



2020 Engineering Innovation Leadership Council (EILC) Report NSF-1952602

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ABSTRACT/EXECUTIVE SUMMARY:

Introduction

On February 26, 2020, the first National Science Foundation-funded *Engineering Innovation Leadership Council* (EILC) workshop was held in Alexandria, Virginia, with more than 40 attendees from academia and government agencies. The workshop explored the role that engineering leadership plays in the Innovation and Entrepreneurship (I&E) ecosystems at universities, as well as their roles in the ecosystems of their state, region and the nation. Through four in-depth sessions across a day-long event, attendees discussed

- (1) the role of an Engineering Associate Dean for Innovation and Entrepreneurship (ADIE) or similar positions.
- (2) ecosystem building and campus policies on I&E, conflict management and ethics.
- (3) I&E effects on faculty engagement, promotion and tenure.
- (4) student engagement, curriculum development and co-curricular I&E program, and
- (5) outcomes and next steps for the workshop attendees and participants.

At the conclusion of the workshop, participants widely agreed it is of great value to gather I&E academic leaders, policy and funding agency leaders on an annual basis to share best practices and further enhance entrepreneurship opportunities in engineering and science across the national innovation ecosystem.

Background on academic entrepreneurship ecosystems and the role of engineering and campus leadership

Over the past decade, R1 doctoral universities, categorized as having “very high research activity” in the Carnegie Classification of Institutions of Higher Education have been increasingly active in creating innovation and engineering entrepreneurship opportunities for faculty and students. NSF, through its Innovation Corps (I-Corps™), Partnerships for Innovation, and other programs has created funding opportunities to increase the translation of funded research into commercial use. Innovation centers, entrepreneurship courses, incubators, research parks and other university-based activities have been growing from satellite activities for students and faculty to central elements of the university strategic plan.

Emergence of engineering and campus leadership roles in Entrepreneurship and Innovation

Many universities in the US have created high-level campus or college leadership positions since the early 2010s, often repurposing roles centered on economic development to those focused on innovation and entrepreneurship. This trend was strengthened by the NSF-funded *Pathways for Innovation Program*, which was developed by the Epicenter at Stanford University. Some examples within colleges of engineering include Tennessee Tech University (TN Tech) College of Engineering, which modified the position of associate dean for research and graduate studies into an associate dean for research and innovation in 2013 to emphasize the importance of these activities. The College of Engineering at the University of Illinois created the position of special advisor to the dean for innovation and entrepreneurship in 2014, and elevated this position to that of associate dean for innovation and entrepreneurship (ADIE) in 2018. NYU Tandon created the position of vice dean for research, innovation, and entrepreneurship in 2015. The University of Michigan, University of Southern California, Massachusetts Institute of Technology, and Princeton University each have similar positions within the



cabinet of the dean of the College of Engineering. The University of Maryland and Arizona State University were among the first schools to create a vice provost or vice president for innovation positions that report directly to the provost and/or president. The University of Pittsburgh created a Vice Chancellor for Innovation & Entrepreneurship in 2018. These new positions focus *specifically* on innovation and entrepreneurship.

The relatively new focus on innovation and entrepreneurship within the university leadership can vary considerably: some universities focus more on research and commercialization, others on education and student experience. Similarly, some of these place the activity at the university level, while others are more focused at the college or department level. Some schools have different leaders responsible for each of these areas. For example, The University of New Mexico has partnered with neighboring Sandia Labs and the Air Force Research Lab to create the *Center for Collaboration and Commercialization* in downtown Albuquerque to catalyze innovation and entrepreneurship based on resources and technologies available at the three partner institutions. The University of Maryland has added AVP positions in Innovation and Entrepreneurship in

addition to engineering cabinet level leadership. Many of these new positions have links through, and have been influenced by, the NSF I-Corps program.

Regardless of the specific hierarchy, programs like

I-Corps have provided an opportunity to align disparate programs and provide a collaborative force among these leadership roles. For example, the University of Illinois transitioned its Vice President for Technology Economic Development into a VP Research role, and then into Vice President for Economic Development and Innovation. Similarly, the Vice Chancellor for Research was recast as the Vice Chancellor for Research and Innovation. Some universities have a combined top-down and bottom-up model. The university-level entity reporting to the Provost and President is charged with serving the entire campus or system by incentivizing collaboration among the college-level or campus-level centers and by integrating innovation into existing academic and research programs that serve all students and faculty. Many colleges of engineering have developed programs and centers in entrepreneurship, with some residing within departments of general engineering, industrial or systems engineering, as was the case, for example, at Stanford and Illinois.

The need for annual meetings for campus leaders focused on entrepreneurship and innovation

It is common practice in academic administration for leadership in similar roles from around the country to meet regularly to discuss best practices, opportunities for alignment of interests, and to meet with government and industry leaders about the future of their engineering/academic discipline. Examples include department heads (*National Electrical Engineering Department Heads Association*), deans (*Engineering Deans Council*), and associate deans for research (*National Research Council*). The Engineering Deans Council of the American Society for Engineering Education (ASEE) is comprised of representatives from each of the member colleges in ASEE. This council is considered the leadership organization of engineering deans in the United States, currently representing over 90 percent of all US engineering deans. As listed on the ASEE Engineering Deans Council website, the objectives of the Engineering Deans Council are to:

1. Provide vision and leadership on engineering education, research, and engagement.
2. Advocate for engineering education, research, and engagement and serve as a resource to its constituents and the public at large.
3. Articulate as a key stakeholder of, and influence US public policy on engineering education, research, and engagement.
4. Partner with stakeholders (e.g. industry, government, educators and professional organizations) to promote excellence at every level of engineering education, research, and engagement.
5. Facilitate the exchange of information among its members and their stakeholders; and provide a forum for member colleges to foster dialog and collaboration and to share best practices.
6. Promote diversity and inclusiveness in all aspects of engineering education, research, and engagement.

The Engineering Research Council of the ASEE is a similar organization that comprises members of the research administration of ASEE member Colleges, many holding the rank of associate dean for research, or a similar position. According to the ASEE Engineering Research Council website, the group seeks

1. to provide a forum for discussion of problems and exchange of information pertaining to the research activities of ASEE members.
2. to provide programs at meetings.
3. to represent and to speak on behalf of research and its administration both externally and within ASEE.
4. to improve the effectiveness of research operations at ERC member institutions.
5. to establish and maintain liaison with other organizations concerned with research and its administration.

The idea for the first EILC workshop originated at the 2018 ASEE Engineering Research Council Annual Conference, which was dedicated to innovation and entrepreneurship ecosystems. University of Illinois Associate Dean for Innovation and Entrepreneurship Andrew Singer, the PI of the grant that supported this (EILC) workshop, gave an invited talk at this ASEE conference. It was clear at this gathering that among the many institutions represented at the conference without college-level administrators specifically focused on developing the academics, programming and supporting resources for engineering innovation and entrepreneurship on their campuses, there was a strong interest in understanding the many issues that arise in the creation, development, and operation of such ecosystems. Many members of the Engineering Research Council attended the EILC workshop. Additionally, many of the workshop attendees participate in the ERC and also have entrepreneurship and innovation in their portfolio.

