Center for Entrepreneurship & Technology
University of California, Berkeley

Report from the Global Venture Lab Network Inaugural Summit

Engineering Entrepreneurship Education: Best Practices and Next Steps

Number: 2010.1.v.1.0
Revision Date: May 19, 2010

Ikhlaq Sidhu, Burghardt Tenderich, Susan Broderick

UNIVERSITY OF CALIFORNIA, BERKELEY

Abstract

In its April 2009 report, *Educating the Next Wave of Entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century*, the Global Economic Initiative of the World Economic Forum (WEF) called the world community to action in four ways:

- Transform the educational system to encourage creativity, innovation, and thinking outside-the-box problem solving
- Build the entrepreneurial ecosystem
- Strive for effective impact and outcomes
- Leverage technology as an enabler

The WEF report was an initial step in gathering current evidence on entrepreneurship education and serves as a foundation for further discussion, action, and localization of recommendations in countries and regions around the world.

This brief, *Report from the Global Venture Lab Network Inaugural Summit,* reports on further discussion in this area by summarizing the proceedings of a November 19, 2009, meeting of engineering entrepreneurship educators from 18 universities. Its main purpose is to be a record of the symposium for participants in the Global Venture Lab Network. The meeting was designed to share best practices in the area of technology entrepreneurship as well as to increase global collaboration among leading academic institutions. This overview provides a snapshot of current methods and challenges in teaching entrepreneurship and leadership skills to engineers and scientists at college-level institutions in areas throughout the world. Many of the sentiments in the WEF paper are echoed here.

The Global Venture Lab Network Inaugural Summit was a daylong symposium consisting of four sessions: Session 1 — "Perspectives in Entrepreneurship Education" with presenters from Stanford University, Cambridge University, SRM University, University of Michigan, and Bristol University; Session 2 — "Programs and Case Examples" with educators from IIT Kharagpur, Johns Hopkins University, University of Melbourne, and the University of Texas, Austin; Session 3 — the "University Policy Cases" session included viewpoints from University College London, University of Jyvaskyla, and ETH Zurich; and Session 4 — "Translational Research in Entrepreneurship Curricula" addressed how entrepreneurship education can engage meaningful global problems with talks from the University of California, Berkeley, and University College London.

Within each session, speaker presentations were followed by roundtable discussions that engaged the entire group. Based on our dialogue, we draw the following conclusions regarding the state of engineering entrepreneurship education throughout the world.

1. Engineering entrepreneurship programs broadly share a common platform:
    a. Teach students entrepreneurship with a focus on technology and experiential learning.
    b. Support student and faculty ventures either directly or more expansively via research programs.

    c. Build ecosystems (university, regional, national, global) to encourage entrepreneurship and innovation.

2. Increased effectiveness of entrepreneurship programs requires the following:
    a. Determine the optimal balance between the depth provided by the traditional strength of engineering schools in technical fields with the breadth of knowledge acquired via coursework in entrepreneurship, innovation, and leadership.
    b. Develop multidisciplinary projects and programs to identify and work toward solving meaningful, real-world economic and social problems.
    c. Encourage academia to adopt new ways (in addition to publications) for faculty with both academic credentials and industry background to be recognized.

3. Measuring the impact of these programs poses several challenges.
    a. How to best address stakeholders' expectations of measurable academic and economic impact.
    b. How to parse and record the direct and indirect results of the program.
    c. How to manage the inherently chaotic nature and varying timelines of entrepreneurship and innovation.

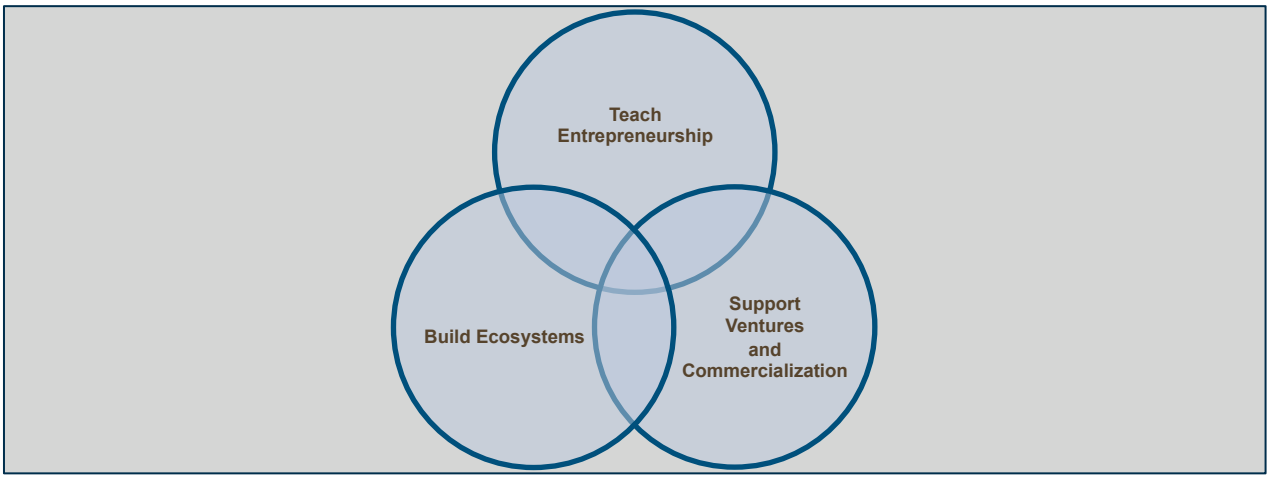
In this report, we present the major ideas that emerged from the Global Venture Lab Network Inaugural Summit. First, despite the relative youth of the discipline and the diversity of economies represented, member institutions broadly share a common set of good practices that includes teaching courses, supporting individual ventures, and building ecosystems to support these activities. To further increase these programs' effectiveness, the Global Venture Lab Network discussed the necessity of ensuring that the breadth of knowledge gained from studying innovation and entrepreneurship complements (and does not compete with) the depth of engineers' technical studies. Curriculum should strive to include multidisciplinary projects (with industry and other universities) that engage students in solving meaningful, real-world problems. Equally important is developing strategies to encourage academia to adopt new ways (other than published papers) to recognize faculty with both academic credentials and industry background participating in this work. The Network also identified a key challenge — how to effectively measure the impact of these programs. In this brief, these and other ideas are supported with first-person university-specific cases that help to illustrate the successes and challenges facing engineering educators in the field of technology entrepreneurship.

Contents

The Common Platform: Teaching. Venture Support. Ecosystem Building.

During the Global Venture Lab Network Inaugural Summit, academic directors of entrepreneurship and innovation programs from around the world spent almost 12 hours exchanging ideas about their respective approaches to teaching innovation. Over the course of the meeting, a pattern of good practices emerged. Engineering Entrepreneurship Programs almost universally focus on three key areas: teaching students technology/engineering entrepreneurship; supporting student and faculty ventures and commercialization efforts; and building university-wide, regional, and global ecosystems. Each university balances and builds these focus areas according to its needs, market, and resources.

Globally, Engineering Entrepreneurship Programs Commonly Focus on These Three Areas



Source: The Global Venture Lab Network, Center for Entrepreneurship & Technology, College of Engineering, University of California, Berkeley

Teaching Entrepreneurship

Expanded Definition of Entrepreneurship As the size and number of these programs has grown, the definition of "entrepreneurship" has transformed. In its 2010 paper, the World Economic Forum states, "When we speak about entrepreneurship, we are defining it in the broadest terms and in all forms – entrepreneurial people in large companies, in the public sector, in academia and, of course, those who launch and grow new companies." These sentiments were echoed by the Academic Summit participants.

> *I think the key here is that we view entrepreneurship in general as the way of improving the practice of managing novel ideas and ventures and leaving the entrepreneurial value of creating value to the stakeholders of the organization. We would like to exclusively*

say that entrepreneurship is not necessarily only about new ventures. It is equally important for established organizations.

