

The UT TRANSFORM Project

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Cory R. A. Hallam was born in Montreal, Quebec, in 1973. He received a B.Eng degree in Mechanical and Aerospace Engineering from Carleton University, Ottawa, in 1996, and an M.Eng in Aeronautics and Astronautics in 1997, an M.S. in Technology and Policy in 2001 and a Ph.D. in Technology, Management, and Policy in 2003 from the Massachusetts Institute of Technology. From 1997 to 2001 he was the Lead Systems Engineer for developing MIT's Aero/Astro Learning Labs. From 2003 to 2005 he worked Lean Enterprise Transformation Efforts with Northrop Grumman Integrated Systems, and served as a program manager on the Global Hawk program for Aurora Flight Sciences until 2006, implementing Lean Enterprise strategies to improve UAV program schedules and costing. In 2006 he joined the University of Texas at San Antonio as the founding Director of the Center for Innovation and Technology Entrepreneurship, and currently serves as the university's Chief Commercialization Officer. He is an Associate Professor of Entrepreneurship and Technology Management conducting research and publishing on topics including Lean Enterprise Transformation, Systems Analysis of Renewable Energies, Technology Commercialization, and Entrepreneurship. Under his leadership, UTSA has forged new ground in the realm of technology commercialization, including the first technology licenses, faculty start-ups, student patent filings, student start-ups, on campus incubation of start-ups and partner companies, and a Commercialization Council that bridges the gap between university research and the broader technology commercialization community in San Antonio. Mr. Hallam was a recipient of the MIT Course 16 Sixteen award, the SABJ 40 under 40 award, the Richard S. Howe Undergraduate Teaching Excellence award, and currently holds the Jacobson Distinguished Professorship in Innovation and Entrepreneurship at UTSA.

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Introduction

The University of Texas System includes fifteen campuses, both academic and medical, dispersed across the largest state of the lower forty-eight. Achieving success with technology start-ups is important to the UT System schools because academic institutions need to adjust to new challenges, such as decreased amounts of federal research funding, increased emphasis on technology commercialization, pressure to limit tuition fee increases, and an overall critique that the U.S. is losing its competitive edge in innovation and product development¹. The creation and maintenance of a transformational and progressive entrepreneurial ecosystem within the university environment is essential to foster, support, develop, and commercialize new technologies². Such an ecosystem across the UT System could help to change academic mindsets and cultures and also result in higher competitiveness in global markets, increased external funding via follow-up research dollars, enhanced educational environment for students and faculty, increased marketability of UT graduates, and greater financial returns to the university via technology commercialization.

The UT System campuses individually face these challenges of commercializing the technologies they develop but, with the possible exception of the System's flagship university at Austin, they lack the critical mass that would enable their technology start-up programs to thrive. To address this problem, four UT System campuses proposed a pilot program that would build a virtual entrepreneurial community across their campuses. The UT TRANSFORM project (**T**ranslational **R**esearch **A**dvancement **N**etwork to **S**upport, **F**und, **O**rganize, **R**oll Out, and **M**otivate UT Innovations) is a joint project of four University of Texas (UT) System institutions: UT San Antonio, UT MD Anderson Cancer Center, UT El Paso, and UT Austin. The project, funded by the UT System, seeks to create and maintain a transformational and progressive entrepreneurial ecosystem within the university environment, essential factors for fostering, supporting, developing, and commercializing new technologies. The project's goals in creating this ecosystem are not only to help change academic mindsets and cultures but also to result in higher competitiveness in global markets, increased external funding via follow-up research dollars, enhanced educational environment for students and faculty, increased marketability of UT graduates, and greater financial returns to the university via technology commercialization. And to the extent that the project can create greater visibility for entrepreneurship and commercialization across the UT System, it can lead to attracting new faculty and students who are interested in innovation to UT System campuses.

The project, funded with \$750,000 from the UT System, began in July, 2012 and is expected to conclude in the summer of 2014. The project comprises two major phases: (1) education in innovation, entrepreneurship, and commercialization, and (2) identification and funding of promising and competitive technologies.