Given the increasing interest in engineering innovation and entrepreneurship at both universities and funding agencies, an opportunity to meet with other Associate Deans for Innovation and Entrepreneurship (and those in similar roles) at other universities was recognized to be of great value, by both the workshop organizers, attendees, and NSF, to foster the development and growth of innovation and entrepreneurship ecosystems at US universities. NSF in general, and the Division of Industrial Innovation and Partnerships in particular, could play an important role in helping to activate such a workshop.

Broader impacts of an annual I&E workshop

An annual workshop focused on engineering innovation and entrepreneurship in US engineering colleges would benefit society in a number of important ways. Discussing best practices, trends, and opportunities among peer institutions would enable universities to enhance the workforce development activities in their respective regions, as well as help to fuel innovation and entrepreneurial activity among the students, faculty and alumni in the local region, across the state, and the nation. There is clear evidence that engineering students — often in collaboration with business students — form companies soon after graduation, based on their innovation and entrepreneurship activities at the university.

Intellectual merit for an annual I&E workshop

Gathering stakeholders from US universities responsible for curating, developing and delivering programming, education, and other resources can better inform universities on best practices developed across the nation, as well as help to better inform NSF on current activities and present and

future needs of universities in areas of key interest to the IIP directorate at NSF. Entrepreneurship education has been a key focus of many programs in IIP, such as those in the I-Corps program, and such a workshop could enable a greater focus among peer institutions to discuss educational and translational research directions among peer institutions. Such a discourse could advance the state-of-the-art of such programs at research universities across the nation.

Related Meetings

As noted earlier, while meetings of other US engineering academic leaders occur each year, no such organizations currently exist for gathering university faculty in administrative roles focused on innovation and entrepreneurship activities in the college of engineering, such as an ADIE.

Annual meetings held by the NSF and VentureWell specifically for the I-Corps program serve a related, albeit different purpose. These meetings are focused specifically on the I-Corps TEAMS and SITES programs and typically include academic professionals, faculty, and administrators from across the university engaged in the respective I-Corps activity. Another group worth mentioning here is the University Industry Demonstration Partnership (UIDP). The UIDP mission is to support mutually beneficial university-industry collaborations by developing and disseminating strategies for addressing common issues between the two sectors. The UIDP focuses on strategic and tactical challenges impacting the environment for research collaboration. They work to identify issues impacting university-industry relations and opportunities to develop new approaches to working together. There may be some synergies or opportunities to work together.

Inaugural EILC workshop organization

The plans for the workshop were informed by discussions with key university participants, representatives from NSF and other key invited stakeholders. The workshop included an optional evening welcome session and one full-day of discussion and plans of action identifying best practices and current examples of innovation and entrepreneurship engagement in engineering colleges across the United States as well as the role of an Associate/Vice Dean for Innovation and Entrepreneurship in colleges of engineering.

The workshop included sessions on:

1. Existing models: Session comprising introductions, best practices and current examples of engagement, current position profiles and scope of appointment, charge of responsibility for selected participants.
2. Existing challenges: Session describing challenges faced at the college and campus level in terms of resources, administration/regulation, messaging, recruiting, retention, promotion and tenure (P&T), campus-level engagement for ADIEs.
3. Opportunities: Session highlighting possible opportunities for ADIEs at the international, national, state, local/regional, campus-level/cross-campus level in terms of education, programming, funding and other resources; opportunities for mentors, engaging venture capital, identifying and catalyzing campus-focused resources, and opportunities for working together across a network of ADIEs at multiple institutions.

4. Future Plans: Session looking forward toward how to leverage actions and ideas captured at the workshops for possible creation of an annual meeting as part of ASEE, or funded through other organizations, such as VentureWell, NSF, or an industry consortium.



Opening hypotheses and discussions

- Hypothesis: Bringing this community of academic leadership together will help articulate the need for innovation and entrepreneurship strategy and policy, informing policy-making at the local, state, and national level.
- Hypothesis: Bringing together this community of academic leadership in I&E will aid more efficient and knowledgeable development of academic innovation ecosystems for both education and research, in part by minimizing efforts wasted by duplicating learning curves for deploying such ecosystems from campus to campus and also sharing best practices and developing flexible models that have proven successful across the academic I&E community.
- Hypothesis: As articulated in the presentation by Dr. Andrea Belz, national investment in technology commercialization shifted from deep technology into primarily software and digital commercial technologies at the expense of investment in deep technology. Such fundamental research-driven innovation has lagged over the last decade, with fewer investment dollars flowing into hardware and deep technology, potentially making the US economy vulnerable to national investments in Europe and Asia. Academic institutions have an important role to play not only in the development of deep technology and its translation into commercial activity, but also in elevating the focus on engineering/academic-based innovation and its critical role in the US economy.
- Hypothesis: NSF is a key resource and influencer in this area, providing a conscious effort to ensure that those receiving research funding (universities) are focused on and resourced to drive applications and innovations emerging from that research into practice. A tighter collaboration between the NSF and the academic innovation ecosystems can improve the yield of innovation and continue to improve the national academic innovation ecosystem.

- Hypothesis: Creating this community can effectively articulate and advocate for better alignment of federal resources from basic research funding (NSF, NIH, DoD) to translational research through programs such as I-Corps, SBIR, and I/UCRC in support of small business (SBA, EDA, etc) to achieve more timely and prolific innovations in a strengthened academic environment for entrepreneurship.

Workshop summary

The ADIE workshop, later called the Engineering Innovation Leadership Council (EILC) Workshop to broaden its scope, was chaired by a steering committee, comprising

- Andrew Singer, Associate dean for Innovation and Entrepreneurship in the Grainger College of Engineering at the University of Illinois at Urbana-Champaign
- Ellis Meng, Vice Dean of Technology Innovation and Entrepreneurship in the Viterbi School of Engineering at the University of Southern California
- Phil Weilerstein, President and Chief Executive of VentureWell.

This steering committee worked closely with staff from the University of Illinois at Urbana Champaign's Technology Entrepreneur Center (Stephanie Larson, Jed Taylor, and Amy Koester) in planning and hosting the workshop, and program and division leadership from the IIP directorate at NSF, including Dr. Peter Atherton and Dr. Andrea Belz.

The workshop was announced through email to deans and associate deans of colleges of engineering across the US, with a particular focus on those engineering colleges that have positions of associate/vice dean for innovation and entrepreneurship (or similar) at present, and those that have mature innovation and entrepreneurship ecosystems. Many of these colleges are currently participants in the I-Corps program either as Sites or as affiliates with a National Node program. Representatives of NSF, NIST, NIH, USPTO and other government agencies were invited as well as entities such as the National Academy of Inventors.

Prior to the workshop, a questionnaire was sent to gauge registrants' goals for this workshop. Responses included:

Network/Build Community

- Meet others in similar roles.
- Network with colleagues and peers.
- Build community with thought leaders at engineering schools.
- Expand my network of like-minded people in the same position to develop ongoing collaborative relations.
- Understand what programs are offered at the school level vs university level.
- Help establish programs for the national innovation ecosystem.