Fredrik Hacklin, Researcher, Chair of Entrepreneurship, Department of Management, ETH, Zurich

[Teaching students entrepreneurship] is not just about creating companies, it is about being entrepreneurial in everything you do.

Doug Neal, Managing Director, Center for Entrepreneurship, University of Michigan

With this broadening definition, entrepreneurship's value is no longer restricted to a few students interested in building small businesses. Entrepreneurship has come to define a way of thinking that is often linked to creativity, innovation, controlled risk-taking, and growth.

Universities establishing entrepreneurship programs frequently start with coursework. Classes are undoubtedly one of the most direct mechanisms for educators to introduce large numbers of students to the basic concepts of technology entrepreneurship and innovation. Almost all the participants at the Global Venture Lab Network Summit offered at least one dedicated entrepreneurship course. Although the group identified coursework as the basis of any successful program, they also discussed mechanisms (and sometimes hurdles) in getting courses up and running. Courses can be offered as part of another established department within the engineering school or, if funding permits, with the support of a formally established entrepreneurship center. For universities just embarking on teaching entrepreneurship, starting a few courses in an established department can be an easily actionable strategy to begin to grow engineering entrepreneurship education within the university.

…Our computer science department is the only department within the university that offers enterprise education. And we offer only about 20 credits of the total 120 departmental credits offered. The interesting thing is that we only started this a few years ago, and just recently the rest of the university has asked us to start this program throughout the university — now that is a culture change.

Nishan Canagarajah, Head of Computer Science, University of Bristol

For some mature programs, the entrepreneurship curriculum is tightly interwoven with the broad curriculum. Stanford University is an example.

Stanford Venture Technology Program faculty and adjunct professors taught 18 different courses a total of 25 times during the 2008-2009 academic year. Approximately 1,500 students from across our campus took our courses during this time.

Tom Byers, Director, Stanford Venture
Technology Program, Stanford University

Course Content The content of the coursework varies from university to university, but these basic goals from the University of California, Berkeley are typical of many of the programs.

5 Skills to Teach Engineers and Scientists

- *To recognize opportunity. Know the problem worth solving.*
- *To know how to acquire resources.*
- *To be able to communicate (to customers, investors).*
- *To know how to work within and build global virtual teams.*
- *To be leaders in a Global Economy, not "commoditized contributors."*

Burghardt Tenderich, CET Executive Director
University of California, Berkeley

Lecture Series Integral to most engineering entrepreneurship curricula, an innovator lecture series brings entrepreneurs and other industry professionals directly into the classroom. Their stories illustrate how an entrepreneurial mindset can help students leverage technical knowledge to build and transform organizations and sometimes the world. Real-life innovators reinforce concepts learned in the classroom and represent the wider ecosystem surrounding the university. Speakers are recruited from the alumni network and local industry. The stories and interaction with speakers can also act a as catalyst for innovation by inspiring/motivating students as well as increasing enrollment in other entrepreneurial programs. One goal of the Global Venture Network is to make the lectures from universities in Asia, Europe, the Middle East, and North and South America available internationally and online. Currently, students can access lectures by entrepreneurs from these universities.

Stanford University
Entrepreneurship Corner (ecorner)
http://ecorner.stanford.edu/browse.html

University of California, Berkeley
A. Richard Newton Distinguished Innovator Lecture Series
http://cet.berkeley.edu/teaching/lecture-series

University of Michigan
Distinguished Speakers and Innovators Seminar
http://cfe.engin.umich.edu/seminar

During the Global Venture Lab Network Inaugural Summit, much of the participants' discussion touched on the importance of teaching entrepreneurship and innovation in the classroom. Entrepreneurship's broadening definition has helped the discipline gain acceptance as a way to teach students about the tools to build a business, but also about creativity and innovation. Starting these programs is not always easy. Perhaps the most straightforward way to begin is to offer one or two courses as part of an established department. Integrating input from industry is also a key to success.

A lecture series course that brings in CEOs and entrepreneurs is a good way for students to learn about innovation first-hand. In short, coursework that relies on input from industry leaders provides a solid foundation of any engineering entrepreneurship program. When planning a lecture series, professors should evaluate the optimal format for their program (pass/fail versus a graded course, whether to require attendance and/or homework) and invite a balanced set of speakers. The series should include entrepreneurs from startups, serial entrepreneurs, seasoned entrepreneurs, venture capitalists, angel investors as well as inventors and corporate innovators. Encouraging other departments within the university to co-sponsor speakers can be an effective way to expand the roster of speakers and ensure solid attendance.

Ventures and Commercialization

Academic Summit participants reported almost universally that their technology entrepreneurship programs provided some kind of direct support to students and faculty building ventures. They connect entrepreneurs to mentors and other experts, investors, potential employees, and sometimes offer workspace, networking opportunities, and, in a few cases, small amounts of funding. Venture support does not require any fees from the student or faculty member in order to receive services (differentiating the services from those of an incubator). Venture Labs can function with relatively simple Internet-based ventures as well as more complex businesses based on innovative research from the campus. In more mature programs, venture activity can include an impactful research component.

Global Venture Lab Network members also touched on the interplay between venture programs and university-wide technology transfer offices. On a campus-by-campus and project-by-project basis, a tech transfer office can act both as an accelerant and an inhibitor to the entrepreneurship work forged by the technology programs. Technology transfer offices usually have very clear directives to generate revenue via licensing and IP activities in the short-term. As background, in a 2004 speech to the IP & Research Spinouts Conference, Carl J. Schramm, President & CEO of the Ewing Marion Kauffman Foundation, said the following regarding the efficacy of the technology transfer offices.

> *Rarely can a university muster the resources to support the work of proactively identifying, evaluating, and developing all of its promising discoveries. Yet in the present system, that is exactly what each of 280 or so institutions is expected to do.* ***Add to that the pressures universities often face to be economic development engines for their regions—profit centers whose primary goal is jump-starting new local companies and the job creation that goes with it—and the result can be just the opposite: a constricting of innovation flow. Also, faculty members who believe basic research is being threatened by the pressures of commercialism***

may be less inclined to come forward with promising ideas. *And on both sides, there is a tendency to overly narrow the focus, which perpetuates the cycle of missed opportunities.*

Carl J. Schramm
President and Chief Executive Officer
Ewing Marion Kauffman Foundation
November 4, 2004
IP Commercialization &
Research Spinouts Conference
Boston, Massachusetts

Venture Programs and technology transfer offices need to identify shared goals and action items necessary to reach those goals. University College London has developed a program that houses the expertise of a technology transfer office alongside the tangible support of a venture program, including the ability to provide funding. The structure of this program is novel and necessary. In a January 2008 paper entitled *Proof of Concept Centers: Accelerating the Commercialization of University Innovation* the authors note that an improvement to the already very successful proof of concept centers (e.g. the Deshpande Center at the MIT School of Engineering and the von Liebig Center at the University of California, San Diego Jacobs School of Engineering) would be more successful if they had technology transfer offices willing to work with the centers to assist in the commercialization process. University College London provides a compelling hybrid model that addresses the shared goals of a venture program and technology transfer office.

University College London, UCL Business

Established in 1826, University College London (UCL) is ranked fourth in the world's top ten universities by the Times Higher Education-QS World University Rankings. UCL Business, LLC, is a wholly owned subsidiary that makes direct connections between industry and UCL's academic research. Its purpose is to promote job creation, license technologies, and disseminate knowledge.

UCL Business, LLC, extends traditional technology transfer services with the capability to tangibly assist in building companies around promising UCL innovations. Through its proof of concept program, UCLB provides bridge funding (supplied by the federal government, regional development agencies, commercial partnerships, and retained earnings) to help companies build prototypes, improve intellectual property positions, and perform market and business analysis. UCLB also helps companies meet the challenge of assembling an effective management team for companies in which the technical lead is often a full-time faculty member unable to devote 100% time to venture building.

