All knowledge forms one whole, because its subject-matter is one; for the universe in its length and breadth is so intimately knit together, that we cannot separate off portion from portion, and operation from operation, except by a mental abstraction.

The nature of the case and the history of philosophy combine to recommend to us this division of intellectual labor between Academies and Universities. To discover and to teach are distinct functions; they are also distinct gifts, and are not commonly found united in the same person.

John Henry Newman The Idea of the University 1852.
The ideal of universities with staff and students shielded from the life around them will produce a Byzantine civilization, **surviving for a thousand years without producing any idea fundamentally new.**

This discussion **rejects the doctrine that students should first learn passively**, and then, having learned, should apply knowledge. . . . In fact, **the applications are part of the knowledge.** For the very meaning of the things known is wrapped up in their relationships beyond themselves. **Thus unapplied knowledge is knowledge shorn of its meaning.**

Celibacy does not suit a university. It must mate itself with action. . . **It is mid-summer madness on the part of universities to withdraw themselves from the closest contact with vocational practices.**

MOVE BACK HOME?!... KIDS TODAY ARE SO LAZY AND IRRESPONSIBLE! YOUR MOTHER AND I STARTED OUT WITH NOTHING!...

FIVE-FIGURE STUDENT LOAN DEBT

TRUST ME, I WOULD'VE LOVED STARTING OUT WITH NOTHING!...
Duke I&E: Bringing to life
“Knowledge in the Service of Society”

“Our work forms an arc, spanning from inquiry through discovery on the one end and translation into practice on the other.”
Social Innovation & Entrepreneurship
Leveraging our strengths to become a world leader in the development, deployment and scaling of social innovation

Horizontal and Vertical Growth
Regional and National Partnering • Alumni Engagement
Universities are providing an increasing amount of entrepreneurship education

- Colleges / Universities offered ~100 formal majors, minors and certificates in entrepreneurship
- 1.5% of college freshmen report they want to start a business
- About 250 courses in entrepreneurship
- Colleges and Universities are receiving major endowments for entrepreneurship education
- More than 5,000 entrepreneurship courses
- More than 400,000 students take them per year
- Around 9,000 faculty members teach entrepreneurship
Universities are providing an increasing amount of entrepreneurship education

What’s the effect?

- Colleges / Universities offered ~100 formal majors, minors and certificates in entrepreneurship
- 1.5% of college freshmen report they want to start a business
- About 250 courses in entrepreneurship
- Colleges and Universities are receiving major endowments for entrepreneurship education
- More than 5,000 entrepreneurship courses
- More than 400,000 students take them per year
- Around 9,000 faculty members teach entrepreneurship

© 2013 Ewing Marion Kauffman Foundation
On a macro level, millennial entrepreneurship is declining.

Rate of New Entrepreneurial Activity, by Age (1996–2013)

Kauffman Foundation
Higher Education programs affect short term outcomes, not long term.

Academic-focused programs make an impact on skills and mindset, with mixed results for longer-term outcomes.

However, we’re using very shallow evidence

- Few studies
  - Ten program evaluations of which two were impact evaluations

- Low focus on external validity
  - Largely delivered on one or two campuses (6)
  - Mainly delivered to undergraduate students (7)

- Focus on developing economies
  - The two impact evaluations were based in Tunisia and Uganda

Next steps

1. Better understanding of what exists
2. More research into program impact and context
3. Sharing across the field
How Kauffman can support this work

**Build Networks**
- Attract more researchers and practitioners to study programmatic questions through supporting and developing networks
- Use convening power to include other people

**Improve Datasets**
- Create benchmarking information and identify common objectives, practices or program types
- Improve the quality of student data available from programs
- Join up with other public and private data sources

**Increase Quality**
- Refine research questions
- Improve research methodologies
- Reach actionable insights for program managers and funders
We need to involve three main groups

- Actionable insights, better programs
- Research
- Practice
- Evaluation
We use a variety of methods to arrive at insights and answers

- Develop and conduct exploratory research
- Build out networks
- Share with field
- Fund grants and RFPs
- Analyze findings
1) Increase Quality

THROUGH NETWORKS

NEW METHODOLOGY / THEORY
2) Improve Datasets

INTEGRATE PRIVATE DATASETS

IMPROVE PUBLIC DATASETS

Global Accelerator Network

Nesta

HM Government
3) Conduct Landscape Analysis

WITHIN ORGANIZATIONS

WITHIN ECOSYSTEMS
### Faculty roundtable — summary of key points

<table>
<thead>
<tr>
<th>Summary</th>
<th><strong>U Chicago, Booth</strong></th>
<th><strong>GATech, TI:GER</strong></th>
<th><strong>Duke, Fuqua, P4E</strong></th>
</tr>
</thead>
</table>
|         | - “New Venture Challenge” — university accelerator  
|         | - Competition and coursework — classroom & experiential  
|         | - Student facing  
|         | - Research & practitioner faculty  
|         | - Highly selective  
|         | - Experiential 12 credit hour certificate program  
|         | - Science & Engineering PhD students, MBA and JD students — cross disciplinary teams  
|         | - PhD student thesis research  
|         | - Business as well as legal mentor  
|         | - IP, Market, Commercialization Plan deliverables for each semester  
|         | - Just under 500 grads to date  
|         | - Academic concentration and two-year experiential program (“Program for Entrepreneurs”)  
|         | - Teams work with faculty advisor and business mentors  
|         | - Access to community resources  
|         | - Structured process with defined deliverables at the end of every semester. |
| **Metrics** | | **2002-2006 quasi controlled assessment externally run**  
|           | - Surveys of alumni, exit interviews  
|           | - 20% of projects 2004 — 2014 had an exit among the following: SBIR, Ga Research Alliance, NSF I-Corps, or other funding; company formed, patent filed, sales.  
|           | - Informal only — track start-ups and entrepreneurial careers of graduates |
| **Challenges** | | **Curriculum materials available to all**  
|           | - Funding  
|           | - Demands for growth in high human capital intensive curriculum  
|           | - Maintaining integration long term  
|           | - Engaging entrepreneurial community while remaining primarily educational rather than incubator  
|           | - Quality of business ideas: need More technology and research based business ideas  
|           | - Diversity of teams — necessary skills: become Integrated / cross-university program  
|           | - Balance education and incubation |