Role of ADIE and other related leadership

- Role of associate dean of innovation and entrepreneurship on campus

- National role for ADIEs
- Understand and define the significant role of universities in innovation and entrepreneurship.
- Establish the role of an ADIE in the college, on campus and nationally
- To have a better sense of what others do -- at both the College and the University level - - to support faculty and student entrepreneurship.
- Gain an understanding of the challenges to and opportunities for increasing the level of innovation in science and engineering at universities from key leaders charged with fostering innovation and translational outcomes at research institutions.
- Interact with other Associate Deans for Research and Innovation and discuss challenges and opportunities in using our role to contribute in enhancing the capacity of faculty to do innovative research and compete for prestigious funding

Institutions were also asked to provide overviews on what their innovation ecosystems offered. These electronic documents were collected and shared with attendees before the workshop so others could have the option to become familiar with each other's backgrounds and campus offerings.

The workshop's overall goal was to align engineering colleges, research institutions, and national resources to accelerate development of a nationwide innovation ecosystem through a network of academic leaders in engineering innovation. Following an evening welcome reception, the workshop ran from 8AM-5PM on February 27 and was highly interactive and participant driven.

Discussions focused on:

- Role of engineering associate dean of innovation and entrepreneurship
- Ecosystem building, campus policies, conflict management, and ethics
- Faculty engagement, promotion and tenure, and incentives
- Student engagement, curriculum, and co-curricular programs

A list of participating institutions can be found in the appendix—they included engineering associate deans/vice deans of research, associate deans/vice deans of innovation and/or entrepreneurship, and university innovation and/or entrepreneurship center directors from **22** universities across the nation. The universities represented were a mix of public & private, small & large, rural & urban.

[Session summaries](#)

[SESSION 1: Role of the Engineering Associate Dean for Innovation & Entrepreneurship \(ADIE\)](#) *(moderated by Andrew Singer)*

The session began with a short self-reflection on the role of an ADIE with each participant thinking about their top priorities, stakeholders, and how they spend their time. They were also asked to consider how we improve alignment between funding agencies and federal resources (NSF, SBIR, I-Corps, DARPA, NIH, etc.) to better align national resources and priorities with those of academic institutions. Participants discussed these questions with one another and also were asked to:

- Discuss the value of connecting with others in similar roles.
- What such a network could provide and how it might operate.
- What an organization could do to advance institutional objectives, and better engage external entities (government and industry).



Attendees at the workshop spanned a variety of roles from academia and government. Some attendees reported that while such positions within the college of engineering may not exist on their campus, positions with related scope existed at the campus level. Some indicated that their college or campus has no such administrative role.

In some engineering colleges, innovation and entrepreneurship administration lies entirely within a single (or multiple) disciplinary departments or may lie within

the purview of centers or institutes that are held within the engineering college, the business college, or at the campus level. These relatively new leadership roles in innovation and entrepreneurship can vary in scope, focus, and constituency. While some focus primarily on research and technology translation and commercialization, serving more faculty and graduate student constituents, others focus more on entrepreneurship and innovation education at the undergraduate level. Some participants indicated that their institution had leaders responsible for different segments of the student and faculty population as well as others focused on education aspects of innovation and entrepreneurship.

From the NSF, participants included program directors, the deputy division director and the division director of the Industrial Innovation and Partnerships (IIP), the division director of the Chemical, Bioengineering, Environmental and Transport Systems (CBET), the program director of Industry-University Cooperative Research Centers Industrial Innovation and Partnerships, the Engineering Education Center (EEC) Division Director, the Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) Program Officer, and the I-Corps Program Director.

From other government agencies, participants included the deputy director of policy and practice with the Office of Technology Transitions in the Department of Energy, the senior advisor and the senior standards specialist for standardization in standards coordination with the Office of the National Institute of Standards & Technology, and the program advisor with the Office of Education and Outreach and the Eastern Regional Outreach Director both with the United States Patent and Trademark Office.

Fundamental Outcomes

In discussing the importance of the role of such a leadership position, participants identified some of the key priorities of an Associate Dean of Innovation and Entrepreneurship (ADIE). These included aspects of **enhancing research success**, and helping to **ensure sufficient resources** were available, along with ensuring safety, with emphasis on laboratory experiences, which are primarily Associate Dean for Research functions. For institutions without an innovation and entrepreneurship-specific role, expanding the role of the ADR to include more Innovation and Entrepreneurship were also seen as important. However, **facilitating aspects of innovation and entrepreneurship across the college** was also seen as an important function of the ADR role, ranging from **technology commercialization** at the graduate student and faculty level, to development and delivery of engineering undergraduate and graduate **curricula around innovation and entrepreneurship**, as well as providing support and educational materials for faculty entrepreneurship. Facilitation of cross-college and cross-campus endeavors, including the **development and support of an innovation and entrepreneurship ecosystem** were seen

as critical functions for the ADIE role. Aid in the development and stewardship of **campus policies around ethics and conflict management** throughout the innovation ecosystem were seen as critical elements of the role. As a member of the Dean's cabinet (or that of the Provost or President), supporting special projects with aspects that relate to innovation and entrepreneurship are also substantive elements of this role. Additionally, such a role has stakeholders across many levels, including faculty, students, industrial, government, and alumni, and is often the primary outward facing college representative for innovation, entrepreneurship and industry relations.

In their ADIE roles, participants reported spending their time on email/correspondence, meetings and management, with some maintaining active teaching and research portfolios. Specifically, they participated in college and campus-level administrative meetings, strategic planning, management of innovation and entrepreneurship organizations, and working with and mentoring students and faculty. Additionally, many spend time working with local, state, and national government agencies and corporate entities as well as engaging with entrepreneurial alumni. For many, planning and executing innovation and entrepreneurship programming and/or education, comprise a substantial component of their time. To ensure sufficient resources for such activities, fundraising, partnership development, and stewardship of benefactors are also substantive components of their time.

Key Observations

With the prompt of discussing the primary role of the participants at the workshop, together with the aspirations for the role of an ADIE at each of the respective campuses, discussions took place across various groups, leading to some of the identified elements of the ADIE role described above. Additional observations brought forth from the individual discussions, and presented back to the larger group included the following. There is great value in connecting with other institutions so they can better learn from one another, sharing best practices and aligning priorities and opportunities with government funding and other resources. Additionally, knowing that other institutions exist with similar challenges, provides an opportunity to create a coalition to present and advocate for institutional needs and challenges to the government agencies, as well as rapidly improve the impact of the ADIE role and develop the most effective mechanisms and structures collaboratively. While the workshop location near NSF was both convenient for engaging with NSF and other government participants, the ASEE and other groups have conferences and venues that can serve as a location and forum to serve a broader group. Engaging with such larger groups could also advance solution development to meet the need for wider innovation and translational training and implementation. Identifying which meetings and forums can be leveraged to facilitate information and best practices exchange can both strengthen and broaden the workshop goals. A variety of NSF programs (and those of other organizations) are highly synergistic with the goals of the workshop participants, though many of these are not yet sufficiently well known.

Participants from institutions without ADIE or related positions wanted to understand why many universities have started creating such administrative positions and how federal agencies view their roles. It was noted that there are a similar number of important challenges that arise in solidifying industry-academic partnerships, including building trust, and the different time-scales at which industry and academic systems operate. Further, as an AD position, often the ADIE serves in a role to influence and guide policy and may have responsibility for the details of implementation of campus I&E policy.