The faculty relationships have also improved —they no longer run away. It helps that we have a bit of money to help with funding. In the beginning they just saw us as bureaucratic.

UCL research identified a compound that reduces ammonia levels in patients with acute liver disease. ***UCLB initially invested approximately £65,000 in PoC funds to validate and secure a core intellectual property position. UCLB subsequently committed £500,000 in internal investment funds to support***

pre-Phase I activities and allowed the team to draw down a further £750,000 from the UK's Medical Research Council (MRC) to support a Phase I clinical trial. Following promising early results, the program was exclusively licensed to Ocera Therapeutics in December 2008. UCL and Ocera continue to work collaboratively in order to take the therapy to the market, which is more than $500 million annually.

Since 2004, UCL has invested approximately £1.8million of funding to support approximately 70 PoC projects. In 2008-09, UCL Business recorded revenue of more the £8 million.

To learn more about UCL Business, go to http://www.uclb.com/

Building Ecosystems

Building ecosystems to support course initiatives, venture building, and commercialization was a central topic in the discussions at the Global Venture Lab Network Inaugural Summit. Naturally, building strategies for a university in India will sometimes differ from those for a university in Great Britain; however, the group agreed that a strong ecosystem (that encompasses the university, region, nation, and, ultimately, the world) is important to keeping the content within the programs relevant and vital.

University-based Connections

Building community within the university system itself is a crucial step to laying the groundwork for a strong entrepreneurial ecosystem. Local meetups with featured speakers, job fairs targeted specifically to entrepreneurs, competitions, and large-scale conferences focused on innovation are all tools for building a university-based entrepreneurship network. Actively engaging students, finding out what they want from the program, and engaging their initiative and talent to spearhead activities will add to any program's strength. Some program directors believe focusing efforts on increasing the level of engagement of university faculty will help nurture the university ecosystem.

> *In Finland and many other countries, even in parts of the US, we need alumni and faculty who are more involved than just mentors. If we have this, we will have better mentors, "knowledgists," as we call them. Our solution is to create a properly connected faculty, where we have dual citizens in those faculty members – professors but also partners on a global level. We drill small holes in the local silos and we are the guys who put new air in the system.*
>
> Marko Seppä
> Professor, Growth Venturing
> University of Jyväskylä, Finland

Competitions During the summit, many presenters mentioned that their schools bolster network building by hosting competitions. According to the WEF, business plan and other competitions have become staples in this sector. Competitions aim to inspire students and faculty to innovate, to bring local industry representatives to campus, to help acquire resources for successful teams, and to publicize the entrepreneurship program. Competitions hosted by engineering entrepreneurship

programs come in many formats, from traditional business plan competitions to idea, problem-solving, prototype, and industry-specific X-challenge formats. Some programs combine the two or offer several types of competitions.

Competition formats have evolved toward more technology-rich, results-oriented formats (e.g. evaluations based on tangible results such as prototypes, , early customer validation, and research) and away from the traditional written business plan competition. According to an April 2009 study from the University of Maryland's Robert H. Smith School of Business, the business plan is "a limited-use document that will in no way substitute for the hard work of actually building a business. You're better off investing in your idea, your social network, finding potential investors, potential customers – the intangibles around your business that are going to make it more likely you succeed. Invest your time in any other business-building activity but working on your business plan." (To see the full article, go to http://www3.interscience.wiley.com/cgi-bin/fulltext/122239730/PDFSTART).

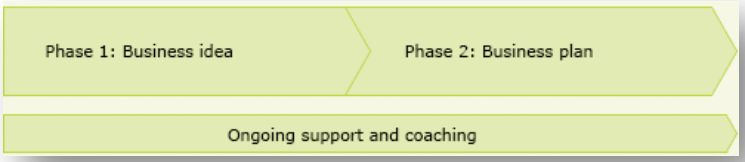
Technology entrepreneurship programs have quickly responded to this reality and have started holding competitions that focus not on putting together the plan itself, but on the participants' core ideas, their existing results, their ability to succinctly communicate their idea, and the role of the competition in creating networking opportunities for teams.

> ***The I2P or the Idea to Product Global Competition,*** *developed at the University of Texas, Austin, stands for* ***applying creative thought to a technology ("idea") and developing a market application ("product") for that technology.*** *The purpose of I2P is to create better engineers, better scientists, and better business people through an active educational experience. It ties technology in the labs right now to the needs of society and has grown to include four universities across the world. (http://www.ideatoproduct.org/global/)*
>
> Steven P. Nichols, Ph.D.
> Professor
> Director of the Chair of Free Enterprise
> University of Texas, Austin

> *In our formative years,* ***Startup @ Singapore*** *was fashioned solely as a business plan competition. Yet in recent years, we've grown and evolved to become much more than just a contest. Over and above the capital that we award to startups with winning business plans, S@S now provides current and aspiring entrepreneurs with a staggering repertoire of resources, such as educational seminars, team building workshops, mentorship opportunities, and networking sessions, to help them make the critical transition from paper to product.*
>
> From the Startup@Singapore, a business plan competition organized by National University

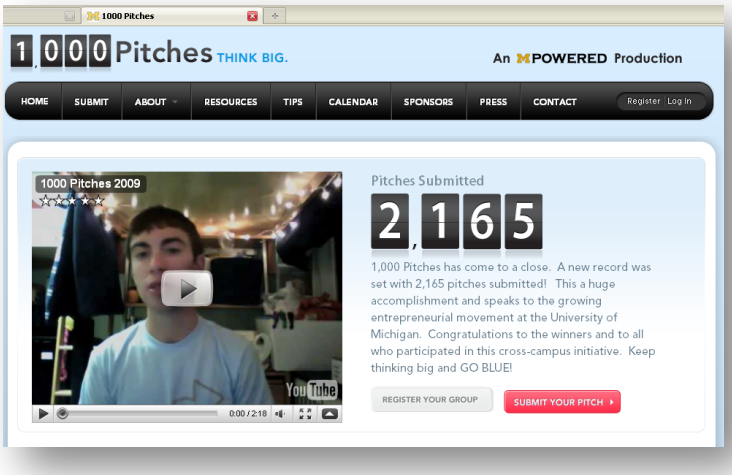
of Singapore (NUS) Entrepreneurship Society (NES), and supported by the NUS Entrepreneurship Centre (NEC) and NUS Business School Alumni Association (http://www.startup.org.sg/)

For the ETH VENTURE Competition, students either participate in a business idea or in a business plan phase. Throughout both phases mentors support their efforts. (http://www.venture.ch/default_e.asp)



Fredrik Hacklin
Researcher, Chair for Entrepreneurship
Department of Management, Technology & Economics
Swiss Federal Institute of Technology (ETH)

For venture acceleration we have something called 1,000 Pitches. *This is a program we started a few years ago where students pitch ideas. It's not a business competition; it is an idea competition. Students stand in front of a camera for one to three minutes, pitching their ideas. If you go to a thousand pitches dot com, you can browse the ideas, you can see all of the students pitching their ideas, and it gets them thinking, gets them excited. Finalists from this competition are cultivated into additional entrepreneurial activities and programs available at our Center. (http://1000pitches.com/)*



Doug Neal
Managing Director
Center for Entrepreneurship
University of Michigan

Regional and National Ecosystems

Successful engineering entrepreneurship programs must necessarily build their industry networks to be at least as strong as their campus networks. This outward focus is exceptionally important to technology entrepreneurship as compared to other engineering disciplines given that industry participation provides essential input and context for the discipline.

