

## **Entrepreneurship, Engineering, Innovation, and Libraries: Empowering Innovators with Information**

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As the IEEE Client Services Manager for the eastern US and Canada, my role is to expand awareness and knowledge of IEEE's online products through training and marketing, my responsibilities include: - Train engineers, researchers, librarians, and end-users in effective use of IEEE Xplore and the patent analytics tool "InnovationQ Plus". - Coordinate customized promotional events at customer sites - Present workshops on topics such as: career & networking opportunities, authorship, innovation & entrepreneurship workshop. - Represent IEEE at conferences and major industry events

Prior to joining IEEE, I had an 18-year career with AT&T/Lucent and its predecessor companies. My roles included Bell Labs Reference Librarian, management trainer and administrator of education, information specialist for business systems, and electronic content coordinator for Lucent's Digital Library

# **Entrepreneurship, Engineering, Innovation and Libraries: Empowering Innovators with Information**

## **Abstracts**

Nearly two-thirds of millennials aspire to start their own business or have already done so. Innovation and entrepreneurship are dominant forces driving innovation in a dynamic global economy, and universities have an essential role in cultivating the innovators and entrepreneurs of the future. In most universities, capstone senior design courses have an entrepreneurship component. We describe a cross-institution workshop designed to heighten student awareness of university resources supporting entrepreneurship. Drexel University and University of Pennsylvania STEM libraries collaborated with the professional society IEEE to organize a workshop highlighting the role of campus information resources in empowering entrepreneurs. The workshop was organized in a panel discussion format, featuring technology transfer professionals, librarians from both institutions, and examples of successful innovators and entrepreneurs. This allowed for active interaction and networking with the panelists. We review the state-of-the-art in entrepreneurship education, report student feedback, and offer lessons learned from this experience.

**Keywords:** Entrepreneurship, Academic Libraries, Collaboration, Information Literacy

## **Introduction**

Innovation and entrepreneurship are driving forces of growth and global competitiveness [1, 2]. University-based innovation and entrepreneurship are flourishing in the United States, well beyond the legacy technology hubs of Boston, New York, and Silicon Valley[2]. Universities increasingly encourage entrepreneurship among their faculty and students, through policy changes that allow faculty to work on their own startups based on their research, incubators and accelerators, transdisciplinary schools of entrepreneurship, and have expanded to thousands of new course offerings in the area. In 2013, over 400,000 students took advantage of these new entrepreneurship course offerings[3].

Entrepreneurship by its nature is highly information intensive[4]. Entrepreneurs constantly locate, absorb, and interpret eclectic information to make decisions impacting their new ventures, and established companies should equip themselves to adopt new technology and business models. University library subscriptions to discovery platforms are the ideal vehicle to access deep technical knowledge, as it emerges and evolves. Unsurprisingly, entrepreneurs who display learning initiative have higher likelihoods of enhancing new startup performance than those whose do not [5]. Entrepreneurship (and STEM fields) are undoubtedly best learned through doing (e.g. experiential learning, project-based learning), as opposed to passively reading or attending lectures[6]. Research and entrepreneurship mindsets are excellent pairings. Legacy thinking has been that startups are simply smaller versions of large companies, and should therefore formulate business plans and execute them perfectly. However, the

community has realized that startups are fundamentally different than large companies, leading to the concept of the “lean startup”[7] which says that new ventures should quickly and cheaply validate or invalidate hypotheses through delivering the minimum viable product to potential customers well before committing to large investments and long timeframe development efforts. This approach essentially amounts to an application of the scientific method in a new venture context[7].