<table>
<thead>
<tr>
<th></th>
<th><strong>U of Toronto, Rotman, CDL</strong></th>
<th><strong>MIT, Trust Center</strong></th>
<th><strong>Arizona State</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summary</strong></td>
<td>• “Creative Destruction Lab” — seed-stage program for massively scalable science-based ventures</td>
<td>• Various curricular and co-curricular&lt;br&gt;• Global Founders’ Skills Accelerator: “complete the ramp” to launch&lt;br&gt;  • “Entrepreneurs not companies”&lt;br&gt;• Space, stipend, structure, status</td>
<td>• “Entrepreneurial Mindset” program with broad administrative support&lt;br&gt;• Begins with Freshmen&lt;br&gt;• Mix of curricular, core curricular, and co-curricular exposure&lt;br&gt;• Currently deployed in 2 of 6 engineering schools&lt;br&gt;• Tied into the Engineering Schools’ Generator Labs, Startup Center, and EPICS program: industry mentor-driven academic associate model</td>
</tr>
<tr>
<td><strong>Metrics</strong></td>
<td>• Equity raised by participating ventures</td>
<td>• Want to do assessment before and after: knowledge, capability, mindset, community&lt;br&gt;• Need more numbers</td>
<td>• Framework established to assess the impact of EM across the courses and curriculum.</td>
</tr>
<tr>
<td><strong>Challenges</strong></td>
<td>• Integration: students, curriculum, etc.&lt;br&gt;• Ensuring successful engagement between students and ventures</td>
<td>• Space, people, funding&lt;br&gt;• Assessment process, metrics</td>
<td>• Aiding faculty in understanding the benefits of an Entrepreneurial Mindset, understanding what it is, and relaying it to all students&lt;br&gt;• Systemic changes take time and we’re being aggressive in our time table&lt;br&gt;• Assessing impact of EM ecosystem and continually refining our deployment and evaluation</td>
</tr>
</tbody>
</table>
Creating a Road Map for STUDENT ENTREPRENEURSHIP Education at MIT

Bill Aulet
Managing Director,
Martin Trust Center
for MIT Entrepreneurship
Purpose of this Document

The purpose of this document is to start with the needs of our target customers (MIT students) and then build a portfolio of offerings, including different delivery mechanisms, to address those needs in the best manner possible.

Note that this focuses on the “business essentials” of starting a new venture which will be complementary with and work hand in hand with the “technology essentials” – which will vary depending on the type of technology involved.
Development of Innovation-Driven New Ventures: Dual Tracks

Innovation
* Technology essentials
* Knowledge of science & engineering
* Skills to develop
* Skills to build

Entrepreneurship
* Business essentials
* Venture engineering
* Knowledge to frame decisions
* Skills to start
* Skills to grow
Process

Segmentation
• Start with market segmentation to identify different types of students in classes today

Personas
• Real representative examples (MIT)
• Significant shift in demand

Needs
• Identify needs by persona
• Note common areas as well

Design
• Modular for flexibility & customization, as well as rigor & quality
• What is our current set of offerings?

Delivery
• Multiple mechanisms for delivery
• Giving options to customers (students)

Action
• Research best practices
• Identify gaps and areas of weakness → Remediation plans developed & implemented
Target Customer Definition & Segmentation

- MIT students
  - Undergraduate (UG)
  - Graduate Student – MBAs (MBA)
  - Graduate Student – other Masters or PhD (Grad)
  - Post Doctoral Student (PostDoc)
- Any of the five schools at MIT
- We will further distinguish between all of these categories of students by their interests using the persona methodology
- Again, we focus on IDE not SME entrepreneurship
### Target Market Personas & Demand

**Exploratory/ Curious**
- Interested but has no driving idea or team; is in exploratory mode; starts here but will migrate to another state or out of entrepreneurship

**Ready-to-Go**
- Chomping at the bit & just wants help to get going – has idea, tech &/or core of team

**Entrepreneurship Amplifier**
- Interested in understanding enough to successfully promote in their org (e.g., gov, corp, family business) but is not the entrepreneur

**Corporate Entrepreneur**
- Wants to be an entrepreneur in a large organization

<table>
<thead>
<tr>
<th></th>
<th>Exploratory/ Curious</th>
<th>Ready-to-Go</th>
<th>Entrepreneurship Amplifier</th>
<th>Corporate Entrepreneur</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UG</strong></td>
<td>High</td>
<td>Low, but influential</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Grad</strong></td>
<td>Medium</td>
<td>Medium, but very important</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>MBA</strong></td>
<td>High</td>
<td>Medium</td>
<td>Low/Med</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>PostDoc</strong></td>
<td>Med</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

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6
# Target Market Personas: Needs

<table>
<thead>
<tr>
<th>Persona</th>
<th>Exploratory/Curious</th>
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</tr>
</thead>
<tbody>
<tr>
<td>High Level Description of Need</td>
<td>Need info on career choice, soft skills, ideation, team building and then some first-hand experience to get a sense of the process</td>
<td>Wants specific skills and lots of them, very quickly; less on the upfront things emphasized for the “curious” persona; wants the deep, immersive experience of being an entrepreneur on her idea/technology</td>
<td>Interested in all steps in some depth but even more interested in strategy, policy and economic impact of the field. Will want to have the experience of being an entrepreneur so can empathize but more interested in the process than the idea or team</td>
<td>Wants depth in executing the process so comfortable doing it again but less tied to the idea or team; more interested in organizational issues and environment issues</td>
</tr>
</tbody>
</table>