There was interest in a common forum that could provide specific knowledge about how to support innovation and entrepreneurship across the academic innovation ecosystem. In particular, there was broad support for collaborating on ways to facilitate development of better programmatic models, tools, and mechanisms for improving commercialization of deep technology and big science. It was widely recognized by participants that the shift over the last two decades from venture capital



investments in the US in hardware and large system development has greatly diminished. This has been replaced by a VC industry and national innovation ecosystem that has expectations of shorter time scales consistent with software and mobile application development. The future impact of technology will be in mixed software/hardware systems that interact with the real world. Large challenges such as climate change, mobility, affordable healthcare, and

defense/security will demand cyber-physical solutions. Developing and implementing these solutions are inconsistent with the modern VC investment model.

Some common findings from the group discussions included an agreement that there was an immense diversity of structure and roles across institutions. Similarly there was a wide range of new and experienced people in the roles. While many felt that there was insufficient time to accomplish all of the activities in their portfolio, it was similarly difficult to find peers to discuss issues and concerns. This was a common theme throughout the workshop, that a venue such as this provided a unique opportunity for participants to interact with direct peers in their roles.. Many suggested the creation of collaboration tools, such as networks, mailing lists, and other resources that might enable sharing data and opportunities for collaboration. There was a fair amount of time comparing the impact of the structure of different institutions on the level of support, autonomy, and role-specificity that existed. At some institutions it was observed that an ambiguous, even competitive or antagonistic environment around innovation and entrepreneurship existed.

Next Steps

Participants expressed a desire to continue peer engagement in a variety of forums. One clear next step was the continued hosting of an annual ADIE workshop, either standalone, or in concert with one of the ASEE conferences or meetings. Some areas of further engagement might include the development of sub-groups that focus on research, education, technology translation/commercialization, technology licensing, corporate engagement, and others. Institutional/ecosystem maps at peer institutions were also seen as potentially of great value both for locally advocating for resources/programs, as well as for tracking trends across many institutions.

SESSION 2: Ecosystem Building, Campus Policies, Conflict Management, & Ethics ***(moderated by Phil Weilerstein)***

Fundamental Outcomes

There have been substantial changes in the Innovation and Entrepreneurship (I&E) ecosystems over the last 5-10 years at most of the institutions represented at the workshop. Changes included creating I&E educational programming and curriculum either within engineering and science or making them accessible campuswide (or both) so that on a growing number of campuses, the business school is no longer the sole center of entrepreneurship. Creation of the role of ADIE (or similar) was part of this shift and was the result in most cases of an active and sometimes externally mediated initiative (NSF-supported programs were often a driver such as Pathways to Innovation (EpiCenter) and the I-Corps

sites program) to address the institutional culture and capacity for innovation. Leadership support was viewed as key to initiating this cultural change and connecting I&E with institutional goals and providing resources. A shift at most institutions towards seeing the key elements of an innovation ecosystem as connected, is occurring, however, alignment remains a long-term objective at many institutions. In order to make this happen, policy, structural, pedagogical and practical issues need to be addressed. A healthy ecosystem is described as having clarity and coherence, alignment in policies and rewards, accountability for innovation at all levels of administration, alignment of incentives and program activities, and cultivation of an atmosphere of trust based on the understanding that institutional representatives will act in a transparent, supportive manner.

Key Observations

Participants identified key areas of high impact and action for creating a successful entrepreneurship ecosystem. First, one could create a program for student innovators and entrepreneurs with educational, training and support resources that are designed to support their growth and development and the advancement of their ideas and Intellectual Property (IP). Second, it is important that the ecosystem cultivate and support IP policies and practices that are stimulative and supportive of innovation by both faculty and students, requiring attention to structure, motivations, and alignment of the campus Technology Transfer Office (TTO) and other parties involved in encouraging and supporting disclosure and pursuit of IP and commercialization.

Third, the campus needs to allocate resources to support innovators in education, early stage commercial exploration, and venture initiation. Campus entrepreneurship ecosystems need to also create recognized and celebrated pathways for emerging inventors and innovators that leverage external structures and resources (for example: I-Corps, VentureWell E-Teams, TechStars) and provide recognition and celebration of these early innovators.

Fourth, it is also important to define metrics that document and track key activities (disclosures, startups, filings, success in competitive external opportunities, funding raised) and are designed to 'share' credit, incentivizing alignment among the contributing ecosystem components. A successful ecosystem needs to align the administrative structures and accountability. For example, there could be reporting relationships to the Technology Transfer Office, Vice President of Research, Engineering and Science Deans, etc. or another example could be building I&E into promotion and tenure (P&T) processes (patents weight in P&T, grad student participation and success in I&E activities such as I-Corps).

Fifth, it is also important to examine consciously intended and unintended results of policies that affect innovators to enable several items: moving at the speed of business in decision making and prioritization, creating simple and fast agreements and terms (eg: favorable indirect rates) that favor momentum of innovation and participation of industry partners, and creating terms that will help innovators to succeed in attracting non-dilutive and equity capital, developing simple and clear guidance on managing conflicts of interest, ethical conflicts, good practice in the pursuing IP and business ethics.

Next Steps

There are several proposed activities that this group can do to improve the local ecosystem and develop a nationwide community to drive continued improvement of the university innovation environment:

- 1) create a benchmark framework to enable assessment of local ecosystems and creation of change action plans based on effective practices.

- 2) bring this community together to share and report on effective practices, provide learning tools and peer support mechanisms to enable and empower EILC community to act locally and nationally (this could be in affiliation with existing groups such as VPRs - APLU Council on Research- and/or higher ed conferences - such as Big 10).
- 3) enable the sharing and comparison of ecosystem maps for institutions for research and education, at both the university and college levels in a way that identifies gaps and weak links, helping to understand why gaps or weaknesses exist.
- 4) work with NSF and other key funders to incentivize and improve innovation in research proposals, supporting innovation activities in graduate funding (innovation fellowships and post-docs) and filling in gaps in existing program pathways and support resources such as I-Corps and SBIR.

SESSION 3 (Working Lunch): Faculty Engagement, Promotion and Tenure, & Incentives (moderated by Ellis Meng)



Fundamental Outcomes

This session began with a list of topics that applicants and attendees suggested through our pre-workshop interest survey in areas related to faculty engagement, promotion and tenure, and faculty incentives. Respondents identified the following topics in order of importance:

- Lack of meaningful faculty incentives, and hence, challenges with engaging faculty.
- Supporting innovative and entrepreneurial faculty.
- Education for faculty.
- Interdisciplinary initiatives.

Using this input, the conference organizers put together a series of questions for groups to consider during the working lunch session:

- How can we encourage and promote diversity, equity, and inclusion among faculty in innovation and entrepreneurship programs and activities?
- How can faculty engagement be improved when there are so many demands on their time? What works and what does not?
 - What about early-career faculty and the competition between achieving tenure and developing their innovation and entrepreneurship portfolio?
 - What advice or caution should we offer to early-career faculty interested in innovation and entrepreneurship?
- What mechanisms and approaches have been successful in bridging faculty research with innovation and entrepreneurship?
 - How can faculty be encouraged to integrate an entrepreneurial mindset in their research?