The nation’s 160,000 libraries empower the innovation and entrepreneurship ecosystem. Libraries are digital decentralized networks that empower innovators from all facets of society through access to knowledge channels and the tools of creation. Such resources may be minimal or non-existent in startups, or even established corporate environments. As access points to transdisciplinary knowledge streams staffed with mentors in the form of librarians, libraries are ideal environments to learn core information literacy skills. Librarians themselves have a long history of innovating to better serve their communities, in ways that go well beyond the baseline knowledge repository role [8]. In fact, the main driver of the United States’ first lending library in Philadelphia was to empower innovators to solve the pressing challenges of their day [9]. Libraries are portals to intellectual property and market research insights, business plan assistance, and capital, and more. For instance, IEEE’s InnovationQ Plus harnesses machine learning and semantic search (e.g. full sentence queries) for rapid discovery of relevant technical and patent literature. Libraries are essential entry points for first-time independent entrepreneurs to access state and federal support for small businesses[10], such as the Federal Small Business Innovation Research (SBIR) [11] and various state programs. The Small Business Administration’s (SBA) Chief Counsel Darryl DePriest acknowledged this important role of libraries in ALA’s first ever national policy convention in 2016. Academic and public libraries have rapidly added makerspaces in response to the recent maker movement, democratizing access to the tools of designing and making things[4-6]. With a library card and some training, library users in over 420 public libraries can now access computer-aided design (CAD) software, 3D printers, and computer-numerical control (CNC) routers, and digital recording equipment[12-14].

The entrepreneurial mindset involves an urge to identify opportunities for value creation, challenge established ideas, and positively view failure as iterative learning. Cultivating an ecosystem around entrepreneurship within and beyond the university environment is critically important for producing the graduates who will creatively solve the problems of the 21<sup>st</sup> century[1]. To this point, the professional society and publisher Institute of Electrical and Electronics Engineers (IEEE) partnered with Drexel University Libraries and the University of Pennsylvania Libraries to organize a panel discussion focused on innovation and entrepreneurship, highlighting resources available on both campuses that are available to students launching new ventures. A panel discussion format was chosen to facilitate sharing of multiple viewpoints and greater audience interaction. Continuing the libraries’ emphasis on innovation and

entrepreneurship, in the following quarter, we hosted a competition for students to pitch ideas for tech startups before a panel of experienced entrepreneurs.

### **Structure of the Panel**

The panel was marketed to undergraduate and graduate students from College of Engineering, School of Business, School of Entrepreneurship, School of Nursing & Public Health, through a social media campaign and Library website in the month prior to the panel using the flyer shown in **Figure 1**. The Dean of Libraries introduced the speakers and moderator. Speakers comprised of recent graduates, faculty, librarians, technology transfer professionals, and an IEEE representative. The event coincided with a lunch and left attendees a full-half hour for networking to occur following the panel.



**Figure 1:** Flyer used to promote the event

## Outcomes



**Figure 2:** A snapshot of the Innovation and Entrepreneurship panel, and the ensuing networking that immediately followed

The panelists discussed wide-ranging issues, beginning with their perspectives on the meaning of innovation and entrepreneurship, launching a company, failures, and resources within and beyond the university available to entrepreneurs including library guides, courses, funding opportunities, and technology transfer. Additionally, several student-entrepreneurs in the audience offered their own experiences in launching companies from an academic platform. Over sixty-five students at undergraduate and graduate levels attended the panel discussion, representing all colleges at Drexel University. Attendees were asked to complete a brief survey on the experience, to capture qualitative feedback and impact, the results shown in Table 1.

**Table 1:** Feedback from attendees on lessons learned and desires for future sessions

What I Learned	I would like more information on	How to Improve Presentation
I learned about entrepreneurship and how it is different than what I thought.	How to find investors, hear experiences of previous students that founded companies	Useful information, actual innovators on the panel
So many resources at Drexel that I should take advantage of ; New MS entrepreneurship this year	Graduate entrepreneurship opportunities	Nice panel but perhaps too many panelists
Successs of a business depends on the target audience	To know more about non-engineering patents	
Various resources that are available that I can make use of	Would like to know more about entrepreneurship and product design	Extremely valuable perspectives, want more events like these
InnovationQPlus	The patent process	Bring more recent graduates
Co-working spaces in Philadelphia	Co-op opportunity for grad students; research opportunity	

The handout given to the audience members contained a program description with speaker bios included, to familiarize the students with the speakers and make it easier to formulate questions. The panel also included a recent graduate and social impact entrepreneur, selected to provide a role model to the students of what is possible through harnessing the new venture resources of a research university. Based on

student feedback forms, it is critically important to have a recent alumni-entrepreneur on panels of this type, to provide a relatable example to the students.