*Note: The UG segment of these personas will need more on the “soft skills” side than the MBAs in particular as it is part of the MBA curriculum already and they get a lot of experience in this in other courses where the UGs & the other Grads (to a less degree) do not.*
Needs Assessment: Business Essentials*

Core Entrepreneurship Specific Skills:

- **“Nucleation” (Phase 1)**
  - Career Choice
  - Ideation
  - Team Building 1

- **“Product Definition” (Phase 2)**
  - Defining & Refining Product ↔ Market Fit
  - Primary Market Research
  - Strategy

- **“Venture Development” (Phase 3)**
  - Key Founders’ Decisions
  - Sector Deep Dives
  - Business Model & Pricing

  - Basics of Finance
  - Product Design
  - Scaling - Manufacturing

  - Legal
  - Product Development
  - Scaling: Process & Infrastructure

  - Customer Acquisition
  - Product Management
  - Financing

  - Strategy
  - Project Management

Essential Skills for Entrepreneurs (Semi-Customized):

- Soft Skills
- Sales
- Communications
- Dealing with Adversity
- Negotiations

General Skills Valuable to Entrepreneurs:

- Corporate Entrepreneurship
- Corporate Strategy
- Work-Life Balance
- Leadership & Culture

* - An open framework built for constant refinement
Curious Entrepreneur Specific Needs

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Corporate Entrepreneurship
- “Nucleation” (Phase 1)
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MIT Center for Entrepreneurship
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- Work-Life Balance
- HR
- Leadership & Culture
- Corporate Entrepreneurship
- Building Eship Systems

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- Corporate Entrepreneurship
- HR
- Leadership & Culture
- Corporate Entrepreneurship
- Building Entrepreneurship

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- Project Management

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- Sales
- Communications
- Dealing with Adversity
- Negotiations

Corporate Entrepreneurship

HR

Leadership & Culture

Work-Life Balance

Corporate Entrepreneurship

Building Entrepreneurship Systems
Fulfillment Mechanisms

1. Residential MIT Classes
   • Full Semester Classes
   • Half Semester Classes
   • Short Classes (IAP or SIP Classes)
2. Online MIT Classes
   • edX/MITx/OpenCourseWare materials
3. Lecture Series and/or Workshops (“SnackPacks”)
4. Extra or Co-Curricular Clubs/Activities (e.g., Hackathons)
5. Supplementary materials could be available via MIT created posts, podcasts, video or other as well as similar external online materials
6. Advisory Network (Specialists, Coaches, Mentors)

✔ All of this would be available via our Resource Page
✔ Going forward we will use more varied and likely multiple fulfillment mechanisms and this will evolve as we run experiments using the various formats
Offerings Mapping to Needs

Core Entrepreneurship Specialties:

- **“Nucleation”** (Phase 1)
  - Career Choice
  - Ideation
  - Team Building

- **“Product Definition”** (Phase 2)
  - Product Management
  - Legal
  - Business Model & Pricing
  - Scaling: Process & Infrastructure

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  - Work-Life Balance
  - Corporate Entrepreneurship
  - Building Eship Systems
  - Communications
  - Dealing with Adversity
  - Negotiations
  - Project Management
  - Corporate Strategy

Ideation

Classes:
- 6.933: Founders’ Journey (1 class)
- 15.390: New Enterprises (2 classes)
- Also included in 2.75: Medical Device Design, 3.042: Materials Project Lab, 2.009: Prod Engineering Process, ESD.051J: Eng Innovation & Design
- IAP class: “Figuring Out the Next Big Thing” IAP.123

edX:
- Watch this space ...

Extra-curricular & Clubs:
- Sloan Design Club
- Hackathons (e.g. MIT Hacking Medicine)
- $100K Brainstorming sessions
- SnackPacs
  - t=0 Brainstorming Sessions
  - Lecture series (at least every 2 months)

Online/Library:
- Videos (IDEO, Improv, plus others)
- Tina Seelig online class
- Add books

Professional Advisor Network Contacts
- Main contact: Sam Breen
- Specialist: Elaine Chen*
- Gordon Contact: Blade Kotelly
- VMS Contact: Roman Lubensky

General Skills Valuable to Entrepreneurs:

- Soft Skills

Central Entrepreneurship Specific Skills:

- Corporate Entrepreneurship
- Corporate Strategy

Martin Trust Center for MIT Entrepreneurship
### Core Entrepreneurship Specific Skills:

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- Soft Skills
- Sales
- Communications
- Dealing with Adversity

### General Skills Valuable to Entrepreneurs:
- Project Management
- Corporate Strategy

* - An open framework built for constant refinement
Action

- Generally, start to address the red (immediately)
- Build initial Resource Page and start to populate (Dec)
- Experiment and measure effectiveness of using multiple delivery mechanisms (Feb)
- Focus on UG Curious Entrepreneur (ASAP)
- Develop recommended road maps for each persona (Jan)
- Run a planning session with Gordon Engineering Leadership Center & increase collaboration (Dec)
- Continue to evaluate the current state with more research (ongoing)
- Coordinate with Innovation Initiative (Dec)
Founders’ Skills Accelerator (FSA) 
Accelerators in an Academic Environment 
Summary of 2012 Program

Bill Aulet
Managing Director
Martin Trust Center for MIT Entrepreneurship
October 2, 2012
entrepreneurship.mit.edu  @EshipMIT
Why?