- How can faculty better identify and develop commercializable research?
- How can the university and federal funding agencies cultivate and promote faculty engagement in innovation and entrepreneurship?
- How can we develop a population of faculty mentors to assist in faculty engagement?
- How can faculty be encouraged to integrate innovation and entrepreneurship into their courses?
 - What about curricula in departments?

Through the collective discussion guided by the questions above, three themes emerged: education and supporting faculty entrepreneurs, faculty incentives and engagement, and promoting diversity, equity, and inclusion. The following summarizes the outcomes of the discussion in these areas including the practices and culture of the different participating institutions, observations of the current status of innovation and entrepreneurship in building academic careers, and suggestions on next steps for the academic community to take to recognize the important role of I&E activities in scholarship.



Educating and Supporting Faculty Entrepreneurs

Education is critically important to increase the number of faculty that can meaningfully engage in entrepreneurship activities. Given that faculty are not traditionally trained in these areas as part of their technical education, engaging in entrepreneurship can be challenging. Many barriers facing faculty can be minimized through education, training, and mentoring.

Many problems of interest may not be addressable by technology alone and interdisciplinary education of both students and faculty are essential to maximizing the impact of proposed solutions. In practice, incorporating additional topics can be challenging for a host of different reasons that may range from institutional barriers to demands on time. For example, faculty should have access to business courses. To enable this, non-traditional approaches such as using stackable certificates or credentials to piece together the equivalent of an MBA could be considered. Likewise, there are a number of topics related to technology transfer that could be offered as additional training or be incorporated into a faculty mentoring program. One such topic is conflict of interest and how it can be balanced while promoting innovation and entrepreneurship activities. To ease demands on time, training could be in a modular format to encourage initial engagement.

All faculty must engage with their technology transfer office (TTO) to commercialize inventions resulting from their federally funded research. Since the TTO acts as a gatekeeper in this process, it is critical that such offices promote a welcoming culture and provide good support and services for faculty entrepreneurs. Participants stressed the need for clear policies and simple disclosure procedures. Some institutions provide entrepreneurs or executives in residence as mentors for faculty and student entrepreneurs. Examples were cited in which TTO staff developed strong relationships with faculty inventors and physically integrated themselves into the research process by regular engagement with labs. The Swanson School of Engineering at the University of Pittsburgh worked with the University's

Innovation Institute to have a TTO staff member embedded within the School with an office in a main thoroughfare in order to increase interactions. Having TTO staff with technical training, especially at the PhD level, coupled with industry experience for business development allows centralization of interactions into a single office. This combined set of skills also provides insight to skillfully assemble collaborative teams. Another model used at Carnegie Mellon's Partnership Office is to have PhD-trained staff with expertise in specific market sectors be assigned to faculty working in that intellectual space.

In some cases, faculty inventors may not want to engage in entrepreneurship and will thus depend heavily on the university's TTO to facilitate continued development of their inventions through a license. Although much of the burden for marketing faculty inventions is currently placed on the university TTO, another model that could be explored is partnership with the USPTO to advertise university patents available for licensing to a much broader audience.

Faculty engagement in innovation and entrepreneurship activities can also be promoted by providing dedicated funding to support entrepreneurial fellowships, start-up companies, or the formation of interdisciplinary groups that span different units across a university that can tackle difficult problems. For the latter, the model of interdisciplinary groups has been explored for research but can be cast in a way to form teams that can address industry needs. One way to achieve this might be through intentional matchmaking of two or more faculty working together from different colleges that can each work on a problem from different viewpoints.

In practice, it may be difficult for all faculty ranks to participate equally in innovation and entrepreneurship. Pre-tenure faculty must first address the traditional requirements for tenure and promotion (some combination of research, teaching, and service) which can consume all available time and effort. These traditional requirements are not likely to change in the near future without external influence. The resistance to change can be tied to an institution's desire to perform well in national rankings which also do not consider faculty innovation and entrepreneurship activities. The community should therefore work to influence ranking systems to incorporate metrics for innovation and entrepreneurship as a way to redefine tenure and promotion requirements.

Attendees were informed of another opportunity to discuss the role of innovation and entrepreneurship in faculty promotion and tenure considerations in an upcoming workshop also sponsored by NSF (CNS-1936073) and hosted by Oregon State University. The Promotion and Tenure - Innovation and Entrepreneurship (PTIE) Summit (<https://ptie.org/>) will be held on September 16-18, 2020, either in Arlington, VA or virtually. The stated purpose of the workshop is to:

"convene key stakeholders to discuss the value and inclusion of evidence-based data, experimental knowledge and impact outcomes derived from innovation and entrepreneurial (I&E) achievements as additional components in promotion and tenure (P&T) decisions for higher education nationally."

Faculty Incentives and Engagement

The longstanding model in academia for faculty load profile includes some combination of teaching, research, and service. Although profiles may vary by institution, faculty incentives are aligned primarily in research and teaching with little acknowledgement of innovation and entrepreneurship activities. Faculty behaviors are often shaped by such incentives which discourages I&E activities. Not all faculty choose to engage in I&E activities, however, for those that do, it was generally agreed that current promotion and tenure guidelines or even annual merit reviews should be reexamined. Importantly, it was acknowledged that I&E should not be made a requirement but there should be concrete processes to recognize and reward meaningful I&E activities. This concept is likely to be met by some resistance as

not all faculty are supportive of the value of I&E activities and instead may consider these activities as competitive against traditional academic responsibilities.

Another practical challenge associated with recognizing or engaging in I&E activities is the long time horizon that is often associated with commercialization of research. New models to allow faculty time to pursue such activities may need to be explored beyond the traditional sabbatical or leave of absence. These might include teaching and research releases or hybrid forms of relief to free up time. A menu of different types of leaves could be offered including partial appointments simultaneously in an academic institution and industry that allow benefits of the academic position to be retained. The concept of an entrepreneurship sabbatical was introduced which could be a means by which to encourage faculty to explore commercialization of their research and engage in taking risks. This is in contrast to the common practice of taking a leave of absence which is perceived as having less value compared to an academic sabbatical or less prestigious compared to taking a leave to serve as a rotator at a government agency. It was recognized that the experience obtained by faculty on leave pursuing I&E would bring value to their academic pursuits and institution after their return, even if the end result of that experience was a failed commercialization attempt. It was suggested that such an entrepreneurial sabbatical should be on equal footing as any other academic sabbatical or leave. By finding new ways to encourage engagement in I&E, faculty will gain access to new pathways to provide societal impact and even wealth while in academia.

I&E activities can result in concrete products and societal impact that merit recognition in the promotion and tenure process. For example, an early stage product is a patent which could be listed along with publications in a CV or dossier. Some institutions have begun exploring this. Purdue University considers royalties, impact, and patents in promotion and tenure reviews. Explicitly recognizing such activities might also incentivize faculty to include I&E in instruction. To promote at the very earliest stages of faculty careers, institutions may consider an optional I&E statement in faculty applications.