During the discussions at the Global Venture Lab Network Academic Summit, we found that geography dictated strategies to best leverage local (and sometimes national and international) industry, markets, and resources. Silicon Valley, which cradles Stanford University and, more extensively, the University California, San Francisco School of Medicine, and the University of California, Berkeley, is esteemed as the ideal breeding ground for innovation and start-ups. Its attributes — a tightly interwoven network of venture capitalists, seasoned entrepreneurs, scientists and other academics, as well as lawyers and other service professionals, that provides easy access to trained technical and professional talent — are not easily replicated in other regions. Program representatives from around the world continue to carefully evaluate and adjust current ecosystem building practices to try to ascertain and increase impact. Below are two examples.

University of Cambridge, Center for Technology Management

One of the world's oldest universities, the University of Cambridge was created as a training college for priests — not an obvious center for entrepreneurship. However, much of the university's strength is the result of highly individualistic, anti-authoritarian, entrepreneurial behavior. Since the 1970s, Cambridge, also known as Silicon Fen, has been one of the leaders in the development of support for new technology-based ventures. The Centre for Technology Management resides within the Institute for Manufacturing, one of six divisions of the Engineering School, and continues to drive these efforts.

The Cambridge ecosystem is defined broadly as three sets of companies — spinouts and startups, companies attracted by research (e.g. Microsoft, Qualcomm, Toshiba), and the associated consulting firms (e.g. Cambridge Consultants, TTP Group). The economic downturn has led to the departure of some big names, such as Kodak, but has also seen the arrival of new ones, like Philips. Although there is a venture capital presence in Cambridge, it is not nearly as strong as that of Silicon Valley. In fact, 3i Group plc decided recently to leave Cambridge.

Given limited funding sources, the large firms wield a disproportionate amount of power and technology startups can be intimidated by some of the bigger firms. There is a lack of trust. The Centre has identified productively managing relationships between technology startups and large corporations toward optimal outcomes as critical to developing its ecosystem. Here is an excerpt from the discussion.

To address the trust and other problems inherent to these asymmetric relationships, we brought together more than 25 large companies directly into the University*. We asked them, as*

University of Cambridge, Center for Technology Management (continued)

well as several technology startups – 'What support would you value in overcoming the challenges of asymmetric partnerships?'

The results revealed that both start-ups and large ***firms share similar concerns: all stakeholders need to be engaged throughout the research and dissemination process, and both startups and large corporations want fluid access to networks to share issues and experiences with other firms.*** *The Centre continues to work toward effective implementation through offerings like workshops, using content-specific intranets, offering one-on-one consultations combined with a constant feedback loop to the stakeholders measuring each initiative's effectiveness.*

Tim Minshall
University of Cambridge

The ecosystem for small ventures is a symbiotic relationship with large ventures and service firms, and that anything you do in this space is working on the dynamics of improving the symbiosis. The example of bringing the large firms together into the heart of the university, which has in the past focused mostly on small firms, is a critical ingredient in the success of the whole program.

Ikhlaq Sidhu,
University of California, Berkeley

I want technology startups to find multiple potential partners. I don't want them to be dependent on one partner for their success. My concern would be that you have to be very careful about how that interaction works. Don't partner just with Qualcomm or Nokia, get out there and find multiple opportunities.

David Ladd
Mayfield Fund, a Silicon Valley venture capital firm founded in 1969

Although Cambridge's ecosystem has in several ways historically mirrored the Silicon Valley model, many university communities would be hard pressed to begin to clone the Valley. IIT Kharagpur takes a different approach to constructing a productive ecosystem mindful of regional attributes.

IT Kharagpur, Science & Technology Entrepreneurs Park

IIT Kharagpur, the oldest and largest of the Indian Institutes of Technology, is a self-contained academic community located 75 miles west of Kolkata (Calcutta). Established in 1951 shortly after India gained independence, IIT Kharagpur's first classrooms and laboratories were housed in Hijli Camp, which was a detention center for India's revolutionaries. British colonial rule prevented India, as a nation, from embarking on an industrial revolution, and, as a result, the country does not have a deep history of productization. This lack of an entrenched manufacturing sector along with other factors has contributed to extreme poverty and limited employment opportunities in many areas of the country.

In short, the ecosystem of IIT Kharagpur, the state of West Bengal and, to a greater extent, the entire nation of India, is characterized by incredible growth in the technology sector while tens of millions of small agricultural and commercial enterprises continue to provide the bulk of employment and more than 40% of people live in poverty (according to the World Bank). The government continues to play a role as central planner despite many free market reforms implemented in the 1990s that supported the expansion of the middle class.

The entrepreneurship faculty and students at IIT Kharagpur consider nation building as their responsibility towards the nation as well as an inherent attribute that all other higher education institutions (HEIs) should practice and incorporate an enterprise-education (EE) model (one that has minor involvement with government) to build productive networks within their ecosystem. The focus is on education, energy, environment, and health (EEEH) with students, faculty and community members universally using entrepreneurship as a tool to fluidly solve problems that may require a combination of high technology, low technology, and no technology. These efforts are part of a bigger goal to transition India from lower-end service models to a high-end product model.

> *The entrepreneurship students double up with efforts in both the grass roots and the high tech core. We actually want to find small local problems, create global solutions with a collaborative approach, and create local entrepreneurs to run the companies. Our venture lab has created more than 30 companies – they are starting from small rural towns, and that is not easy in India.*
>
> Dhrubes Biswas
> IIT, Kharagpur

IT Kharagpur, Science & Technology Entrepreneurs Park (continued)

On a recent trip to one of India's Centres of Excellence, we discussed that EEEH might not be the right solution for India because it is easier to move around bits than products. If you go to this kind of industrialized approach to manufacturing goods, you are going to create a big infrastructure problem of moving these goods around on those crazy roads (that I've been on many times). Shouldn't you try to stay focused on moving bits around and being a more service-oriented economy than move too quickly to a product-oriented economy where you could get these 150,000 villages eradicated and everyone moves to the city? However, ultimately, these decisions are of a geopolitical nature.

Andy Singer
University of Illinois at Urbana-Champaign

IIT Kharagpur is an example of a productive entrepreneurship ecosystem making many-to-many connections among people – whether it is between a student and a entrepreneurial mentor, an innovative professor and an investor, a chief scientist and a technology firm, a community member with a pressing need and a graduate student. Building ecosystems is critical to nurturing entrepreneurship and innovation within the academic setting and the greater community. The mechanisms – competitions, meetups, job fairs, lecture series, venture labs – may vary depending on location, but the result is the same.

Next Steps in Technology Entrepreneurship

A large portion of the Global Venture Lab Network Academic Summit was devoted to discussing next steps for the discipline, with the basic question, "How do we increase the effectiveness of our programs?" In trying to pin down answers, the Academic Summit members discussed a few courses of action. 1) Further refine the curriculum's balance between the technical depth courses (e.g. electrical and mechanical engineering) with the broader coursework in entrepreneurial and leadership studies; 2) within the curriculum, more actively initiate and manage multidisciplinary projects that address meaningful economic and social problems; and 3) encourage academia to adopt new ways to evaluate and recognize entrepreneurship and other faculty working with applied and industry-facing research. The premium value placed on peer-reviewed individual authorship does not encourage faculty to embark on uncharted, multiple-player projects whose success or failure will be reviewed outside academia (based on the companies and jobs created, the illnesses alleviated, or the lives saved).

Balancing Technical Expertise with Leadership Insight

Engineering schools need to ascertain exactly how core curriculum and entrepreneurship studies best complement one another. Technology entrepreneurship programs must efficiently provide students with insight and skills in areas like leadership, communication, finance, marketing, and team building that can be integrated with their core studies. Programs need to avoid mimicking the teaching techniques and material found in business schools, but rather tailor material to the engineering student, taking into account time limitations and the deep analytical skills the students may already possess. UC Berkeley's Fung Institute of Engineering Leadership, announced during the late afternoon session of the Global Venture Lab Network Academic Summit, aims to strike this balance and teach the engineering leaders of the future.