- Student Demand
- Institute Mission
- Changing Face of Entrepreneurship
Changing Face of Entrepreneurship

Herbert B. Jones Foundation’s Milestone Achievement Awards University of Washington
Challenge

• Peter Thiel
• Fellows Program
• $100k to dropout

RESULTING CONCLUSION

Stay in school OR Be a Serious Entrepreneur

OR AND
MIT’s Unique Role

- Educational
- Honest broker
- Existing extensive entrepreneurship eco-chamber & value chain

- Tremendous opportunity for a complementary program
Goals of FSA

• Complete the Ramp

• Entrepreneurs Not Companies: Teaching our students how to fish rather than catching a fish

• Fulfill MIT’s Mission
The Grand Plan: “The Ramp”

MIT Entrepreneurship Ramp

Inspiration, Idea, Technology

Validation

Classroom

Extra-Curricular

Escape Velocity!
Plan vs. Reality: Before FSA

MIT Entrepreneurship Ramp

Inspiration, Idea, Technology
Validation
Classroom
Extra-Curricular

15.390

Most Often Unable to Achieve Escape Velocity

WE NEEDED SOMETHING TO SUPPORT STUDENTS!
Completing the Ramp with FSA

MIT Entrepreneurship Ramp

Inspiration, Idea, Technology

Validation

Classroom

Extra-Curricular

Accelerator

15.390

i-Teams

$100K

MIT $100K ACCELERATE CONTEST

MIT Clean Energy Prize

Beehive Cooperative

Escape Velocity!

Completing the Ramp with FSA

MIT Entrepreneurship Ramp

Inspiration, Idea, Technology

Validation

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Accelerator

15.390

i-Teams

$100K

MIT $100K ACCELERATE CONTEST

MIT Clean Energy Prize

Beehive Cooperative

Escape Velocity!
How FSA Works

- Space
- Stipend
- Structure
- Status
FSA Educational Component

TEAM
- Founders Agreements & Equity Splits
- Hiring and Firing Employees
- Developing Company Culture

CUSTOMER
- Primary Market Research/User Innovation
- Developing a Persona
- Securing your First Customer
- Decision Making Unit/Decision Making Process

FINANCE
- Legal Issues and Startups
- Building Financial Statements
- Entrepreneurship MicroEconomics: CoCA & LTV
- Alternative Ways to Raise Capital

PRODUCT
- 24 Steps to Successful Product Launch
- Protecting and Growing your Core
- Iterating, Refining & Evolving Your Product
- Building a Pricing Model
Demo Day “Graduation Event”

- Extremely Important “Forcing Function” & Closure Event

- Three Goals for Three Audiences
  - Students
  - FSA/Beehive
  - External Players

- Positive effects already seen
  - 3x increase in student participation in t=0 events from last year
  - Fills pipeline to make next year’s FSA much stronger
  - Dozens of teams proactively asking to move into the Beehive

- Videos of Demo Day presentations can be seen at:
  http://entrepreneurship.mit.edu/demo-day-presentations
Participant Data Validates Assumptions

Ability to Articulate Theory

Customer | Product | Team | Financials/Other | Overall
---|---|---|---|---

Participant Data Validates Assumptions

Ability to Execute

- Customer
- Product
- Team
- Financials/Other
- Overall
Participant Data Validates Assumptions

Net Promoter Score of +73

“This experience helped us to quickly develop the product that addressed real market needs, and with a high market potential.”

“This was one of the most valuable experiences I’ve had while at MIT.”

“The program fills the chasm that often limits ideas/projects from becoming real businesses.”

“We learn a lot of theory in class, but now we know how to execute.”

“I have already advised professors at other universities about the program and suggested that this is the real way to honor your students.”

“This real world experience really helps clear up a lot of misconceptions about the struggle as well as the pay off in the end.”
Conclusion

• All in all, a huge success
• Can make it better next year
• With success & now more lead time awareness in the community, it has become an aspirational goal for students and so …
• We have only begun to see the dividends from FSA as the pipeline for next year is already filling up & in fact, it seems to be a draw to attract new entrepreneurial students to MIT
• We have been looking & not seen a similar comprehensive program anywhere yet but we can certainly learn from elements of other programs, mostly private
• The key is not just the program but how it integrates with & complements the rest of the strong ecosystem – it is an important part of a bigger mosaic
End

Questions?
Appendices
“Ready to Go”
Chris had his business idea even before the school year began and the drive to start his business ASAP. Chris is already meeting other students so he can find his co-founder, securing mentors, and building his network. He is taking the course for some guidance, but he would have started his business even without the class.

“The Curious”
Devin is intrigued by entrepreneurship. She isn’t quite sure what it means to start a new business or be an entrepreneur. Taking this class as an opportunity to demystify entrepreneurship and help her decide whether starting a new business is something she wants to do in the future.

“Learn the Science”
Esteban has limited interest in becoming an entrepreneur, but wishes to learn about the science and art of entrepreneurship in order to support others from a role in the public sector, NGO’s, board of director, or funding. He is anticipating a post MIT job where he will likely work with and interact with entrepreneurs and start-ups.
Founder’s Journey Class Topics

**Career Choice**
- Class #2: Industry Trends & Startups (Software)
- Class #3: Industry Trends & Startups (Healthcare)
- Class #4: Path for Impact: Ideas
- Class #5: Path for Impact: Individuals

**Ideation**
- Class #6: Tools for Impact: Ideas & Design

**Team Building**
- Who’s Your Team

**Soft Skills**
- Path for Impact: Individuals
- Class #13: Who’s Your Team?
- Class #20: Does It Make Economic Sense to Start & Various Forms of Entrepreneurship

**PMR / Product-Market Fit**
- Class #7: Is There a Need?
- Class #8: Who’s Your Customer?
- Class #10: Elements of a Business Plan

**Financing**
- Class #23: How & When To Raise Money

**Product Design / Product Dev & Marketing**
- Class #9: Software Prototyping
- Class #11: Hardware Prototyping
- Class #13: What Should My MVP Be?
- Class #14: From Prototype to Product

**Presentation Skills**
- Class #21: How Do I Talk About My Company To Different Audiences?

**Founder’s Dilemmas**
- Class #12: Should I Change Paths or Stop?
- Class #15: Common Startup Death Traps
- Class #16: Survival Techniques (from MIT Startups)