As a pilot project, this panel lacked an activity component. However, we recommend that events of this nature include an activity for students to immediately implement ideas that emerged during the discussion, and promote audience interaction. We offer several suggestions for activities that could fit within an hour-and-half to two-hour time window. A facilitator could read “controversial/bold statements” on innovation and entrepreneurship, and have the audience stand up and align themselves along a spectrum from “totally agree” to “totally disagree”. The facilitator would then invite sharing of perspectives along the spectrum, to engage the group in social knowledge construction. Students could be asked to breakout into small groups and craft pitches on portable whiteboards, and a facilitator would invite a few groups to pitch the audience on their ideas for startups.

As the Harvard education strategist Tony Wagner writes “The world doesn’t care what you know, it cares about what you can do with what you know”[15]. There is clear opportunity for university libraries to form partnerships to develop a new layer of *experiences* focused on entrepreneurship that go beyond content delivery. The work herein reflects a collaborative partnership between two universities and a major professional society. Libraries are transdisciplinary spaces that promote interaction and collaboration. We are exploring ways to tap into this interest – including a follow on panel composed entirely of student and recent graduate entrepreneurs alongside speakers from corporations, and competitions that exercise entrepreneurial thinking.

### **PITCH Competition**

During a one month period in the academic quarter following the panel discussion, Drexel University Libraries and the College of Engineering jointly-hosted a blended online competition for students to craft ideas for new technology-driven startups. The goal was to engage students across disciplines in the simulated entrepreneurial experience of pitching an idea in a mock “Series A” round to create an engaging experience to give students early exposure to the work of starting a new venture. The organizers linked participants to several online resources on crafting successful pitches. The entire competition was hosted on the open cloud platform Google Forms and open to on campus and online students. Students were encouraged to reference technical literature as appropriate, to demonstrate feasibility before investors. Contestants were also given the option of submitting video pitches, in lieu of presenting before an in person judging panel at the library’s new data visualization zone.

## Outcomes

The competition attracted a transdisciplinary mix of students representing mechanical engineering, biomedical engineering, fashion and design, security systems pitching a diverse set of companies. The competition provided an opportunity for students to learn through making and doing, an opportunity for practice in selling ideas to a diverse audience of potential investors. Rather than “telling” students the value of information as legacy instruction would, a healthy competitive environment enables students to demonstrate that value to themselves through creatively synthesizing eclectic information into a viable startup proposal. Entrepreneurship and some engineering faculty members also encouraged students to attend and participate. The competition inspired students to identify opportunities for financially successful ventures and pain point reduction in targeted markets. Furthermore, all participants were invited to attend a monthly recurring local maker/startup meetup series, an opportunity to form deeper connections with the region’s growing technology sector.



**Figure 3:** Snapshots from the PITCH competition in the university library

Through the competition, the students had an opportunity to expand awareness of resources in the university setting to support early-stage ventures. The pitches were judged by a panel of three judges including two Drexel faculty and one from the corporate sector, with first, second, and third place winners selected for prizes. Based on this pilot experience, the authors will seek local venture capitalists, corporations, and makerspaces as partners to sponsor scaled-up versions of the competition as a vehicle to tap into the entrepreneurial drive and talent on university campuses. Libraries offer vital resources to entrepreneurs, but encounter a “messaging” challenge that can in the authors’ opinion be overcome through a consistent stream of I&E programming and strategic partnerships, such as the two events described here.

## Concluding Remarks

In a time of exponential rates of change, entrepreneurship and entrepreneurial thinking are critical assets for all university graduates today, whether they found startups or not. The dynamically evolving global marketplaces of the 21<sup>st</sup> century requires entrepreneurs to quickly synthesize knowledge from diverse knowledge streams, including scholarly communications, standards, regulations, market research, and the intellectual property landscape. Libraries are an often overlooked, yet vital components of the nation's entrepreneurship landscape, and represent the transdisciplinary core of any vibrant research institution.

Herein, we reported an experiment to form cross-institutional partnerships to convene a panel discussion that reached a diverse audience of undergraduate and graduate students from technical and nontechnical backgrounds. As indicated by engagement in the panel discussion and subsequent pitch competition, excitement around innovation entrepreneurship runs deep on university campuses. To continue expanding the libraries entrepreneurship offerings, we launched a blended online PITCH competition to create an informal project-based learning experience. We are planning to scale up similar competitions across the campus community to empower learners to engage in transdisciplinary teams on collaborative ventures.

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