The project's education initiatives include:

- A comprehensive assessment of entrepreneurial orientation, perceptions and activity across UT System campuses.

- An Entrepreneurs Academy™, an online program designed to help faculty learn the fundamental concepts of starting a business and commercializing their innovations. The modules provided in the Academy combine a selection of best-in-class videos and reading materials.

The project's commercialization initiatives include:

- A competitive program for early-stage translational proof-of-principle seed funding, intended to accelerate the technology-commercialization pipeline. The project solicited proposals from across the UT System, not just from the campuses of the UT-TRANSFORM project.
- A start on building the UT System's ecosystem for innovation and entrepreneurship, through a Web site that provides paths for commercialization at the project's participating institution, including university and community resources.

Problems of building the entrepreneurial ecosystem

The promise of common creation and maintenance of a transformational and progressive entrepreneurial ecosystem within the environment of UT institutions faces six key obstacles: (1) faculty buy-in and capacity, (2) institutional culture, (3) time commitment, (4) incorporation of offices of technology commercialization (OTCs), (5) technology outlets, and (6) critical mass.

Faculty buy-in and capacity. Successful university commercialization requires certain essential preconditions, starting with an assessment of faculty buy in and campus capacity for commercialization, the lack of which poses a major obstacle to a sustainable entrepreneurial ecosystem. Thus, the proposed project began with a UT System-wide assessment of barriers and motivators to increased commercialization, and entrepreneurial orientation, defined as the individual's propensity to engage in innovative, proactive and risk taking behavior to start new venture,³ which has been shown to strongly predict successful commercialization outcomes for universities, including filing patents and spin-offs.⁴

Culture. Institutional culture, especially where hierarchical, can impede entrepreneurship.⁵ Given the hierarchical nature of universities, our culture represents a significant obstacle to achieving the goals of this project. Moreover, the mismatch between the culture of the university and the culture of business can hinder the transition of a project from the academic realm to the commercial realm.⁶ These cultural obstacles are so strong that the American system of technology commercialization is actually less conducive to entrepreneurship than that of Sweden⁷. The proposed project involves activities specifically designed to address these issues of culture, primarily through workshops, UT System case studies, and other training for both researchers and administrators oriented toward reshaping our academic culture⁸. Indeed, this approach grows out of and leverages universities' principal role as educational institutions; if we can educate our students we ought to be able to educate ourselves.

Time commitment. University faculty, and particularly the most productive faculty, face well-known issues of having to cram too much work into too little time.⁹ As these productive faculty are the very faculty whose research is most likely to lead to commercializable results, the

proposed project faces an obstacle of competing demands on faculty time, particularly given the substantial time commitment required by commercialization. In this project, we address this obstacle by linking faculty with organizational resources that can take on much of the effort that would normally be born by the faculty. This approach builds on the “two-in-a-box” approach to management by linking researcher experts with business experts.^{10, 11}

Interaction with OTCs. The offices of technology commercialization (OTCs) at UT System Institutions play a significant part in the entrepreneurial ecosystem, through their management of the IP disclosure, patenting, and licensing process. The UT Transform Program incorporates the OTCs into the broader university commercialization process via a clear set of responsibilities as described below. This synergism augments the reach of OTCs to a broader pool of technologies and entrepreneurial faculty, and enables the potential for a greater number of start-ups and technology licenses, thus improving OTC performance metrics at all institutions. At UTMDACC, the OTC and OTD (Office of Technology Discovery) are in the process of merging, resulting in more efficient and integrated collaboration. Similarly, at UTSA the OTC now reports to the Office of Commercialization Alliances and Innovation to streamline the process from research discovery to start-up, licensing, and incubation. UTEP and UTA will also work closely with their OTCs along similar lines.