**Sales**
- Class #17: When Should I Start Selling? How?

**Basics of Finance**
- Class #22: Essential Finance for Entrepreneurs

**Legal & IP**
- Class #19: Managing Risk and Getting Legal Advice

**Business Model / Pricing**
- Class #18: Business Model & Distribution Strategies
Topics Covered Outside Course 15

**Career Choice**
- UPOP

**Ideation**
- 2.75 Medical Device Design
- 3.042 Materials Project Laboratory
- 2.009 The Product Engineering Process
- 2.008
- ESD.051J Engineering Innovation & Design
- SuperUROP

**Soft Skills / Team**
- GEL
- 2.96 Management in Engineering
- 6.UAT Presentation Skills
- UPOP

**PMR / Product-Market Fit**
- ESD.051J Engineering Innovation & Design
- 2.75 Medical Device Design

**Presentation Skills**
- 6.UAT Presentation Skills

**Legal & IP**

**Entrepreneurship (small sampling)**
- 1.462/11.345 - Entrepreneurship in Construction and Real Estate Development
- 6.S078 - Entrepreneurship Project
- 11.352 - Real Estate Ventures II

**Product Design & Development**
- D-Lab (multiple classes)
- 1.036 Structural and Geotechnical Design
- MAS.863 How to Make (Almost) Anything
- 2.00A Fundamentals of Engineering Design: Explore Space, Sea and Earth
- 2.00B Toy Product Design
- 2.007 Design and Manufacturing I
- 2.008 Design and Manufacturing II
- 2.009 The Product Engineering Process
- 2.739 Product Design and Development
- 2.744 Product Design
- 2.72 Elements of Mechanical Design
- 2.75 Medical Device Design
- 2.813 Energy, Materials, and Manufacturing
- 2.888 Professional Seminar in Global Manufacturing Innovation and Entrepreneurship
- 4.500 Introduction to Design Computing
- 4.504 Design Scripting
- 4.112 Architecture Design Fundamentals I
- 4.113 Architecture Design Fundamentals II
- 6.813 User Interface Design and Implementation
- 16.440 Human Factors Engineering
- ESD.051 Engineering Innovation and Design
- ESD 267/268J Manufacturing System and Supply Chain Design
- 2.875J: Mechanical Assemblies: Their Design, Manufacture, and Role in Product Development
- 2.83: Environmentally Benign Design and Manufacturing
- 3.961/HST.524/2.782/20.451 - Design Med Devices & Implants
Students form teams to start a company while getting an MBA
Learning vehicle for students and faculty, platform for research
Open to all Duke students
3 course sequence
Not selective: not an entrepreneurship prevention program
Focus:
- Process and principles
- Skills needed in entrepreneurial action
P4E process

Selection (students)
1. Application
2. Idea matching

NV 1 - Opportunity Evaluation

Business Plan
NV 2 - Strategy development
NV 3 - Operating plan

Company Launch

Timing
Pre-enrollment
July – October, 1st year

Fall 2, 1st year

Spring, 1st year

Fall, 2nd year

Spring, 2nd year
P4E team

- Faculty Advisor
- Business Mentor
- Committed Student(s)
- Committed Student(s)
- Inventor
- Supporting Roles
- Supporting Roles
- Supporting Roles
- Supporting Roles
Students pitch ideas
Mentors give feedback
Other students can join the team
# P4E history

<table>
<thead>
<tr>
<th></th>
<th>Class of 2010</th>
<th>Class of 2011</th>
<th>Class of 2012</th>
<th>Class of 2013</th>
<th>Class of 2014</th>
<th>Class of 2015</th>
<th>Class of 2016</th>
<th>Class of 2017</th>
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<td>112 students</td>
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<td>*Handpicked</td>
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<td>*Matchmaker</td>
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<td>9 students</td>
<td>7 students /</td>
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<td>CrowdTunes</td>
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</table>
P4E outcomes to date

- 67 projects over 5 years
- 20 launched
- 41 of 47 failures to launch (87%) due to absence of market
- 18 survive or unknown

<table>
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<tr>
<th>Class</th>
<th>Projects</th>
<th>IT</th>
<th>Life science</th>
<th>Energy</th>
<th>Consumer other</th>
<th>Launch</th>
<th>Fail Market</th>
<th>Fail Tech.</th>
<th>Fail Other</th>
<th>Survive</th>
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<td>2015</td>
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<tr>
<td>Totals</td>
<td>67</td>
<td>32</td>
<td>11</td>
<td>7</td>
<td>17</td>
<td>41</td>
<td>1</td>
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### Class of 2017

<table>
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<th>Microfluidics Technologies</th>
<th>Elastic microparticles</th>
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<tr>
<td>Xiaozao</td>
<td>Platform for career guidance</td>
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<tr>
<td>Fitted</td>
<td>Platform for freelance fitness instructors</td>
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<tr>
<td>Social radar</td>
<td>Website &amp; app: what to do in my city</td>
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<tr>
<td>Konost</td>
<td>Digital Rangefinder Camera</td>
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<td>Recommendation Engine for Travel</td>
<td>Recommendation Engine for Travel Itineraries</td>
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<td>Adless</td>
<td>Location based brand advertising through games</td>
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<td>Rika Box</td>
<td>STEM activity subscription box</td>
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<td>New school in Casablanca</td>
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<tr>
<td>Chinese High School Education</td>
<td>High School Education For Chinese Student</td>
</tr>
<tr>
<td>My Own Farm</td>
<td>Low income investment platform (Mexico)</td>
</tr>
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</table>
'I got offers from Bank of America and Walmart (Finance and Strategy, 1 of only 8 total, they typically recruit from Harvard, Kellogg, Chicago). I think my experience over the two years in P4E was definitely the reason I got both offers'

-Mark, Fuqua ’11

“I've told several incoming students that P4E taught me more in business school than anything else”

-Ted, Fuqua ’12
Main challenges

• Quality of business ideas
  – Need More technology and research based business ideas
• Diversity of teams — necessary skills
  – become Integrated / cross-university program
• Balance education and incubation
University Inventors, Start-ups, and the Market for Judgment