University of California, Berkeley

Announcement: Fung Institute of Engineering Leadership

During the late afternoon session of the Academic Summit, Shankar Sastry, the Dean of the College of Engineering at the University of California, Berkeley, announced the plans for the Fung Institute of Engineering Leadership, created to set a new standard in engineering education. The new institute will prepare engineers and scientists – from undergraduates to seasoned professionals – with the multidisciplinary leadership skills necessary to become leaders in industry, government, and the nonprofit sector.

The Institute will teach leadership to engineering students via a format that aims to optimize students' learning in the more broadly focused technology leadership studies with the depth of study in an industry specialization. This integration is designed to cultivate leaders who can make insightful decisions with the confidence that comes from a synthesized understanding of technological, marketplace, and operational implications in enterprises of all scales. The Institute plans to close the gap between engineering theory and business practice with an emphasis on experiential learning with a solution-oriented methodology that drives students to incorporate societal issues, business models, and political ramifications into their thinking. Another important component of the curriculum is teaching engineers (who often focus on removing risk in the design or production phases) to take calculated risk – a skill necessary to leadership.

Solving Meaningful Problems with Multidisciplinary Projects

As technology entrepreneurship education matures, the kinds of problems it can address also needs to advance. Today's educational entrepreneurship and innovation programs (as represented at the summit) are already introducing students to leadership skills via curricula that simulate real-world experiences. Students are addressing pain points within the markets by building businesses with the resources at hand. For many students, this means starting a web-based business. The web-based business could be characterized as this generation's lemonade stand with its ease of entry to a huge addressable market. At the Global Venture Lab Network Academic Summit, the group asked, "What are the more challenging problems that university–level technology entrepreneurship programs need to solve next?"

Overwhelmingly, the participating program directors indicated they are ready to take on complex multidisciplinary projects that address meaningful social and economic problems of varying scales. There seem to be two classes of problems – those we know how to solve and those that are so complex that solutions have not been defined. Two participating universities presented frameworks to undertake these types of research projects. The University of California, Berkeley addressed a facet of the ongoing clean energy problem with a project focused on planned electric vehicle deployment within the San Francisco Bay Area. The University of Melbourne is utilizing its Centres of Excellence to leverage the insight of multiple disciplines in areas from water irrigation to neural implants.

University of California, Berkeley
Industry Lab: The Electric Vehicle in the Bay Area

Better Place, a provider of electric vehicle (EV) services, is building a network and services that make an electric car affordable to buy and use. Subscription packages will give drivers access to a network of charge spots, battery switch stations, and systems that optimize the driving experience and minimize environmental impact and cost. Better Place has worked extensively with universities on cooperative research toward analyzing the challenges inherent to their business model.

The research project started with several meetings between point people at Better Place and the directors at the Center for Entrepreneurship & Technology (CET) at the University of California, Berkeley. Better Place had already identified general applied research questions:

- What would be the impact of putting hundreds of thousands of electric vehicles on the electric grid in California?
- Who would buy this service?
- Where in the Bay Area would we have to deploy our infrastructure?
- What would this mean in terms of job creation, job loss, GDP impact?

Once the research questions were refined, the Center recruited in the College of Engineering, the Haas Business School, the School of Information, the Goldman School of Public Policy, and key departments within the College of Letters & Science to compile a group of 9 graduate students. The students were split into teams and assigned the aforementioned research problems.

Weekly work sessions were set up. Each week students presented their research in its initial phases and received input from the academic advisors and Better Place executives. Often, the students' work would generate more research

questions. Over the course of that initial semester, the team developed three technical briefs, which were published on the Center's website and promoted widely. Better Place also received copies of the briefs to use as an aid in working with their constituencies. The students received a hands-on experience working with industry as well as research credit.

During the second semester, this model was scaled to become a regular course within the College of Engineering and Haas School of Business graduate curriculum. Thirty students from various disciplines within the College of Engineering and the Haas School of Business participated in the class. The result was six teams of students, answering six more research questions, resulting in six more papers. Teams presented the papers at Better Place at the end of the semester and had very rich discussions. The economic analysis report, in particular, turned out to be relevant to mainstream media as well as to green energy media. Anecdotal reports indicate that this economic analysis white paper was carried around quite a bit in Washington by policy-makers. Although the class format was a positive experience, the previous semester's research team format seemed better aligned with the project's goals, since the students were less concerned about grades and credits.

This multidisciplinary research project was experimental for CET. The Center was fortunate to have a great partner in this research, a great amount of commitment from the executive team, and interesting and relevant problems to solve. It will be a challenge to replicate this model with another equally appropriate firm.

University of Melbourne
Centres of Excellence: National ICT Australia (NICTA)

The University of Melbourne is trying to solve large-scale problems with use-inspired research by putting together eight to ten institutes across the whole university. These institutes, or Centres of Excellence, comprise a virtual model that creates tangible linkages amongst a large percentage of researchers across disciplines (e.g. medicine, engineering, science) and geography (e.g. Melbourne, Sydney). The Centres are trying to bring together resources to crosscut complex problems in areas like energy, health, and technology. The Centres, funded in part by Australia's Research Council's National Competitive Grants Program (NCGP), often have partners throughout Australia. The consortium agreements frequently have a particular intellectual property framework, allowing universities to assign the IP directly to the Centre. This means the Centre can then manage the IP and any collateral venture creation. (Note that University of Melbourne also has a program called Melbourne Ventures that helps the individuals within the academic community commercialize their intellectual property.)

An example of a shared research problem is water irrigation management. Australia has faced drought for the past five years. One Centre of Excellence, the National Information and Communications Technology Australia (NICTA), is a major participant in a large-scale multidisciplinary project called "Regional and Economic Benefits through Smarter Irrigation." $4.5 million in funding was contributed by three partners: NICTA ($1.5 million), the Victorian government ($1.5 million) and the University of Melbourne ($1.5 million). Professors and students were already working on sensor networks and then paired with experts from the state of Victoria to provide context. Their initial focus was on canal systems. Later, with the input of local farmers, they developed a full sensor platform that allowed farmers to allocate water and avoid the wasteful practice of flooding plains.

NICTA also partnered with Rubicon Systems, a company that helps water authorities efficiently manage operations and water resources, to incorporate the system into its product line. The system has also influenced government policy on water allocations.

Tackling more complex and multidisciplinary problems is a goal of many of the universities that attended the Global Venture Lab Network Inaugural Summit. Both the UC Berkeley electric vehicle project and the Melbourne University water irrigation project are illustrative of how academia can begin to pull in insight and resources from the university and the region on a larger scale. UC Berkeley established a very direct connection to industry by working closely with one firm. The project became multidisciplinary by recruiting self-selecting graduate students from the engineering, business, information, and public policy schools. The University of Melbourne's Centres of Excellence address the space between precompetitive research and industrialization – reminiscent of the large industry laboratories in the 60s, 70s, and 80s. Being able to scale both of these formats will likely make huge impacts on society and industry.

Re-Evaluating How Academia Values Industry-Facing Research

As the group discussed the importance of multidisciplinary research projects that directly endeavor to solve societal challenges, a recurring issue emerged. Perhaps the concern was most succinctly communicated by Han Wei, Deputy Director of the Tsinghua University Career Center, when she asked, "How do you engage faculty in this kind of multidisciplinary program?" Many agreed the basic method for evaluating professors would have to change. Industry-facing, use-inspired research often does not produce the same publication stream (a critical professional evaluation component) as pure applied or basic research. Also this kind of research needs to fairly balance the needs of the academic community with those of industry and other non-academic organizations.

> *Let's consider how measuring research output could be changed with the focus on economic impact. One variation is to change fundamentally how the research output is measured and how the faculty is evaluated among their peers. A revamped evaluation system that valued industry impact would encourage more participation.*
>
> Ikhlaq Sidhu, Ph.D.
> CET Director
> University of California, Berkeley

Another challenge universities face in choosing to engage with industry is ensuring that the students' educational experience is well aligned with industry's objectives. Providing a solid framework for industry-facing research is an important piece of this puzzle.

