
University Startups and Entrepreneurial Ecosystems

Best Practices

INTRODUCTION

Universities vary widely in their goals for technology commercialization, design of supporting structures, and resources they provide. However, all universities we have examined share a common objective: a desire to increase the impact of research activities through effective technology commercialization.

This report provides an overview of technology commercialization at the leading institutions in the U.S. and Canada based on recent Opus Faveo research. We have identified five key categories of activities:

1. Education
2. Technology Transfer and Licensing
3. Centers, Institutes, and Programs
4. Funding
5. Networking

In addition, while a common method of advancing commercialization is through licensing, fostering the creation of startups is also important, and this approach is less developed at many universities. An active startup ecosystem can be a major contributor to the impact of a university's technology development. The universities that lead in technology commercialization in general also tend to be leaders in new company formation.

Utilizing the information in this report can assist in establishing or strengthening a university's long-term plan to expand and advance technology commercialization, and in doing so, increase its impact on the university, the community, and society.

1. EDUCATION

Universities can strengthen their capabilities with respect to startups by investing in educational opportunities for both students and faculty. Most universities that lead in technology commercialization have a well-established framework for structured learning, as well as discrete and ongoing events which provide networking and competitive opportunities.

- *Classes.* Because a university specializes in education, this is a place to begin creating an entrepreneurial ecosystem. Many universities view entrepreneurship as a set of skills that can be taught, and they have designed courses and hired faculty to teach those skills. For example, Babson College in Boston offers over 20 courses in its Entrepreneurship Division, from Raising Money to Managing a Growing Business.ⁱ A wide offering of entrepreneurship courses taught by experienced faculty provides students with the knowledge, skills and confidence to start new businesses.
- *Degree Programs and Concentrations.* Multidisciplinary degree programs typically blend coursework from schools of engineering, design or business with a focus on commercializing technological innovation. The university can also provide concentrations, such as entrepreneurship, within existing schools. Duke University has multiple programs focused on strengthening entrepreneurship, such as its Law and Entrepreneurship Master of Laws degree which builds upon a student's JD, as well as entrepreneurial concentrations within the business school.ⁱⁱ
- *Hosted Events.* Formal speaker series that bring successful entrepreneurs to campus have both educational and motivational benefits. These events augment classroom learning with the personal lessons and experiences of individuals from the business world. At Carnegie Mellon University, the James R. Swartz Entrepreneurial Leadership Series brings business leaders to its campus several times a year to discuss innovation and entrepreneurship. These leaders, many of whom are alumni, share practical wisdom with university staff, faculty, and students and serve as role models.ⁱⁱⁱ

Seminars and workshops also add educational value. Washington University in St. Louis hosts a Technology Transfer Workshop designed

"A wide offering of entrepreneurship courses taught by experienced faculty provides students with the knowledge, skills and confidence to start new businesses."

"Hosted events such as speaker series augment classroom learning with the personal lessons and experiences of individuals from the business world."

to instruct graduate students and post-doctoral fellows on the transfer and commercialization of research.^{iv} The University also hosts seminars for targeted audiences, like a Gender Impact seminar for the Women in Innovation and Entrepreneurship association.

- *Hands-on Learning.* Providing opportunities for experiential learning is also a key part of creating a strong culture of innovation at many top universities. Such experiences can take a myriad of forms, from week-long boot camps to business plan contests. U.C. Berkeley is a prime example. The university offers both a New Manager Boot Camp as well as a Boot Camp for Experienced Managers – both of which involve a few packed days of faculty programs and break-out sessions.^v U.C. Berkeley also hosts multiple startup competitions, from LAUNCH (a months-long push to form a successful business) to its Global Social Venture Competition to its sponsored Intel Global Challenge.^{vi}

“Providing opportunities for experiential learning, such as entrepreneurial boot camps and business plan contests, is a key part of creating a strong culture of innovation at many top universities.”

2. TECHNOLOGY TRANSFER AND LICENSING

Support from the university can be crucial in fostering an environment where entrepreneurship can flourish and the results of research can be successfully commercialized.