Entrepreneurship Education:
Developing a Community of Practice

Rachel Harris
University of Toronto
May 3, 2016
Puzzle

- On one hand, the University of Toronto is a global powerhouse in a broad range of research areas. On the other hand, there is **little evidence** of UofT inventions in the Ontario commercial landscape.
  - Same is true for Canada
  - Same is true for other OECD countries, including the US outside of SV

- Failure to transform university research into products and services that benefit society
The primary cause for poor performance in translating regional excellence in innovation into entrepreneurial success is not lack of:

1. Ideas/IP
2. Effort
3. Capital

Instead, the primary reason is a failure in the market for judgment.
Judgment

• Prioritizing tasks (allocation of scarce resources)

• Variation in the quality of judgment:
  – VCs, lawyers, bureaucrats, consultants, administrators, academics, entrepreneurs
Objective

Design a **seed-stage program** that:

1. **Reduces frictions in the market for judgment: enhances equity value creation**

2. **Creates a unique pedagogical environment that combines learning-by-doing with theory (economics, finance, marketing, strategy, OB)**
How it Works

1. Set 3 objectives
   i. Measurable deliverables
   ii. 8 weeks
   iii. Agreeable to founders
How it Works

1. Set 3 objectives
   i. Measurable deliverables
   ii. 8 weeks
   iii. Agreeable to founders

2. Cut lowest performing ventures
How it Works

1. Set 3 objectives
   i. Measurable deliverables
   ii. 8 weeks
   iii. Agreeable to founders

2. Cut lowest performing ventures

3. Investment
How it Works

1. Set 3 objectives
   i. Measurable deliverables
   ii. 8 weeks
   iii. Agreeable to founders

2. Cut lowest performing ventures

3. Investment

4. Chief Scientists

5. MBAs
How it Works

1. Set 3 objectives
   i. Measurable deliverables
   ii. 8 weeks
   iii. Agreeable to founders

2. Cut lowest performing ventures

3. Investment

4. Chief Scientists

5. MBAs

6. Business School Faculty
How it Works

1. Set objectives
   i. Measurable deliverables
   ii. 8 weeks
   iii. Agreeable to founders

2. Cut lowest performing ventures

3. Investment

4. Chief Scientists

5. Business School Faculty

6. Partners

7. MBAs

[Diagram with color-coded roles: G7 Member, Faculty, Founder, Partner, Chief Scientist, MBA]
2015: Double Throughput of Lab

CDL Prime

CDL: Machine Learning & Artificial Intelligence
**Metrics**

**Goal:**
Equity value after 5 years

- $50m

**Actual:**
Equity value after 4 years

- $300m
Market Signal

• Venture capitalists from the Bay Area and elsewhere now attend CDL meetings and interact intensely with CDL ventures

• Notable VCs who have attended:

- Bessemer Venture Partners
- AME Cloud Ventures
- DFJ
- The Alexa Fund
- Lux
- Greylock Partners
- True Ventures
Second, research and development funding should be focused on projects with clear commercialization potential. Specifically, we need a national strategy to commercialize the high-quality research that has already been done in Canada’s labs and universities. The Creative Destruction Lab at the University of Toronto is a remarkable program that specializes in getting technology to market by providing milestone-based coaching and multiple rounds of funding. This program could be used as a model for other universities.
MBA Course

- Most competitive course at the Rotman School to get into
- Students evaluate venture applications, interview founders, and then rank applicants
- They then apply to work with ventures and spend the rest of the year helping their ventures achieve their objectives
- Students from around the world now apply to the Rotman School specifically to participate in the Creative Destruction Lab Course
- Out of 60 students, 6 joined their science-based ventures as cofounders
Challenges

• How do we quantify the success of our MBA course?

• As our program scales (to 50 ventures and 60+ students) how do we integrate the MBA course in a way that keeps students engaged?

• With such a large cohort, how do we ensure that the relationship between ventures and MBAs is always a success?
THANK YOU
The Polsky Center:
Entrepreneurship at Chicago Booth and the University of Chicago

Steven Kaplan, University of Chicago
Evolution of Entrepreneurship at Chicago Booth

1898: University of Chicago Business School founded.
1996:
- No entrepreneurship concentration.
- 3 classes taught by practitioners.
- Dean Hamada decides Chicago needs strong entrepreneurship program:
  - Program aims:
    - Mix of research and practitioner faculty.
    - Mix of classroom/experiential learning.
    - Student facing.
Evolution of Entrepreneurship at Chicago Booth

1998:

- Entrepreneurship concentration introduced.
- Kauffman Foundation gives Booth $1M grant to start entrepreneurship center.
- Ellen Rudnick, '73, hired as Executive Director.
Evolution of Entrepreneurship at Chicago Booth

2002:

- Michael Polsky, '87, leading energy entrepreneur, endows center.
- Staff, faculty, and programming increase dramatically.

University of Chicago Business School founded

1898 2016
Evolution of Entrepreneurship at Chicago Booth

2012:
- Michael Polsky, '87, doubles his endowment.
- Polsky Center expands its mission to become the venture creation engine for the entire university.

University of Chicago Business School founded

1898 2016
#1

CONCENTRATION
at Chicago Booth
30 Courses
24 Faculty Members

Hyde Park Angels
One of top 10 angel groups in U.S.
Continued commitment to underlying philosophy:

- Mix of research and practitioner faculty.
- Mix of classroom and experiential learning.
- Student-facing.
- Passion for new venture creation and innovation.
In **1996-97**:
- Jeff Meyer, '97, asks if we can have a business plan competition.
- New Venture Challenge launched with support from Edward L. Kaplan, '71, who provided the initial prize money.
In 2008:
Global NVC launches for executive MBA students in the U.S., Europe, and Asia.
In 2011: Social NVC launches driven by increased student interest.
In 2011-12: College NVC debuts for undergraduates.
In 1996-97:

13 TEAMS  $20,000 IN PRIZES  1 TRACK

SPONSOR:

Edward L. Kaplan, ’71
NVC Growth & Expansion in 20 Years

**In 1996-97:**

- **13 Teams**
- **$20,000 in Prizes**
- **1 Track**

**Sponsor:**

Edward L. Kaplan, '71

**Today:**

- **93 Teams**
- **$600,000 in Prizes**
- **4 Tracks**

**Sponsors:**

Edward L. Kaplan, '71

[Logos of various sponsors]
New Venture Challenge – How Do We Do It?