> *The multidisciplinary projects allow us to cross-cut the deep vertical knowledge and research in specific disciplines with a shorter time-scale. I think that the possibilities of multidisciplinary projects focused on real-world problems are very interesting, but again, we don't want our projects to become consulting projects. We don't*

want to say to every firm that is out in the world, come, and we'll do your research for you. On the other hand, we don't want to solve useless problems that have no business models attached to them, that have no way of going anywhere in the real world. We're caught between these two boundaries, and I don't have an answer for it, but I think this is the real issue for the discipline. When we solve it, I think we are going to get to a whole new level of how universities interact with the industry in very meaningful ways. And if we have the scale of the undergraduates and the masters and the Ph.D. population against these problems, and if we figure out how to do this right, we can have a huge impact in the world.

Ikhlaq Sidhu, Ph.D.
CET Director
University of California, Berkeley

John Fini, the Director of Intellectual Property (Homewood) at Johns Hopkins University contended that IP is the key to documenting the impact of use-inspired research.

If you said AMD licensed my IP, that ends the argument, they pay for it. So there is a linkage between IP and really moving forward, and the big job that I have, and that I think all of us do, is that I have to understand what that IP is and what that knowledge is – the science and projects being developed.

John Fini
Johns Hopkins

Shankar Sastry, Dean of the College of Engineering at UC Berkeley, affirmed that the culture is still one focused on publishing; however, there are indications of change.

A lot of faculty say this is such an applied agenda – what can we get out of it that is publishable? It take times to change the culture even though faculty are attracted to the ecosystem – to an opportunity to interact with a stimulating group and a genuine desire to share.

Shankar Sastry, Dean
College of Engineering
University of California, Berkeley

Until recently, it was very hard for academics to get brownie points as entrepreneurs. If you were an entrepreneur some colleagues might not like you because you spent too much time doing outside stuff when you should be doing research. Another problem we have is that unlike the US, most of our research funding comes from the government.

Nishan Canagarajah
Head of Computer Science
University of Bristol

Coleman Fung, who provided matching funds for the Fung Institute of Engineering Leadership at UC Berkeley and is the founder and CEO of OpenLink Financial, was an invited guest for the day. His belief is that financial incentives to faculty to participate in projects may be the most direct way to encourage participation in industry-facing research.

> *At the end of the day, perhaps the faculty member should have a financial incentive to opt-in.*
>
> Coleman Fung
> Founder and CEO of Open Link Financial, Inc
> Founder, Fung Institute of Engineering Leadership

Technology Entrepreneurship Programs and Economic Impact

During the Summit, the group discussed the importance of being able to measure the economic impact of our programs. Of the 15 universities that participated in the academic summit, ten indicated that their programs had an obligation to economically develop their region or nation in addition to their primary educational goals. These programs were in Europe, Asia, the Middle East, and the United States. Measurable economic impact is elusive due to the inherently chaotic nature of how knowledge translates to value; however, it can help increase funding and scope of this kind of education at the university level.

The expectations of economic impact from programs can be subtle or very direct. For example, Andy Singer, Director of the Technology Entrepreneur Center at the University of Illinois, Urbana-Champaign, mentioned that the state of Illinois has added substantive economic growth as a fourth mission to its educational goals. As a public research university, the University of Illinois is ultimately accountable to the citizens of Illinois and the Illinois General Assembly regarding their efforts to achieve these economic goals. As a result, the University has modified the way it reviews research faculty to include substantive economic development. For other universities, the expectation of economic impact often resides at the program and university level.

The challenge is being able to measure economic impact data that are directly linked to engineering entrepreneurship program activities. Innovation, entrepreneurship, and disruption are inherently chaotic and do not lend themselves to standardized measurements. Universities are operating in vastly different ecosystems from each other, making standardized measurements meaningless. Even within the university itself, entrepreneurial and innovative activities can be highly decentralized. Some believe that the key is to measure impact at the national level. Data points that are relatively easy to pinpoint, like IP licensing income or the number of new startups, don't seem to begin to capture the power and insight that graduates of these programs bring to the workplace and society at large. The World Economic Fund seems to understand this dilemma and states in its recent report, "The purpose and goals of entrepreneurship education need greater clarity. They should be based on a broadly defined set of outcomes, not only on narrow measures such as the number of startups created."

During the summit, the GVL Network members also expressed various viewpoints regarding the measurement and evaluation of programs vis-a-vis economic impact across the United States and the world.

The University of Michigan is a compelling example of a public university that is successfully answering the question, "How do we create significant impact in a place that does not have Silicon Valley next door?" During these past years of economic downturn, with unemployment rate as high as 15%, the state government and other funding sources continued to put their trust in the University's potential and ability to have a positive impact on the economy. The downturn has created a vacuum that has caused acceleration of funding. Michigan's annual research expenditures grew from $753 million in 2004 to $1.0 billion in 2009. Strong funding combined with the

development of an entrepreneurial mindset (not as strong in areas of the state traditionally dominated by large automakers) around the University of Michigan is indeed demonstrating economic impact.

One university has successfully reported on its regional economic impact. The Massachusetts Institute of Technology (which was not a participant on the day of the Global Venture Lab Academic Summit) published an exceptional report on impact, entitled *Entrepreneurial Impact: The Role of MIT (*http://www.kauffman.org/newsroom/mit-entrepreneurs.aspx) in 2009 that stated, "If the active companies founded by MIT graduates formed an independent nation, their revenues would make that nation at least the 17th-largest economy in the world." MIT embarked on a rigorous survey effort in 2003. Below is a brief description of the methodology behind this economic impact report.

> *The goal was to identify, carefully study, and assess the impact of new enterprises created by all living MIT alumni. The survey produced detailed information on 4,611 companies founded by 2,111 graduates. To provide still more information about these companies, including current sales, employment, industry category, and location, this new MIT database on alumni companies was further updated and upgraded from the 2006 records of Compustat (for public companies) and Dun & Bradstreet (private companies). Our report's findings with respect to total employment and sales, MIT enrolled department of company founders, industry, and age of the companies, are based on this updated database. We use data only on MIT alumni companies that still were active in 2003, that information coming from a carefully conducted survey process. In this way and many others, the numbers in our report are conservative in their estimation of the total economic impact of MIT-related entrepreneurs, ignoring the entrepreneurial outcomes of the many non-alumni faculty, staff, and other employees, as well as other spillovers from MIT.*
>
> From *Entrepreneurial Impact: The Role of MIT*, 2009

As far as economic impact, the MIT report sets a high standard for research in this area; however, even these researchers state that the numbers are more than likely conservative and do not take into account potential outcomes from non-alumni staff and others.

The quest for how best to determine economic impact continues for each of the universities within the Global Venture Lab Network. Measurements will be ecosystem-dependent and varied. Each member university of the Global Venture Lab Network will continue to work toward finding ways to measure and communicate economic impact of their programs. Nishan Canagarajah of the University of Bristol synopsized the sentiment.

> *What I see are the challenges: we have to understand that every country has different means, and we need to find out models which*

work with our own systems. Unlike the United States, the United Kingdom has a different model for funding. But now presents a great opportunity because the government is changing the landscape. They are saying from now on we don't want just for you to publish your paper, we want to evaluate that paper. They want to measure that in terms of impact, and that is a fantastic development.

Nishan Canagarajah
Head of Computer Science
University of Bristol

How Will the Global Venture Lab Network Collaborate?

The Global Venture Lab came together as an alliance of academic institutions sharing common research and educational programs that are likely to lead to new industry and economic growth. The goal of the network is to share best practices to foster innovation and entrepreneurship in a university environment with the intent to help create new companies and industries. The November 19 meeting was an initial step toward reaching those goals. During the day, the members discussed how best to utilize the network.