Outlets. The costs of finding markets for innovations are beyond the reach of most university OTCs at the campuses of the UT System.¹² Isolation makes this problem all the worse. Compared with even small institutions in startup-intensive regions such as Silicon Valley and Route 128, many UT institutions are at a significant disadvantage. In startup-intensive regions, proposed innovations are accessible to many outlets for financing and development, in part because of the large number of venture capitalists present in the region.¹³ In Texas’s broad expanse, such opportunities are spread thin, and many of our institutions are located in regions where the venture-capital community is minimal at best. To address this obstacle, the project is working to develop networks with venture capital firms and other outlets at the level of this joint project in place of the individual institutions. Leveraging the nation’s maturing digital infrastructure, the project aims to create a sort of virtual technology corridor—a high-tech Texas located in cyberspace in which venture capitalists and other outlets for commercialization can attract innovative projects.

Critical mass. The converse problem of the lack of outlets for innovation is a lack of critical mass in the number of innovative startups looking for funding. The relatively small size and geographical separation of many UT institutions means that, for their region, these institutions do not produce a large flow of startups sufficient to sustain a healthy population of venture capitalists and other sources of financing. For example, the Rio Grande Angels Investors Group, based in El Paso, closed in 2011, citing insufficient deal flow. To address this obstacle, this project aims to exploit the aggregate strengths of the participating institutions, pooling the presentation of their innovations so that, from the perspective of a potential financier, the number of innovations is large enough to sustain continued interest and the building of the sorts of relationships that helped Silicon Valley to thrive.¹³ This aggregation can be simple: just look in the other direction at the virtual technology corridor discussed above. From the standpoint of entities seeking startups to support, the cyberspace high-tech Texas can present a much larger number of opportunities and thus can sustain the deal flow they need.

Results to date

Entrepreneurship assessment. The project surveyed graduate students and faculty across the fifteen campuses of the UT system to assess their attitudes, perceptions and activity with innovation and commercialization. Among the 2589 survey respondents, 354 (approximately 14%) were from engineering departments and schools. Among the engineering respondents, 49% of faculty and 10% of students indicated having received technology and commercialization training at the university. Faculty in STEM fields were most likely to have received training, followed by respondents from business and the health/medicine fields. Among all survey participants, having received training was significantly correlated with positive endorsement of statement: “I have the expertise needed to commercialize my innovations.” This positive statement of perceived self-efficacy is a key antecedent for entrepreneurial intent in Shapero and Sokol’s entrepreneurial event model.¹⁴

On a scale of 1-5 (5 indicating highest agreement), engineering faculty and students both moderately agreed (mean of 3.49 for both faculty and students) that their departments encouraged them to focus on applied application of their research. However, faculty and students did not strongly agree (means of 2.96 and 2.95, respectively) that their departments provided them sufficient support to be a successful entrepreneur. Faculty and students tended to disagree (means less than 2.88) with the statement: “Technology transfer is valued as strongly as grants, publication or teaching.”

Nearly three-fourths of students and 86% of faculty agreed that engagement and/or collaboration with the private sector is needed to improve the transfer of research to commercially viable opportunities. When asked to indicate suggestions for private sector engagement and/or collaboration, engineering respondents most often suggested that universities should provide access to venues for regular interactions among faculty innovators, venture capitalists, and private sector representatives. In addition, engineering respondents indicated a need for more technology incubators and increased awareness and university funding for scaling up technologies, marketing, and capitalization.

Many engineering respondents (51.2% of faculty and 66% of students) agreed or strongly agreed that partnering with other departments/disciplines is necessary to commercialize inventions. Among the engineering respondents, faculty and students who agreed that interdisciplinary collaboration was important most often suggested business as a collaborator. However, among non-engineering survey respondents, a wide range of disciplines indicated that engineering specifically would be an important collaborator for innovation. Disciplines desiring collaboration with engineering included pharmacy, nursing, social work, architecture, arts and humanities, public affairs, and other health fields.