Process is Key:
1) Creation – idea generation, team formation.
2) Selection.
3) Course – mentorship, criticism, time pressure.
4) Finals.
Phase 1: Creation

September - February

Phase 1 | Phase 2 | Phase 3 | Phase 4

Identify an Idea
- Polsky Center events, programs and classes inspire ideas and projects.
- Resources to support:
  - Collaboratorium
  - Big Problems, Big Ideas
  - EVC Student Group Start-Up Week

Validate an Idea
- Students learn how to test the commercial potential of an idea.
- Resources to support:
  - Entrepreneurial Discovery
  - Polsky I-Corps program
  - Entrepreneurship Essentials

Form a Team
- Polsky Center helps students put teams together for the NVC.
- Resources to support:
  - University of Illinois partnership
  - Quick Pitches
  - NVC kick-off and Fast Pitch
Phase 2: Selection

February

- 80 plans typically received by early February deadline.
- Judges, coaches, and faculty select 25-35 viable plans to advance.
- Advancing plans announced in late February.
Phase 3: Course

March - June

- Two sections with ~15 teams each.
- All teams have access to at least three coaches and NVC faculty, who suggest other mentors and facilitate introductions.
- Mentor network grows every year, alums/friends with domain expertise.
- Each team presents in class in April
  - Coaches, mentors, and judges attend.
  - Provide brutal, but constructive criticism.
- Teams incorporate feedback into plans and present again in class in May.
**Phase 3: Course**

March - June

- **Stunning improvement / progress over three-month period**

---

[Image of course materials and participants]
June

- **10 teams chosen** to present in the finals in June.
- **Major incentives to get to finals:**
  - Full day with **20+ senior judges and investors**.
  - **$500K+** in prize money and legal/business services.
NVC Results

140+ COMPANIES still operating today

$434+ MILLION funding raised

$3.7+ BILLION in mergers and exits
NVC Results
Rated the top university accelerator in the U.S. in 2015 and 2016

- 1016

These are the top accelerators in the U.S.
NVC Results: GrubHub

- Won the 2006 NVC.
- Raised $81M + from Benchmark Capital, DAG Ventures, others.
- Merged with Seamless in 2013.
- Used by 40,000+ restaurants in 1,000+ U.S. cities and London.
- Completed IPO in April 2014 (NYSE: GRUB).
- Market Cap $2B - $4B.
NVC Results: Braintree

- Won the 2007 NVC.
- Raised $70M from Accel Partners, NEA, etc.
- Acquired **Venmo** in 2012.
- Clients include Uber, Airbnb, Living Social, Opentable, etc.
- **Sold to eBay PayPal for $800M in 2013.**
NVC Results: LuminAID

- Won 2012 Social NVC.
- Named to The Today Show’s “Top Technology Trends” list.
- Supplies NGOs, like Doctors Without Borders, with 20,000+ LuminAID Lights.
- All five sharks make offers on Shark Tank; strike a deal with Mark Cuban for $200,000.
Why is the NVC so effective?

- **Focus on team creation** builds strong teams:
  - Great students, great inputs.

- **Careful selection** process:
  - Teams are vetted and do not waste anyone’s time.

- Substantial and growing **mentor network** adds real value.

- **Tight timeline / deadlines** force teams to get a lot done quickly.

- **Strong frameworks.**

- **Great outputs.**

  Process is similar to that of Y Combinator, TechStars, etc.
Thoughts / Challenges

- **Keys to Success:**
  - Student facing.
  - Strong partnership between Executive Director and Faculty Director.
  - Limited channel conflict.
    - Polsky Center is the business creation engine for the University.

- **Challenges for the Future:**
  - Bringing our processes and IP to bear on the rest of the University.
  - Ensuring channel conflict remains limited.
Arizona State University: A New American University

Scott Shrake, Arizona State University

- Leverage our Place
- Transform Society
- Value Entrepreneurship
- Conduct Use-Inspired Research
- Enable Student Success
- Fuse Intellectual Disciplines
- Be Socially Embedded
- Engage Globally

- Research I University
- $450M Research Expenditures
- 16 Colleges/Schools
- 83,000 students
- 5 campuses
  - Tempe
  - Downtown Phoenix
  - Polytechnic
  - West
  - Lake Havasu
<table>
<thead>
<tr>
<th>ACADEMIC PROGRAMS</th>
<th>STUDENT ACTIVITIES &amp; LEADERSHIP</th>
<th>ECOSYSTEM (internal and external)</th>
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<td>Business Entrepreneurship (Business)</td>
<td>Ashoka Changemaker Campus, Changemaker Central, Changemaker Challenge</td>
<td>NSF iCorps Site</td>
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<td>Digital Culture (Design)</td>
<td>Launch Days</td>
<td>Venture Development</td>
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<td>Generator Labs (Engineering)</td>
<td>Mentor Network</td>
<td>Hayden Library Maker Space</td>
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<td>EPICS (Engineering)</td>
<td>E+I Freshmen Fellows</td>
<td>Startup Center/Generator Labs (FSE)</td>
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<td>Edson Student Entrepreneur Initiative</td>
<td>New Media Innovation Lab (Cronkite)</td>
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<td>Pakis Social Entrepreneurship Challenge</td>
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Post Phase 1 – Entrepreneurial Mindset Ecosystem within Fulton Schools of Engineering