Many institutions have faculty awards for excellence in teaching, research, and/or service. To elevate the status and importance of I&E, faculty awards should also be given for faculty entrepreneurs and innovators. Such a practice would acknowledge the value in these activities. In addition to awards, faculty achievements and success stories in I&E could also be highlighted in other formats that are commonly used for teaching and research activities. Importantly, the value and societal benefit of faculty engagement and success in I&E activities needs to be communicated outside of the university and the Higher Education community so that it is understood by the general public.

Diversity, Equity, and Inclusion (DEI) in Innovation and Entrepreneurship

Participants discussed DEI challenges in faculty activities in Innovation and Entrepreneurship. It was pointed out that these challenges are not unique to I&E activities and instead mirror those faced in engineering schools. Thus, many of the resulting recommendations are generic: performing university-level DEI self-assessments, identifying champions within an institution, having diverse faculty in leadership roles, and having underrepresented groups review materials and content for inclusive messaging. It was acknowledged that DEI efforts would benefit from professional development training opportunities and education provided to faculty.

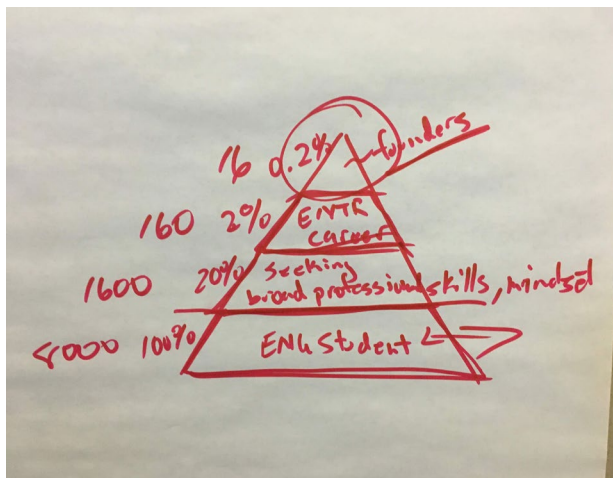
While the majority of the discussion centered on engineering faculty and an engineering-centric perspective on I&E, the group recognized that not all societal solutions can be solved with engineering. In the spirit of taking a broad definition of “inclusion,” the group cited the importance of engaging social sciences, humanities, and the arts in I&E activities. The consensus was that the intersections between these intellectual domains have not been adequately explored in I&E activities but that such

collaborations could potentially result in holistic design and solutions that appeal to broad markets and improve society.

Key Observations

This session, unlike the others, was held as a working lunch. The group touched upon a number of topics raised in the list of questions provided to attendees and engaged in rich discussions. However, as expected, the time allotted did not allow all questions to be addressed and many more were raised. It was noted that innovation and entrepreneurship as a whole are fledgling efforts and not mature within the majority of engineering schools in higher education. As such, there is an opportunity to make major strides in diversity, equity, and inclusion at an early stage as opposed to trying to address it after the fact. Participants shared several best practices to promote faculty engagement and support faculty entrepreneurship. Follow up meetings could be dedicated to exploring such programs in more detail, understanding the impact of their outcomes, and how they might be more generally adopted by other engineering schools.

Faculty play a central role in the commercialization of university technologies by serving as role models to other faculty and students. Many challenges and barriers were exposed or examined and a community effort is required to address them in a manner that offers different solutions for deployment at a wide range of institutions. It is critical to remove as many barriers as possible.



Next Steps

Faculty and administrative leaders within academic institutions are encouraged to consider developing a number of practices and policies that lower the barriers to faculty engagement in innovation and entrepreneurship and provide support to faculty entrepreneurs at different stages of the commercialization process. Our recommendations include:

- Developing mechanisms to improve faculty education in I&E which is generally lacking.
- Working to change traditional academic incentive structure to value and encourage faculty engagement in innovation and entrepreneurship.
- Eliminating barriers to growth of I&E in

academic settings.

- Communicating and celebrating on equal footing with research the value of faculty innovation and entrepreneurship.
- Developing mechanisms for promoting I&E to diverse populations with a message of equity and inclusion, so as to diversify the participants in innovation and entrepreneurship.

SESSION 4: Student Engagement, Curriculum, & Co-Curricular Programs

(moderated by Phil Weilerstein)

Fundamental Outcomes

The emergence of entrepreneurship education in engineering and science was the starting point for discussions. High levels of student interest are consistently recognized and can be characterized as two levels of learning. The first is learning *about* innovation and entrepreneurship with a goal of 'literacy in innovation' (understanding of the process, familiarity with the nomenclature and ability to be an active bystander) an 'entrepreneurial mindset'. The second, for more interested and committed students, can be described as learning by engagement in pursuing innovation and entrepreneurship activities. This type of learning is often focused on developing an innovation and exploring its development and/ or launching a venture.

Development of curriculum should be done with these different goals in mind. Resources should be allocated disproportionately so that those interested in deeper learning and pursuit of an innovation are receiving more intensive support (training, mentoring, tangible resources, access to campus facilities, etc) that support their efforts fully. However, regardless of the focus of the learning, the goals and metrics of educational programs should prioritize literacy in innovation skills and knowledge for all STEM students and support outcomes that demonstrate and celebrate the pathways that innovators take to develop and scale their ideas.

The value of including entrepreneurship education in STEM is based on the reality that while most students will not be founders, they will learn soft skills and competencies that improve employability. These students will also learn how tech ideas become applications in the real world.

Student interest in I&E is often motivated by wanting to have a positive impact on the world. Connecting I&E opportunities to areas of student passion and interest is an effective way to engage broader and more diverse participants. Explicitly connecting programming with topics such as sustainability, energy and climate, health and education can provide a point of entry for students who may not already see themselves as entrepreneurs. The integration of ethics and ethical entrepreneurship practices in I&E programming is critical to the development of well prepared leaders. Rather than treating I&E as an add-on lecture, it should be integrated into the curriculum through experiential projects that provide the opportunity to apply ethical principles in the development of a business or product.

Experiential learning and doing opportunities are critical and should have both educational and commercial goals and metrics. Experiential opportunities should have a productive commercial focus (ie: the creation of a product or venture) so that the experience is authentic. It is important, however, to recognize and measure student learning and skill development in addition to positive commercial outcomes and not penalize participants for making a no go decision or deciding to opt out of pursuing a project further.

We suggest providing more intensive support to student innovators who are trying to commercialize an idea. This is a rational way to allocate limited resources. This support includes access to: space and prototyping facilities and equipment, rapid and low threshold initial funding to test and validate, advising and mentoring from both faculty and experienced entrepreneurs, access to specialized training such as Lean LaunchPad or localized I-Corps programming, and encouragement and support to pursue resources beyond the institution. Programs and resources exist that provide access to grants, early stage angel investors, and accelerator and incubation programs as they progress. Rather than seeing this as interfering with their education, these features should be 'designed in' for those who are serious and have high potential opportunities through fellowships, entrepreneurial 'leaves' from coursework, and other mechanisms.

