an application and it is then ranked according to the two guiding principles outlined above, (page 3). Since the ETIC has been launched with infrastructure funding by New York State and the U.S. Department of Commerce's Economic Development Administration, all applicants are expected to support the local economy by contributing to human capital development, job creation and investments in technologies and hi-tech enterprises of the future. Companies that also have the resources to support the academic mission of the School (e.g., conduct joint research with faculty, offer internship and experiential

learning opportunities for students), have a competitive edge over those that decide to operate independently.

The evaluation and approval process for all applicants includes a review of how well they match the following criteria:

Academic and Research Alignment

- Is the business aligned with the mission and objectives of the ETIC, including being a technology business related to: IT & Cybersecurity; Bio Sciences/bio-engineering & health analytics; Clean energy & Green technologies?
- Is the business in an industry aligned with current and/or developing University research, scholarly, and creative activity?
- Does the business provide experiential learning and workforce opportunities (e.g., internships, fellowships, full-time jobs) for students and graduates?
- Does the business provide areas for partnership and advancement for faculty and students?
- Will the business provide access to research instrumentation, tools, and/or equipment necessary to advance the academic and research mission?
- Will the business fund scholarships, campus facilities or other academic services or amenities?
- Will the business and/or its employees contribute to instruction or provide student mentoring?
- Does the business offer the use of company resources, intellectual property or expertise to support the academic mission?

Economic Benefit & Business Viability

- How many net new jobs will be created?
- Is the business viable in both the short- and long-term?
- Is there significant market potential?
- Is sufficient financial planning demonstrated via a multi-year financial projection?
- Will the business attract private financial investment?
- Does the business plan to make capital investments (e.g., renovation, new construction)?
- Are the new jobs in critical areas of the economy?
- How will the University financially benefit from the terms of the license?
- What is the expected timeline for product/service commercialization and realization of economic benefits?

Community Benefits

- Does the business have the support of one or more municipal or community entities?
- Does the business expect to recruit employees from the local workforce?

- Does the business invest in underserved, economically distressed regions?
- Will the business rely on suppliers within the local and regional economy?

Challenges and Strategies to Address Them

Two important challenges have emerged during the first months of operation and are now being addressed. The first one has been how to incentivize students to be actively involved at the ETIC. The second one refers to attracting more companies and startups that align well with the ETIC criteria, (outlined above).

As the ETIC just launched in the spring of 2015, the first challenge has been to bring awareness among students about the opportunities afforded through the Center. In order to accelerate the process of students' active engagement at the ETIC, NYIT's [School of Engineering and Computing Sciences](#)' (SoECS) decided to change the current academic culture to best align its curricular programs to make students aware about the possibilities of using their engineering training to solve real-world problems.

To address this challenge, NYIT applied and was selected as one of 25 universities that have joined the [Epicenter](#)'s Pathways to Innovation program.⁸ This alliance enables us to engage with other schools on fully incorporating innovation and entrepreneurship in undergraduate engineering education.

With the support of the Epicenter network, the SoECS is now capitalizing on the ETIC to implement significant curricular changes, such as incorporating the Center's advanced fabrication facilities across the curriculum to teach students about design and rapid prototyping. The SoECS is also organizing training modules to strengthen students' ability to bring their ideas to fruition, such as 3-D printing workshops offered every two months. Over the course of two years the Pathways program is helping "NYIT empower undergraduate engineering students and unleash their creative potential for the ultimate benefit of society and the economy."⁹

In addition, the School is organizing several activities to bring visibility and students foot traffic to the ETIC. These range from an Entrepreneurship Seminar Series and related workshops by industry representatives, to product challenges and business plan competitions. These activities have been effective in creating a buzz among students about the ETIC. For example, within a week of announcing the business plan competition, close to twenty student-teams submitted applications to enter the challenge, including projects in the following categories: IT/software; service/product development; biotechnology; and energy technologies. All teams have been mentored on their plans and how to pitch to investors before presenting their projects to a cadre of judges at an event at the ETIC.

The second challenge refers to the company recruitment process in accordance to the ETIC's criteria for selection, which includes requirements by state and federal agencies that provided infrastructure support for the Center. Some companies, in particular very early stage startups, have cited requirements such as space usage fees or liability

insurance as impediments to joining the ETIC.