- *Intellectual Property Protection.* University Technology Transfer Offices (TTOs), also known as Technology Licensing Offices (TLOs), are responsible for managing and protecting the intellectual property resulting from university research. Staff members in these offices assist researchers with disclosing inventions, filing for patents, and negotiating contracts to license university technology to startups or established businesses. The TTO or TLO may also publish a list of technologies available for licensing on the university web site.

In addition to managing and protecting intellectual property, the TTO or TLO also ensures that researchers and entrepreneurs who commercialize university technology comply with legal requirements, government regulation and university policy. For example, Material Transfer Agreements (MTAs) are required to govern the exchange of tangible research materials between academic, government, and commercial organizations.

“When a university licenses its technology to an established business or a startup, it is important that the terms and conditions of royalty fees and licensing income distribution do not discourage participation from the faculty entrepreneurs, their schools and departments, or the licensees.”

“Many leading universities publish a Startup Guide to provide resources and roadmaps for faculty inventors and student entrepreneurs.”

- *Smart revenue-sharing.* When a university licenses its technology to an established business or a startup, it is important that the terms and conditions of royalty fees and licensing income distribution do not discourage participation from the faculty entrepreneurs, their schools and departments, or the licensees. To facilitate technology licensing, many top research institutions foster a commercialization structure that provides incentives for all parties involved. Stanford University divides the school’s royalties equally among the inventor, the inventor's department, and the inventor's school.^{vii} The University of Michigan has a sliding scale of revenue sharing, depending on the significance of the royalties or equity value.^{viii}
- *Industry Relations.* Some of the universities in our analysis have an office that is dedicated to developing and managing relationships between the university and companies. This office assists in technology commercialization by helping companies find experts at the university, reviewing proposals for industry-sponsored research, and assisting with administration issues such as contract terms, cost management, and export control. When necessary, the office can assist in executing research agreements with foreign sponsors and manage the intellectual property generated through international research efforts. In some instances, the office may even provide assistance in technology and market assessments and then actively market university technologies to industry partners. As an example, the Industry Alliances division at Texas A&M University connects corporate and government partners with the vast resources of the Texas A&M University System (TAMUS).^{ix}
- *Resource Guides.* Many leading universities publish a Startup Guide to provide resources and roadmaps for faculty inventors and student entrepreneurs. These Startup Guides include sections on:
 - Policy: a summary of intellectual property policies and how to avoid conflicts of interest;
 - Process: an overview of the TTOs and the series of steps from getting started to getting funded;
 - Resources: a description of the “ecosystem” with directions to resources on campus, off campus and online; and

- Business Considerations: definitions of financing terminology, questions for opportunity assessment, lists of best practices and key success factors for entrepreneurs.
- *Reporting Metrics*. Universities measure their success in technology commercialization using metrics such as invention disclosures, patents, licensing income and startups. TTOs frequently use these metrics to compare their performance to that of other universities a) in total, b) in their respective university's peer group, and c) in their respective university's state or region. Like many other technology commercialization leaders, the University of Utah publishes a Technology and Venture Commercialization Report annually, highlighting successes and statistics.^x

3. CENTERS, INSTITUTES, AND PROGRAMS

Universities that excel at technology commercialization and entrepreneurship focus their efforts by establishing areas of specialization in Centers, Institutes, and Programs. While these entities reside outside of the TTO in the university organizational structure, the TTO typically maintains close relationships with them.

- *Centers and Institutes*. Centers at the university tend to be localized within a school and have a specific focus. The College of Engineering at the University of Michigan hosts the Center for Entrepreneurship which offers unique classes that feed into a structured degree program.^{xi} In addition, the Center supports collaborative training with different sectors of the university (and even other universities), events with student groups, competitions, and even grants and a startup accelerator. Similarly, M.I.T. hosts the Deshpande Center – which helps translate lab research into commercial enterprises – and the Martin Trust Center for MIT Entrepreneurship – providing the resources to launch students into entrepreneurship.^{xii}

Institutes are like Centers, although they tend to have a slightly broader approach. The Georgia Tech Research Institute is an applied research and development organization, focused on applied sciences.^{xiii} It has 21 locations in the U.S. and Ireland, and it oversees

“Universities measure their success in technology commercialization using metrics such as invention disclosures, patents, licensing income and startups, frequently comparing these results to those from other universities.”