The most valuable “currency” students have is their time - they vote on what’s most important to them with how they spend their time. Therefore, rather than competing for their time in a zero-sum game (forcing them to give something up in order to learn about or pursue I&E), we can reach more students by embedding I&E where they’ve already committed their time. This could be courses they already plan to and/or must take like general education courses, introduction to major courses, major prerequisite courses, and upper level major required courses like capstones. In addition, individually designed majors or the addition of minors can provide greater flexibility.

Next Steps

The following proposed activities will improve student engagement and support the climate and culture of innovation in the university environment:

- Create an accessible cross-disciplinary/campus-wide introduction to I&E opportunities and pathways that are broadly available, for example as part of design or introductory sequences to create a minimum level of I&E literacy.
- Introduce I&E course tracks that are open to all students and are well-aligned with the undergraduate and graduate curricula.
- Introduce innovation competitions for student teams to showcase their technology ideas and business plans.
- Develop pathways for exploring I&E that promote internships and the pursuit of innovation opportunities.
- Celebrate student pursuit of IP and enable students to own IP created on campus where appropriate.
- Encourage students to pursue entrepreneurship within the context of their educational experience.
- Use a tiered approach to enable scaling of resources for exposure to all and intensive support for students actively pursuing innovation and IP.
- Provide space, catalytic funding, and access to networks and resources for innovation.

SESSION 5: Workshop Wrap-up and Next Steps

Before the last session of the workshop, participants were asked to identify a few “big ideas” that they heard or developed during the workshop. They posted these on a board to be discussed by the group. Participants were also asked to consider the timing and location for a second (or an annual) EILC National Workshop.

Participants roundly agreed on the following areas for future workshop discussion:

- Institutional conflict management policies and best practices. It was felt that opportunities to learn from other (good and bad) past outcomes would be of benefit to institutions with less experience.
- A means for scalable delivery of faculty education in and around the path from translational research to commercialization and entrepreneurship. Sharing of methods used at other institutions around annual disclosure mechanisms and how to best manage and document student-faculty relationships in such endeavors.
- The role of the ADIE and vice chancellor for research (VCR) at many institutions in educating and managing issues related to faculty and staff conflict management.

Participants also discussed how to best expand the reach and scope of the group represented at the workshop and the benefits of doing so. They explored the optimal group size and how often to meet. Some pointed out that the Spring ASEE Dean's workshop and Research Council meetings would include many attendees of this workshop and may be a convenient venue. An email list was recommended to be established, enabling group communications along with a web site that can be updated and made publicly available. A forum or other means to ask questions was also agreed to be of broad benefit.

Some attendees proposed authoring brief case studies of outcomes and learning experiences from institutions with such experience, noting that many universities currently operate well-functioning innovation and entrepreneurship ecosystems. Noting that campuses of different sizes in different regions may operate in different ways, multiple points of view were seen as essential. Such brief case studies could include issues related to how systems operate and how they are managed, how various pieces of the ecosystem interrelate and the associated challenges, along with lessons learned and any recommendations for others to follow.

Some of the other groups that were mentioned as potentially being engaged in future endeavors included the AAU, as partners outside of engineering, including institutions that have strong research functions. This is a well-established group outside of engineering that does a lot of work with STEM.

It was noted that institutions participating in the NSF I-Corps program would be important to engage in this group. Additionally, it was suggested to engage successful entrepreneurs who have developed within academic entrepreneurship and innovation ecosystems and can provide experiential learning. Another group with strong synergies to this working group is the National Academy of Inventors (which had representatives at this workshop).

A list of the "Big Ideas" proposed during the final session included:

1. Recognition of entrepreneurship successes. Encourage deans and administration to do a better job of highlighting entrepreneurship, patents, and other related achievements. "You can give people time, title, or treasure."
2. Creation of a US chief entrepreneurship officer. Megan Smith's role as chief technology officer was important in advancing a national view of technology and public policy and engaging the national technology innovation ecosystem.
3. Start a national innovation program, just like the space program in all states and discuss funding mechanisms.
4. This group should launch a marketing campaign for educating people on the role of academia in I&E, like "Schoolhouse Rock" for I&E. Most people have no idea what a university faculty member does, with massive misconceptions. Many view the role of a faculty member as teaching one or two classes a week while otherwise simply grading papers. It is often difficult to understand why faculty would receive large grants. Education could help depoliticize academic research.
5. Change the perception and culture of faculty members of innovation and entrepreneurship. Ten years ago there was a campaign by the NAE to explain what an engineer was. Perhaps we can do more outreach around technology innovation and entrepreneurship.

6. Establish a national and regional engineering officer network. To some degree the I-Corps provides an avenue for some of this, but only one slice of what we are discussing, namely commercialization of deep technology. The City of Chicago chief technology officer attends some of these types of events, engages in advocacy and is himself an entrepreneur.
7. Provide a list of the job descriptions for all participants. Each could provide their ideas of success and what they are actually doing in their roles.
8. Investigate how I&E skills and courses compete with liberal arts. It has been reported that liberal arts majors often earn more in the long run, so exploring these skills and how they help make them more competitive would be of interest.
9. Encourage E&I educators to build better bridges and connections to applied ethics. The article by the Stanford president, "Putting Ethics at the Heart of Innovation" is a good start from a university's leader. We have all kinds of crazy things going on in the world in 2020, and truth is often fluid these days. Ethics is a problem on everyone's mind the past few years, especially with its relationship to causing problems in society and technology. We, as I&E advocates, could help solve some of their problems. When we teach, it could include an effective dose of ethical reasoning. Sadly, ethics has been in the back seat of entrepreneurship and innovation education for the most part, except for in certain instances in social and impact investing. It could be in the front seat!. Traditional fields like engineering ethics, medical ethics, and business ethics are all well-developed and admirable. The Chronicle of Higher Education notes that "innovation programs consistently reinforce a hypercompetitive culture.... Leaders never cheat. "Winners never Cheat," also a book about entrepreneurship and ethics. SBIR programs take ethics seriously. Trouble often happens when people adopt a dangerous interpretation of ethics to justify their questionable actions to achieve success of the enterprise at all costs.

Participants identified audiences who did not attend but should be reached in future workshops, including:

- Students
- Colleges of science leaders
- Venture capital and start-up company reps
- Tech center advisory board members

Participants asked whether a centralized model for I&E across campus is successful. CMU has a university-level entity that was created to support I&E. UC Berkeley has a number of endowed I&E related centers. Berkely also has a position of chief entrepreneurship officer. Some universities, including UMD, ASU, GW, NYU, JHU and USC, have a combined top-down and bottom-up model. The university-level entity reporting to the provost and president is charged with serving the entire campus by incentivizing collaboration among the college-level centers and by integrating innovation into existing academic and research programs that serve all students and all faculty. Other universities have created, and since disbanded campus-level units keeping an emphasis on I&E activities at the college level.