For the Global Venture Lab Network, communication amongst members is tantamount to its success and the limited number of participants eases the logistics of communication and the establishment of productive relationships. Each member's students can also easily connect to peers worldwide. The group discussed several mechanisms to communicate, including establishing a Google Wave Group or Skype connections. Most simply, members could continue to use the already established group email list. Another suggestion was that each university designate two students to research ways the network could most effectively cooperate globally. Members also discussed the possibility of sharing introductions to guest lecturers and establishing an informal speakers bureau. Also, it was proposed that a two-day meeting with small working groups to encourage more discussion might be a better format for next year.

All members seemed to reach consensus that student exchanges and research projects are an obvious and powerful way for the network to collaborate. One idea was to start with university-to-university projects and collaborations. The University of California, Berkeley offered as a possible prototype the project the Center is working on with IIT Kharagpur. Still in its pilot stages, the project brings together graduate students from IIT Kharagpur and UC Berkeley in engineering, business, and public policy to work on health care issues and the possible establishment of a low-cost HMO in eastern India. The project has required recruiting efforts across the campus and, more importantly, project champions with considerable hands-on involvement from both universities. The members of the group wanted to consider this format but also thought that university-to-university research partnerships may require models tailored to the project.

In terms of how to decide on which projects to work on, the group agreed to be aware of certain key technical challenges on each of their campuses that require research, and to disseminate that information to the group. In addition to communicating these potential research problems, it was suggested that members might also communicate some of their institution's best capabilities. In short, the group must clearly articulate the requirements of the potential student project, come up with some ground rules for working together and a methodology, and, if the project requires funding, determine the funding source. The annual meeting can be a forum to report on the progress of these projects.

Naif Alajlan, Director of the KSU Innovation Center, King Saud University mentioned one example of potential research problem.

> *One of the things that came to my mind about the potential of the Global Venture Lab Network is that there might be a solution of*

technology somewhere in the world that has great impact in another context. For example, I come from the Middle East. We have some unique situations that need a lot of research, for example for the hajj, an annual event in my country. It is a unique situation in which three million people gather in a very small area for a limited period of time. There are many issues related to this. We have a research center dedicated to these issues. Maybe somewhere else this situation doesn't happen, so that technology or technique which is considered there to be of low value may have great impact for us.

Each country and region represented within the Global Venture Lab Network could potentially benefit from the strength of fellow member universities. Students from those universities will also benefit by having the opportunity to work internally in global teams. As the Network develops, the methods and logistics on how best to make these very valuable collaborations happen will undoubtedly unfold.

Global Venture Lab Network, November 19, 2009

Appendix 1: Agenda

Global Venture Lab Network
Inaugural Academic Summit

University of California, Berkeley, November 19, 2009

Seaborg Room, Faculty Club

8:30 – 9:00 **Continental Breakfast**

9:00 – 9:15 **Welcome**
Ikhlaq Sidhu, Director, Center for Entrepreneurship & Technology (CET)
Paul Wright, Director, CITRIS – Technology for Societal Impact

9:15 – 10:30 **Session I: Perspectives in Entrepreneurship Education**

"Aligning Teaching, Research, and Outreach"
Tom Byers, Stanford University

"The Cambridge Technopole, the Cambridge University Enterprise Network, and the Cambridge Open Innovation Network"
Tim Minshall, Cambridge University

"Entrepreneurship & SRM"
Jayshree Suresh, SRM University

"Balancing an Entrepreneurial Mindset with the Focused Development of Ventures"
Doug Neal, University of Michigan

"Bristol Enterprise: Ethos and Experience"
Nishan Canagarajah, Bristol University

10:30 – 10:45 **Break**

10:45 – 11:45 **Session II: Programs and Case Examples**

"New Strategy of Entrepreneurship Development at IIT Kharagpur – An Integrated, Output-Oriented Approach"
Dhrubes Biswas, IIT Kharagpur

"High Throughput Technology Commercialization – Developing Creative Approaches for Accelerating Process"
John Fini, Johns Hopkins University

"Commercialization: A Case Study of Optimal Performance Monitoring Spin-Out and Collaborative Research"
Thas Nirmalathas, University of Melbourne

"Integrated Technology Commercialization"
Steven Nichols, University of Texas

11:45 – 12:30 **Session III: University Policy Cases**

"Proof of Concept Funding: Accelerating Commercialization of University Technologies"
Steven Schooling, University College London

"GVL Partners Incorporated: Globally Connected Faculty as the Cornerstone of a New University-Based Business Creation Platform"
Marko Seppa, University of Jyvaskyla

"Entrepreneurship Research and Education: Bridging Theory and Practice"
Fredrik Hacklin, ETH Zurich

12:30 – 2:00 **Lunch & Campus Walk**

2:00 – 2:45 **Session IV: "Translational" Research in Entrepreneurship Curricula**

"Accelerating the Transition to a Low Carbon Future: Open Innovation and Disruptive Technologies"
Stefaan Simons, University College London

"Industry Lab for a Disruptive Technology: the Better Place / CET Research Cooperation"
Ikhlaq Sidhu, Burghardt Tenderich, UC Berkeley with
Guest Speaker Guryan Tighe, Better Place

2:45 – 3:00 **Walk to CITRIS Headquarters at Sutardja Dai Hall**

Kvamme Atrium, Sutardja Dai Hall

3:00 – 4:15 **UC Berkeley Announcement**
"An Innovative Approach to Engineering Leadership at UC Berkeley"
Dean Shankar Sastry, College of Engineering, UC Berkeley

Seaborg Room, Faculty Club

6:00 – 8:00 **Reception and Closing Dinner**
David Ladd, General Partner, Mayfield: "Global Collaboration"

Appendix 2: Member Directory

(Asterisk indicates members present for the November 19, 2009 Global Venture Lab Network Inaugural Summit)

Americas

Johns Hopkins University *
John N. Fini *
Director, Intellectual Property
Whiting School of Engineering
Contact: jfini@jhu.edu
Program: http://engineering.jhu.edu/industry-partners/

Mayfield Fund *
David Ladd *
Venture Partner
Contact: dladd@mayfield.com
http://www.mayfield.com/

Pontificia Universidad Católica de Chile *
Ricardo San Martín *
Professor
Department of Chemical Engineering
Contact: sanmarti@ing.puc.cl
Program: http://www.ing.puc.cl/esp/index.phtml

Stanford University *
Tom Byers *
Professor and Academic Director
Stanford Technology Ventures Program
Contact: tbyers@stanford.edu
Program: http://stvp.stanford.edu/

University of California, Berkeley *
Ikhlaq Sidhu *
Director, Center for Entrepreneurship & Technology
Professor, Industrial Engineering &
Operations Research
Contact: sidhu@berkeley.edu

Burghardt Tenderich *
Executive Director
Center for Entrepreneurship & Technology
Program: http://cet.berkeley.edu/

Jennifer Walske *
Lecturer
Lester Center for Entrepreneurship
Contact: jwalske@myriadllc.com
Program:
http://entrepreneurship.berkeley.edu/main/index.html

University of Illinois at Urbana-Champaign *
Andy Singer *
Director, Technology Entrepreneur Center
Professor, Electrical & Computer Engineering
Contact: acsinger@illinois.edu

Rhiannon Clifton *
Contact: rclifton@illinois.edu
Program: http://www.tec.illinois.edu/

University of Michigan *
Associate Dean for Entrepreneurial Programs
Professor, Space Science and Aerospace Engineering
College of Engineering
Contact: thomasz@umich.edu

Doug Neal *
Managing Director
Center for Entrepreneurship
Contact: dougneal@umich.edu
Program: http://cfe.engin.umich.edu/about

University of Texas, Austin
Gregory L. Fenves, Dean
Cockrell School of Engineering
Contact: fenves@mail.utexas.edu
Program: http://www.engr.utexas.edu/