The School has been addressing this challenge by establishing a support system for all applicants to the ETIC. For instance, and in order to attract and support industry partners that fit the right profile, NYIT has submitted an application to StartUp NY.¹⁰ This New York State program targets businesses whose mission align well with the host university's research agenda. Through the program, New York offers new and expanding businesses the opportunity to operate tax-free for 10 years on eligible university or college campuses throughout the State. Participants partnering with universities also gain access to advanced research laboratories, development resources and faculty experts in key fields.

This support system includes the ETIC's Board of Directors, and in particular its "Entrepreneurship" Standing Committee, which seeks to create a Seed Fund for Entrepreneurs at the Center; as well as a dedicated personnel for the ETIC, tasked with recruiting companies, work with them through the application process and develop collaborations with faculty and students at the School of Engineering and Computing Sciences, and on occasion with other schools as well.

We have been working hard to address these two challenges so as to reinforce synergies between student and faculty talent and startups and other business ventures. Our School promote the partnerships among these actors, in a number of ways. For instance, the ETIC leadership and faculty screens and recommends students that fit the co-located companies' profiles or specific project requirements. At the same time, once the ETIC companies engage the students, either as interns or on specific projects, the School ensures that they provide students with appropriate compensation (and in accordance to NY State regulations). The School also facilitates that students who would like to work on their own startups, are able to do so as a special credit-bearing project.

Moreover, the ETIC leadership which includes an "Entrepreneurship Standing Committee" of the board of directors, connects students to industry mentors, to ensure their success in their business ventures. The startup "mentor network" is composed of companies within the ETIC as well as those who are involved as members of the board of directors or any of the committees for each academic department within SoECS.

Concluding Remarks

The paper provides a blueprint for how to set up an entrepreneurship and technology innovation incubator within an academic institution, in particular when the goal is to strengthen the work readiness of graduating students. Its principal role is to be a conduit for strategic partnerships between industry, entrepreneurs, venture capital/angel investors, on the one hand, and academia and the workforce development on the other hand. Various strategies are described that may help other academic institutions as they gear up to set up similar business incubators and challenge their own students to work on application oriented projects or their own startups.

While the results presented on this paper are based on the incubator's first year operation, the authors have gained insights that are now shared as the strategies reviewed address key challenges likely to be faced by other new incubators. The authors expect to provide an update on progress in the coming years.

Endnotes

¹ As reported by NYIT's media alert, "NYIT Launches Entrepreneurship and Technology Innovation Center,"

http://www.nyit.edu/box/news/nyit_launches_entrepreneurship_and_technology_innovation_center

² These opportunity clusters have been identified by the Long Island Association's Economic Development Program. <http://www.longislandassociation.org/economic-development-programs.cfm>

³ Further information is available at "Entrepreneurship and Technology Innovation Center: Bringing Together Industry, Faculty, and Students" by Drs. Nada Anid, Steven Billis and Marta Panero, NYIT. The Paper was presented at 120th ASEE Annual Conference and Exposition, Atlanta, GA, June 23-26, 2013.

⁴ Becker, F. S. (2010), "Why don't young people want to become engineers? Rational reasons for disappointing decisions," European Journal of Engineering Education, Vol. 35, No. 4, pp. 349-366.

⁵ The ETIC Application Form, which is the first step towards taking residence at the ETIC is available at the ETIC's webpage: <http://www.nyit.edu/etic>

⁶ While the company hoteling space has different desks which offer certain degree of privacy, affiliates that wish to hold confidential conversations have the option of doing so at any of the private conference rooms.

⁷ The Advisory and Partners list is available at: <http://www.nyit.edu/etic/advisors/>

⁸ The Epicenter's Pathways to Innovation program is directed by Stanford University and [VentureWell](#).

⁹ Anid, N. as quoted by Sullivan E. in "NYIT Selected to Participate in Epicenter's Pathways to Innovation Program," www.nyit.edu/box/news/nyit_selected_to_participate_in_epicenters_pathways_to_innovation_program

¹⁰ Further information about the StartUpNY program is available at: <http://startup.ny.gov/business-growth>