Appendix

EILC workshop participating institutions

- Carnegie Mellon University
- City College of New York
- New York University
- Purdue University
- Stanford University
- Stony Brook University
- Tennessee Tech University
- Tulane University
- UC Santa Cruz
- University of Illinois at Urbana-Champaign
- University of Louisville
- University of Maryland
- University of Massachusetts Amherst
- University of Michigan
- University of Minnesota
- University of Pittsburgh
- University of Rochester
- University of Southern California
- University of Tennessee Knoxville
- University of Toledo
- University of Utah
- University of Virginia
- National Science Foundation
- National Institute of Standards and Technology
- Department of Energy
- United States Patent and Trademark Office
- National Academy of Inventors
- VentureWell

How this report was created

The final report was drafted by the conference organizers,

- Andrew Singer, Associate dean for Innovation and Entrepreneurship in the Grainger College of Engineering at the University of Illinois at Urbana-Champaign, Steering Committee member

- Ellis Meng, Vice Dean of Technology Innovation and Entrepreneurship in the Viterbi School of Engineering at the University of Southern California, Steering Committee member
- Phil Weilerstein, President and Chief Executive of VentureWell, Steering Committee member
- Stephanie Larson, Associate Director of Innovation & Entrepreneurship Student Programs, Technology Entrepreneur Center, University of Illinois at Urbana Champaign
- Amy Koester, Assistant Director of Graphic Design, Technology Entrepreneur Center, University of Illinois at Urbana Champaign

shared via Google docs, and reviewed by the academic participants of the workshop with several comments and feedback provided. The following participants reviewed and contributed to this report.

- Tom Byers, Professor and Faculty Director, Stanford Technology Ventures Program (STVP), School of Engineering, Stanford University, Stanford, CA
- P. Scott Carney, Director, The Institute of Optics, University of Rochester, Rochester, NY
- Dean Chang, Assoc VP for I&E, University of Maryland, College Park, MD
- William M. Dunne, Associate Dean for Research and Facilities, Tickle College of Engineering, University of Tennessee, Knoxville, TN
- Sundar Krishnamurty, Distinguished Professor in Engineering, Department Head, Mechanical and Industrial Engineering, University of Massachusetts Amherst, MA
- Jon Longtin, Associate Dean for Research and Entrepreneurship, College of Engineering and Applied Science, Stony Brook University, Stony Brook, NY
- Vahid Motevalli, Associate Dean for Research and Innovation, College of Engineering, Tennessee Tech University, Cookeville, TN
- Norman Rapino, Executive Director of Rocket Innovations, University of Toledo, Toledo, OH
- David Vorp, Associate Dean for Research, Swanson School of Engineering, University of Pittsburgh, Pittsburgh, PA

Feedback provided from attendees

What was most useful for you at this workshop?

- The effective structure and pacing of the meeting, the quality of the attendees, the importance of the topic that is also timely for my College at UTK, where we will likely not create a ADIE position, but will need to become more focused and thoughtful about the role of IE in the work and outcomes of the College (and the University).
- Spending a fruitful 1.5 days with mostly new co-instigators and collaborators who share my passion and goals in a format that was conducive to lots of sharing.
- The networking opportunities.
- The network.
- Learning about the challenges faced by those in this position. Seems like some people had a wider footprint at their institution than others.
- NSF interest and leadership.
- Accomplishments and programs in other universities.
- Best ideas and practices and benefits of this approach.

What was least useful for you at this workshop?

- Actually, I was very pleasantly surprised that I did not end up in a group that got too offtrack or suffered from dominant personalities. That speaks to the quality of the attendees, which was strong. I personally had the opportunity to be in a room full of people with more knowledge, skill and experience than me, so was really a "kid in a candy store".

- I wouldn't say anything was least useful, but given more time or a follow-up, I wish there were more perspectives to learn from (students, APT committees, accreditation, etc.) and an opportunity to understand funding models, incentives, priorities, etc. of those not already in the I&E camp.
- It was all pretty good. The agenda might be a little too packed.
- The funding discussion.
- The lunch meeting was hard to follow discussions in this particular format. I think it would be better to have a presentation during lunch and Q&A.

Please provide your overall feedback on the daylong workshop on Thursday, Feb 27th. What did you enjoy? What could be improved?

- As a person who does not have intellectual property creation/development and the encouragement of faculty/student entrepreneurship as a primary responsibility (e.g., not in top three responsibilities), the workshop was a great opportunity to interact with a group of individuals who have or had direct involvement in entrepreneurship, and of which a subset now have this activity as a primary job responsibility in either academia or an agency/foundation. My goal at this meeting was to immerse in this culture, better understand it and engage it, and from that perspective the meeting was a great success for me. One limitation of the group was that the many folks from engineering do not understand the work and mindsets in the humanities, social sciences and arts, and at best see them as just plug-ins to engineering-centric entrepreneurial activities, which is unfortunate. Not universal, but very prevalent and simplistic.
- Kudos on the variety of people in the room. Organizers struck a nice balance of 1) obligatory remarks by NSF (short but informative), 2) enough structure to focus and drive the conversations towards key points and ideas rather than prolonged opinions, and 3) flexibility to adapt on the fly depending on reading the room.
- Great chance to hear from colleagues from a wide variety of places. The topics were very good, but maybe a little redundant. Maybe that's good though and gives everyone more chances to contribute.
- Overall it was good. It was/is not clear what the intended outcome is for the day.
- I enjoyed the back and forth discussions about a wide variety of topics.
- Presentations were well-done. I would not mind them having more time.
- The break-out sessions and discussions.
- The space needed to be larger.

Please comment on the workshop format. How could it be improved?

- The workshop format was highly functional for me. Good group discussions and report-outs. No period of burnout, so while working hard, the pacing was good. Also, the mix of people and backgrounds was effective. Personally, I learned much from many different perspectives about the workshop topics and goals.
- Would be valuable to have two additional types of people in the room. 1) faculty who aren't already drinking the Kool-Aid to understand what their reservations and barriers are and how we might make things work for them, and 2) students - both those already interested in I&E as well as those who aren't.
- It was a little mentally exhausting. Maybe longer breaks or some other refreshing activities.
- Liked the format.
- Not much improvement needed - I thought it was productive.
- The format was fine. Perhaps doing a little bit less, and allowing more time on the topics.
- Keep in mind the size of room, especially with an interactive workshop (more space would be better, to allow participants to move around easily for each session)

- I would like more structure and a more inclusive environment for people to contribute.

What topics would you like to see in future workshops?

- Implementation strategies for particular topics.
- How do we improve the presence of I&E in the culture of a college of engineering without creating an ADIE position? (many colleges are not big enough to be adding another AD position).
- I wish there were more perspectives to learn from (students, APT committees, accreditation, etc.) and an opportunity to understand funding models, incentives, priorities, etc. of those not already in the I&E camp.
- Well, in light of recent events, I think the "innovation" needs to include an aspect of institutional agility. In this crisis, we needed to be agile in moving on-line. We can't be sure what the next major necessary change will be.
- Information about pathways to outside (foundations) grant funding to support our efforts.
- I&E at the graduate level.

Budget (estimates)

Fixed costs: venue, audio visual, materials

- Venue: \$1,000
- Audio Visual: \$3,700
- Materials: \$1,000

Variable costs: hotel accommodations, participant travel expenses, banquets & catering

- Hotel accommodations: \$7,400 (24 guests; avg \$308/person)
- Participant travel expenses: \$12,570 (22 participants needing reimbursement; avg \$571/person)
- Banquets & catering: \$9,200 (40 attendees; avg \$230/person)

Total expenses: approximately \$35,000 (avg \$875/person)