Steven P. Nichols *
Professor of Mechanical Engineering
Director, Chair of Free Enterprise

Director, Advanced Manufacturing Center
Contact: s.nichols@mail.utexas.edu
Program: http://www.engr.utexas.edu/cofe/

Asia

Hong Kong University of Science & Technology
Philip Chan
Dean of Engineering
Contact: eepchan@ust.hk
Program: http://rdc.ust.hk/eng/entrepreneurship.html

India Institute of Technology (IIT), Kharagpur *
Dhrubes Biswas *
Professor
Electronics & Electrical Communication Engineering
Managing Director
Science & Technology Entrepreneurs Park
Contact: dhrubes@gmail.com
Program: http://www.stepiitkgp.in/db.html

King Saud University *
Naif Alajlan *
Director
KSU Innovation Center
Contact: najlan@KSU.EDU.SA
Program: http://www.innovation.org.sa/

National University of Singapore
Wong Poh Kam
Professor, NUS Business School
Professor (Courtesy), NUS Engineering School
Director
NUS Entrepreneurship Centre
Contact: PohKam@nus.edu.sg
Program: http://www.nus.edu.sg/nec/

SRM University *
Jayshree Suresh *
Dean
School of Management
Contact: jayshreesuresh@gmail.com

V. Kirubandan
Contact: kirubanandan.v@gmail.com
Program: http://www.srmuniv.ac.in/management/index.htm

Tsinghua University *
Gao Jian
Professor & Chair, Dept of Innovation & Entrepreneurship
Contact: gaoj@sem.tsinghua.edu.cn

Han Wei "Viola" *
Deputy Director
Tsinghua University Career Center
Contact: hw@mail.tsinghua.edu.cn
Program: http://www.tsinghua.edu.cn/eng/index.jsp

University of Hong Kong
Francis Y.L. Chin
Associate Dean of Engineering
Professor and Chair, Computer Science
Contact: chin@cs.hku.hk
Program: http://www.cs.hku.hk/cisc/main.html

Australia

University of Melbourne *
Thas Nirmalathas *
Director, Melbourne Engineering Research Institute (MERIT)
Head, Department of Electrical and Electronic Engineering
Contact: thas.nirmalathas@nicta.com.au
Program: http://www.merit.unimelb.edu.au/

Europe

Johann Wolfgang Goethe University Frankfurt am Main
Roberto Zicari
Professor, Database and Information Systems
Goethe Unibator
Contact: zicari@informatik.uni-frankfurt.de
Program: http://www.unibator.de/Mission-eng.htm

Politecnico di Torino
Mario Calderini
Professor of Innovation Management

Cittadella Politecnica Program
Contact: mario.calderini@polito.it
Program:
http://www.cittadellapolitecnica.polito.it/home/index.html

Swiss Federal Institute of Technology (ETH)*
Pius Baschera
Chair for Entrepreneurship
Department of Management, Technology and Economics
Contact: pbaschera@ethz.ch

Fredrik Hacklin *
Researcher
Chair for Entrepreneurship
Department of Management, Technology and Economics
Contact: fhacklin@ethz.ch
Program: www.entrepreneurship.ethz.ch

Technical University of Denmark
Søren Salomo
Professor, Director, DTU Business
DTU Executive School of Business
Contact: soren@business.dtu.dk
Program: http://www.business.dtu.dk/

TU Dresden
Gerhard P. Fettweis
Vodafone Chair Professor
Contact: Gerhard.Fettweis@vodafone-chair.com
Program: http://www.vodafone-chair.com/

University Alliance Finland *
Marko Seppä *
Professor, Growth Venturing
University of Jyväskylä
Contact: marko.seppa@econ.jyu.fi

Mari Suoranta *
Program Director
GVL, University of Jyväskylä
Contact: mari.suoranta@econ.jyu.fi

Timo Seppälä *
Contact: timo.seppala@jyu.fi
Program: http://www.gvl3.com/

University College London *
Mike Spyer
Vice-Provost, Enterprise
Contact: k.spyer@ucl.ac.uk

Stefaan Simons *
Director
Centre for CO2 Technology
Contact: stefaan.simons@ucl.ac.uk
Program: http://www.ucl.ac.uk/advances/index.html

University of Bristol *
Nishan Canagarajah *
Head of Computer Science
Contact: Nishan.Canagarajah@bristol.ac.uk
Program: http://www.bris.ac.uk/engineering

University of Cambridge *
Tim Minshall *
Center for Technology Management
Contact: thwm100@eng.cam.ac.uk
Program: http://www.ifm.eng.cam.ac.uk/ctm/

University of Manchester
Jeremy Howells
Manchester Institute of Innovation Research
IDEAS Partnership (Innovation Design Entrepreneurship and Science)
Contact: JHowells@dom01.mbs.ac.uk
Program: http://www.umic.co.uk/news/ideas_at_daresbury

Biographies

Ikhlaq Sidhu is the chief scientist for the Fung Institute for Engineering Leadership in the College of Engineering at UC Berkeley and serves as the primary architect of its curriculum and integrated research. Professor Sidhu joined UC Berkeley in 2005 as founding director of UC Berkeley's highly successful Center for Entrepreneurship & Technology, which has grown to become the cornerstone of the Fung Institute. In 2009, he received recognition as the 2009 Emerging Area Professor of Industrial Engineering and Operations Research at UC Berkeley for his contribution to this new research and teaching area at UC Berkeley. Within industry, he has established new advanced development programs and launched new businesses at leading technology firms and new ventures (U.S. Robotics Corporation, 3Com Corporation, and Cambia Networks). He was awarded 3Com's "Inventor of the Year" award in 1999, and has been granted over 50 US Patents in fundamental and broadly used areas of networking technology, IP telephony, and PDA functionality. Dr. Sidhu received his bachelor's degree in Electrical and Computer Engineering from the University of Illinois at Urbana-Champaign, and his masters' degree and doctorate in Electrical Engineering from Northwestern University.

Burghardt Tenderich is the Executive Director of the Center for Entrepreneurship & Technology and a lecturer on entrepreneurship. Dr. Tenderich brings to the Center over 18 years experience in marketing and communications in the information technology and internet industries. He is a Founding Partner of TnT Initiatives, LLC, a social media publishing and consulting firm focusing on web and healthcare-related technologies. Previous positions have included General Manager, North America, for technology communications consultancy Bite Communications, Vice President, Public Relations at Siebel Systems, and Senior Vice President & Partner in the technology PR agency Applied Communications. Dr. Tenderich holds an M.A. and a Ph.D. in Economic Geography from the University of Bonn, Germany.

Susan Broderick is the Policy Analyst for the Center for Entrepreneurship & Technology and helped establish the Center by creating and overseeing many of its programs. Before joining CET, Susan was a senior analyst at the University of California Office of the President with the Industry-University Cooperative Research Program. She began her career in Tokyo as a translator before managing communications and compliance for the research department of boutique investment firms in the San Francisco. Susan is a graduate from the University of Pennsylvania and is a founding board member of Web Trick, Incorporated, a pioneer in online music education.

Acknowledgements

We would like to acknowledge all of the entrepreneurial educators from around the world who made the long trip to the University of California, Berkeley, to participate in the Inaugural Summit of the Global Venture Lab Network. We would also like to thank Sara Meldrum, CET's Program Coordinator, and Marcia Hickman, CET Student Services Officer, who were instrumental in orchestrating the Summit and the completion of this brief.

About UC Berkeley
Center for Entrepreneurship & Technology

The Center for Entrepreneurship & Technology (CET) seeks to foster entrepreneurship within the University and to bring Berkeley's research capability to industry collaborations. To these ends, the CET hosts multidisciplinary research projects in collaboration with industry stakeholders; as well as provides mentoring and support to new Berkeley ventures. To learn more about CET, go to cet.berkeley.edu