“Universities that excel at technology commercialization and entrepreneurship focus their efforts by establishing areas of specialization in Centers, Institutes, and Programs.”

eight labs organized by technical focus, each with its own subdivisions. These labs often collaborate, so there are connections within the Institute, as well as with outside firms.

In some cases these Centers and Institutes are focused on commercializing technology for specific industries or geographies. Computer scientists and engineers at Traffic21, a multidisciplinary research initiative of Carnegie Mellon University, work on developing solutions that address problems facing the transportation system in the Pittsburgh area.^{xiv} On the West Coast, faculty at Stanford Biodesign train practitioners worldwide on its methodology for inventing and implementing new biomedical technologies.^{xv}

- *Programs.* Programs expand beyond the confines of a single school within the university and are oriented toward providing faculty and students with hands-on experience in technology commercialization and entrepreneurship. Programs are often educationally focused, like Purdue University's Interns for Indiana (which connects students to high-tech startups in the state), and its Deliberate Innovation for Faculty (providing faculty with entrepreneurial mentors).^{xvi} Other Programs are grant-related, such as the Engine Funding Program at the University of Utah.^{xvii} This Program is accessible to the faculty body at large, with the goal to advance early-stage discoveries.
- *Designated Space.* Although connectedness has increased dramatically through online portals, physical space is still crucial in fostering creativity and human relationships. A feature at the University of Toronto is its Creative Destruction Lab.^{xviii} This Lab hosts workshops led by faculty and industry experts, and it also provides entrepreneurs with office space and access to free legal and accounting services. In addition, the University runs its ThingTank Lab, a space open to the community at large and intended to foster exploration, experimentation, and ideation.

“Although connectedness has increased dramatically through online portals, physical space is still crucial in fostering creativity and connections.”

4. FUNDING

A key component of successful technology commercialization is funding, which is usually provided in the form of grants or venture capital.

- *Grants.* Grants are typically provided by federal agencies or universities to advance an early-stage discovery into a proof-of-concept or prototype. Grants are an attractive source of funding for university startups because unlike angel or venture capital investments, grants are non-dilutive and do not require the founder(s) to give up a portion of management control. The California Institute of Technology's Caltech Innovation Initiative (CI²) provides grants to faculty in support of research focused on large technological challenges, with the idea that solutions to these challenges will hopefully provide great benefits (economic, political, and social) to the community at large.^{xix} CI² provides \$250,000 to its selected participants over a two-year period. Caltech also has a Grubstake Program which is designed to provide 'gap' funding to push projects into the prototype stage.^{xx} Awards in this case are typically on the scale of \$50,000.
- *Venture Capital.* Some universities have created their own venture capital funds, allowing them to invest directly in commercializing their technology through university startups. At the University of Michigan, the Zell Lurie Commercialization Fund is a pre-seed investment fund with the goal of commercializing technology from the university and the surrounding community. What is unique about this fund is that MBA students decide which companies to invest in, guided by an advisory board of experienced executives.^{xxi} This fund therefore provides the double benefit of funding selected technologies and of providing students with experience making investment decisions.

"Grants are an attractive source of funding for university startups because unlike angel or venture capital investments, grants are non-dilutive and do not require the founder(s) to give up a portion of management control."

"Some universities have created their own venture capital funds, allowing them to invest directly in commercializing their technology through university startups."

5. NETWORKING

Leading universities recognize the importance of interpersonal networking in commercializing technology, and they facilitate relationships both within the academic community and with the business world at large.

“The knowledge and experience of a university’s alumni base is a powerful resource for commercializing that university’s technology. Alumni serve as mentors, subject matter experts, potential executives or board members for university entrepreneurs.”

“Connections outside the university are crucial for launching new ventures, and success is often driven by nurturing industry relationships by hosting events and by participating on an ongoing basis with economic development organizations and chambers of commerce.”