Pre 1st Year – E2 Camp, SEE@ASU, EPICS High, GCSP Summer Institute

1st Year

School of Biological and Health Systems Engineering*
School of Computing, Informatics, and Decision Systems Engineering
School of Electrical, Computer and Energy Engineering
School for Engineering of Matter, Transport and Energy
School of Sustainable Engineering and the Built Environment
The Polytechnic School*

Core Curricular
- Introduction to Engineering (All schools 2,900)
- ASU 101 (All schools 2,900)
- Entrepreneurship Value Creation, FSE 301 (500)
- Core Curriculum Innovation (2 chosen per school)
- Capstone/Senior Design eProjects

Elective Curricular
- EPICS, FSE 194/394 (1,000)
- Innovation Space (pending app)
- GlobalResolve (50)
- ProMod (start-up phase)
- eSeed
- Faculty Mini Grants (25)

Student Experiences
- FUEL (60)
- Grand Challenge Scholars (450)
- Start up Labs (250)
- Student Organizations (34 clubs, 3,000 students)
- FURI (208 students, 111 faculty)
- Prescott Fulton Ventures (30 Ventures Teams per year)
- Edson (vary pending applications)

Graduate

Engineering Education Systems and Design PhD program
- Engineering Innovation and Entrepreneurship, FSE 535
- Applications of Qualitative Methods for Engineering Education Research, FSE 571

*Design Spine and project based courses
An Integrative Approach to Technology Entrepreneurship

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TI:GER Founder & Executive Director

Entrepreneurship Education: Developing a Community of Practice
May 3, 2016
Duke University
What is TI:GER?

- 2-year Team-based Experiential Certificate Program
- PhD students in Science & Engineering team with Georgia Tech MBA & Emory School of Law JD students
- Focus on issues in potential commercial application of PhD student thesis research
Technology commercialization requires integration of
- Science & engineering expertise
- Knowledge of Business & Law

Graduate students—particularly PhDs-- underserved in entrepreneurship education

Challenge: Not to divert PhD students from research
Program Goals

- Produce graduates with multidisciplinary skills & entrepreneurial perspective for career success in innovation
  - S&E PhDs aware of business & legal issues
  - MBAs & JDs experienced in technical research setting
  - Communication & team skills

- Produce S&E research of technical merit and market relevance
2 Year Graduate Certificate Program

Science & Engineering

Classes/Labs

Multidisciplinary Research Centers

PhDs

TI:GER

3 Core Classes
Industry/Legal Mentors
Consult/Int’l Projects

Teams: Issues in Potential Commercialization of PhD Research

Market Informed S&E Research
Graduates aware of technical, legal, market, interpersonal, & communication issues

Mgt/Law/Econ Research on the Innovation Process

Management

Classes

Internships

MBAs

Law

Classes

Clinics/Internships

JDs
## Team Experience

<table>
<thead>
<tr>
<th>Integrated Research</th>
<th>S&amp;E/MGMT/Legal Issues</th>
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<tbody>
<tr>
<td>Hypothesis formation</td>
<td>Scientific merit; feasibility</td>
</tr>
<tr>
<td>Market opportunities</td>
<td>Economic and social impact</td>
</tr>
<tr>
<td>Legal landscape</td>
<td>Prior art</td>
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<tr>
<td>Proof of concept</td>
<td>Testing and validation</td>
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<tr>
<td>Competitive analysis</td>
<td>Risk, product &amp; platform definition</td>
</tr>
<tr>
<td>Intellectual Property</td>
<td>Startup &amp;/or license; financing</td>
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<tr>
<td></td>
<td>Freedom to operate</td>
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<td></td>
<td>Patent, mark, secret, or copyright</td>
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<tr>
<td>Prototype</td>
<td>Refinement and scale-up</td>
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<tr>
<td>Commercialization strategy</td>
<td>Full market analysis (pricing, cost)</td>
</tr>
<tr>
<td>Business Associations</td>
<td>Contractual issues</td>
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</table>
Teams Span Disciplines & Universities

5 member teams; 35 – 40 students per cohort

Georgia Tech PhD & MBA; Emory JD students

PhDs 108
JD  211
MBA 161
Post Docs 3
Total 483

- Biomedical Engineering 16%
- College of Science 19%
- Biomedical Engineering 16%
- Mechanical Engineering 18%
- Materials Science Engineering 9%
- Electrical & Computer Engineering 19%
- Bioengineering 9%
- College of Computing 4%
- Other PhDs* 6%
Metrics: Student & Project Outcomes

- NSF Assessment Results
  - Pre and Post Capabilities of TI:GER PhDs vs control PhDs
  - On all criteria, TI:GER PhDs scored significantly higher than Controls
  - Within sample comparisons, entry vs. exit, differential gains but few significant

- Survey of PhD Research Commercialization Outcomes
  - For the TI:GER PhD research projects, have any of the following events occurred? (79 responses; 32% reported a commercialization event with 76 outcomes reported)

<table>
<thead>
<tr>
<th>Event</th>
<th>Count</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>SBIR/GRA</td>
<td>16</td>
<td>20 %</td>
</tr>
<tr>
<td>Company formed</td>
<td>17</td>
<td>22 %</td>
</tr>
<tr>
<td>Funds raised 09-14</td>
<td>14</td>
<td>19 %</td>
</tr>
<tr>
<td>Patent filed</td>
<td>19</td>
<td>24 %</td>
</tr>
<tr>
<td>Job Opportunity</td>
<td>13</td>
<td>16 %</td>
</tr>
</tbody>
</table>

- 3 waves of surveys re career paths, differentiate those in startups/medium & large companies
Challenges

- Curriculum materials accessible to all


- Funding—PhD & MBA students partially supported; $2 M endowment; Provost Office;

- Demands for growth in high human capital intensive curriculum

- Maintaining successful integration long term
  - Across administrators, universities
  - Free rider problem
Integrative Education in Technology Entrepreneurship & Innovation