*Entrepreneurs Academy.*TM The project created and deployed an online certificate program in technology entrepreneurship. The launch of a system-wide entrepreneurs’ certificate is an asynchronous, self-paced program that trains potential entrepreneurs to translate ideas into ventures. This is the next generation of a pilot certificate launched at UTSA in 2011 and expanded with the option of both for-credit and not-for credit versions open to faculty and

students. The certificate program has 17 modules and culminates in a concise business plan and proposal for seed funding to complete a proof of principle technology demonstrator (from Phase II of this program). This program drives more technologies towards risk reduction and readiness for investment by the UT Horizon Fund, the strategic venture fund of the UT System, while building a core experiential-based entrepreneurial competency¹⁵ in the UT System. These business plans will also serve as the basis for any technology transfer office to assess the market potential of the innovation as part of their patenting and licensing process. While a full evaluation of the program's effectiveness awaits the project's conclusion in 2014, feedback from participants suggests that the program provided useful training. The program was required for investigators funded by the project's seed-funding program, and these investigators, who may have originally viewed the certificate program as an annoying administrative hurdle, commented that the program proved, perhaps unexpectedly, valuable for them. To date, the program was completed by 44 seed-funded project investigators and by 55 other individuals who took part in classes at UTSA or were otherwise interested in the topic. Our current work on the program focuses on adding depth to each of the modules by creating a second layer of training for each of the module's topics.

Seed funding. UT-TRANSFORM's held its seed-funding competition in the spring of 2013. The project developed a Web-based proposal management system that enabled submission of proposals, assignment of reviewers and summarization of ratings. This system is now being expanded to enable grant recipients to report on project progress and to generate summary analyses for the seed-funding initiative as a whole. The reviewers for the proposals included the project's principal investigators, plus outside venture capitalists, government agency research directors, personnel at technology development companies, and personnel from start-up incubators. Proposals were rated in terms of overall innovative idea, use of funds, commercial potential in terms of total market size, and clear customer need.

The competition received 44 proposals and funded 33, in amounts up to \$10,000 per project. Projects were funded at UT-Arlington, UT-Austin, UT-Pan American, UT-San Antonio, UT-El Paso, UTHSC-Tyler, UTMB-Galveston, and UT-MD Anderson Cancer Center. The funded technology included areas such as nanotechnology, power processing, online sex education, drugs for fighting infectious diseases, drugs for fighting cancer, and mobile health. Specific projects included, for example, "Roller printed semiconductor nanomembranes for flexible RF electronics" and "Proof-of-principle in vivo efficacy study of dengue antiviral drug candidate." The investigators were required to complete the Entrepreneurs Academy™ before receiving project funds. Early results include one acquisition of a supported project, and a venture-capital term sheet for another project that values the company at \$6.5 million, subsequent to UT-TRANSFORM's \$10,000 support. However, one funded project withdrew because the investigators were unable to negotiate an acceptable intellectual-property agreement with their home institution. The projects are expected to complete their work in the summer of 2014, when their results will be showcased.

Ecosystem for innovation and entrepreneurship. The project created a Web site that provides information for each UT-TRANSFORM campus with respect to resources available for university innovators who seek to commercialize their inventions; the resources include university offices for technology transfer and business incubation, plus complementary resources from the community. This part of the project sought to build a cross-UT System ecosystem for

innovation and entrepreneurship, which proved to be more difficult than anticipated. The principal stumbling block is that processes and offices for technology transfer and business incubation differ markedly across campuses, even across the four campuses of the UT-TRANSFORM partners. While these differences likely reflect local priorities and history, they detract from providing UT System innovators a clear and consistent path for commercial development of their ideas. Thus while the project's Web site provides useful information for university researchers interested in commercial development, the result falls short of providing an innovation ecosystem that is system-wide. This result is linked to real differences in the ways that universities support innovation, and achieving the ecosystem goal depends on administrative forces beyond project's scope. Nevertheless, the project is starting to serve as a catalyst for discussion of these issues at the System level.

The project will be supporting the achievement of a System-wide unified ecosystem for innovation and entrepreneurship in another way, though. As the seed-funding projects reach fruition in 2014, the UT-TRANSFORM project will be sponsoring a System-wide showcase for the projects. This means that the various UT System campuses funded by UT-TRANSFORM will present, in effect, a single venue for venture capital firms and other funders. To this extent, the project is overcoming the fragmentation of the System's individual campuses to create a critical mass that can attract national interest from funders. The showcase will take place in the early summer of 2014.

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