- *Alumni Connections.* The knowledge and experience of a university’s alumni base is a powerful resource for commercializing that university’s technology. Alumni serve as mentors, subject matter experts, potential executives or board members for university entrepreneurs. Moreover, these alumni most likely have a strong interest in seeing their university’s technology successfully brought to market. The goal of Stanford University’s Angels and Entrepreneurs association is to tie together on-campus entrepreneurs with its powerful alumni network and angel investors.^{xxii} The association is open to all Stanford students, faculty, staff, alumni, and even direct family members. The association also provides educational sessions, professional development, and mentoring.
- *Community Connections.* Connections outside the university are crucial for launching new ventures, and success is often driven by nurturing those relationships. While this can be done at an individual level (i.e. with specific companies), this can also be done at large. MaRS Innovation is located in Toronto, and it links together its sixteen member institutions including universities, hospitals, and research institutes. The goal of this enterprise is to translate research into applications which will provide great commercial and social benefits.^{xxiii} As another example, the University of Texas at Arlington’s Office of Technology Transfer has partnered with the Arlington Chamber of Commerce in promoting research, growth, and company incubations and launches.^{xxiv} Other universities connect with the business community by joining chambers of commerce and local economic development organizations.
- *Event Planning.* Successful relationships require continual communication. Approaches toward fostering these connections include formal and informal events. Rice University hosts an annual Energy and Clean Technology Venture Forum which provides educational sessions, as well as networking with investors, industry leaders, companies, and Rice researchers and entrepreneurs.^{xxv} Brigham Young University runs an Entrepreneurship Week constructed to provide quick introductions (speed-pitches) as well as brief educational sessions and entrepreneurial competitions.^{xxvi}

- *Student Clubs.* Many of the universities we analyzed sponsor clubs that bring together students interested in technology, innovation and entrepreneurship. These clubs offer opportunities to network with other students and are oriented toward providing practical learning opportunities through regular meetings, educational workshops and events.

CONCLUSION

Whether the focus is on invention disclosures, patents, licensing income, or startups, the tactics listed above can be applied by any university to meet its objectives for technology commercialization and to increase the economic and social impact of its research. Together these tactics can form the building blocks of an entrepreneurial ecosystem where technological innovation and startups can flourish.

To build this vibrant ecosystem, however, universities will face challenges such as selecting and prioritizing the right mix of initiatives, allocating resources to them, and coordinating their implementation to achieve specific, tangible results. A superior understanding of how to overcome these challenges, especially through university startups, will define which universities generate the greatest impact through innovation.

Technology Commercialization Checklist

CATEGORY	TACTICS
Education	<ul style="list-style-type: none"> • Classes on entrepreneurship and commercialization • Multidisciplinary degree programs and concentrations • Seminars, workshops, and speaker series • Hands-on learning with real world problem-solving
Technology Transfer and Licensing	<ul style="list-style-type: none"> • Legal services for contracts and intellectual property • License income reward incentives for faculty inventors • Corporate relations and industry-sponsored research • Published resource guide for inventors and startups • Technology commercialization performance reporting
Centers, Institutes, and Programs	<ul style="list-style-type: none"> • Centers for entrepreneurship and innovation • Institutes for commercially-oriented research • Interdisciplinary programs to teach entrepreneurship • Interdisciplinary programs to bring research to market • Designated office and lab space for university startups
Funding	<ul style="list-style-type: none"> • Grants for proof-of-concept or prototype development • University venture capital funds
Networking	<ul style="list-style-type: none"> • Alumni connections for faculty and student startups • Access to economic development organizations • Partnerships with regional chambers of commerce • Industry conferences and forums hosted on campus • Student entrepreneurship and technology clubs

REFERENCES:

- ⁱ Babson College: <http://www.babson.edu/Academics/centers/blank-center/Pages/home.aspx>
- ⁱⁱ Duke University: <http://entrepreneurship.duke.edu/>
- ⁱⁱⁱ Carnegie Mellon University: <http://www.cmu.edu/cie/programs/james-r.-swartz-entrepreneurial-fellows-program/>
- ^{iv} Washington University in St. Louis:
http://research.wustl.edu/Offices_Committees/OTM/education/Pages/TechnologyTransferWorkshop.aspx
- ^v U.C. Berkeley boot camps: <http://executive.berkeley.edu/programs/leadership>
- ^{vi} U.C. Berkeley programs:
<https://innovators.berkeley.edu/entrepreneurs/studententrepreneurs>
- ^{vii} Stanford University royalties:
http://otl.stanford.edu/inventors/inventors_policies.html#royalty
- ^{viii} University of Michigan royalties: <http://temp.techtransfer.umich.edu/resources/policies.php>
- ^{ix} Texas A&M University: <http://otc.tamu.edu/ForIndustry/IndustryAlliances>
- ^x University of Utah: <https://www.tvc.utah.edu/about.php>
- ^{xi} University of Michigan Center for Entrepreneurship: <http://www.cfe.umich.edu/>
- ^{xii} M.I.T. Centers: <http://deshpande.mit.edu/>; <https://entrepreneurship.mit.edu/>
- ^{xiii} Georgia Tech Research Institute: <http://gtri.gatech.edu/>
- ^{xiv} Carnegie Mellon University Traffic21 Initiative: <http://traffic21.heinz.cmu.edu/>
- ^{xv} Stanford Biodesign: <http://biodesign.stanford.edu/bdn/index.jsp>
- ^{xvi} Purdue University: <http://discoverypark.itap.purdue.edu/learningcenter/ifi/>; <http://otc-prf.org/deliberate-innovation-for-faculty-diff>
- ^{xvii} University of Utah Engine Funding Program: <https://www.tvc.utah.edu/tco/engine-funding.php>
- ^{xviii} University of Toronto Labs: <http://www.creativedestructionlab.com/content/how-it-works;>
<http://www.criticalmaking.com/ddimit/>
- ^{xix} Caltech CI²: <http://m.ottcp.staging.caltech.edu/content/ci2>
- ^{xx} Caltech Grubstake Program: <http://m.ottcp.staging.caltech.edu/content/grubstake-program>
- ^{xxi} University of Michigan Wolverine Venture Fund: <http://www.zli.bus.umich.edu/wvf/>
- ^{xxii} Stanford University Angels and Entrepreneurs: <http://stanfordaande.com/>
- ^{xxiii} MaRS Innovation: <http://marsinnovation.com/>
- ^{xxiv} UT-Arlington Commercialization: <http://www.uta.edu/research/vpr/commercialization.php>
- ^{xxv} Rice University: <http://www.alliance.rice.edu/>
- ^{xxvi} BYU Entrepreneurship Week: <https://marriottschool.byu.edu/cet/index/entweek>

About Opus Faveo

Opus Faveo Innovation Development is a venture development firm that identifies opportunities to create scalable, world-class companies, often working in conjunction with large organizations such as national governments, universities and large corporates. Opus Faveo then assembles the pieces and nurtures the entity into formation and maturity. Through its Corporate and Institutional Innovation Initiative (Ci²), Opus Faveo also works with universities and research institutions, corporations and governments to develop and improve innovation commercialization programs and policies and to establish cost-effective frameworks for venture formation.

Institute for Innovation Development & Enterprise Acceleration

Opus Faveo created the Institute for Innovation Development and Enterprise Acceleration (the IDEA Institute) as an initiative designed to be a source of private sector thought leadership on innovation and innovation policy. In addition, the Institute, through its IDEA Fellowship programs, creates opportunities for talented individuals to contribute to, and benefit from, the development of research on innovation policy and ongoing venture development projects.

Important Disclosures:

Opus Faveo Innovation Development LLC or its affiliates and/or subsidiaries (collectively Opus Faveo) may have clients and/or ownership stakes in companies and/or industries that are discussed in this report. Additional information is available upon request. Information contained herein is original and proprietary content developed by Opus Faveo Global Research and/or based on publicly available information unless otherwise noted. Opus Faveo Global Research does not use confidential information provided by clients, prospective clients or portfolio companies in its analyses. Information has been obtained from sources believed to be reliable but Opus Faveo does not warrant its completeness or accuracy. Opinions and estimates constitute our judgment as of the date of this material and are subject to change without notice. All pricing for securities discussed is as of the close of market, unless otherwise stated. Past performance is not indicative of future results. This material is not intended as an offer or solicitation for the purchase or sale of any financial instrument.

**© Copyright 2014 Opus Faveo Innovation Development LLC. All rights reserved
This report or any portion hereof may not be reprinted, sold or redistributed
without the written consent of Opus Faveo Innovation Development.**