Building Technology Transfer within Research Universities

An Entrepreneurial Approach

Over the past several years, academic entrepreneurship has become one of the most widely studied topics in the entrepreneurship literature. Yet, despite all the research that has been conducted to date, there has not been a systematic attempt to analyze critically the factors that lie behind the creation of successful business spin-offs from university research. In this book, a group of academic thought-leaders in the field of technology transfer examine a number of areas critical to the promotion of start-ups on campus. Through a series of case studies, they examine current policies, structures, program initiatives, and practices of twelve international universities and R&D institutes to develop a normative model of successful academic entrepreneurship, with the aim of helping other universities to enhance the quality of their commercialization programs on campus. This book is a valuable resource for university research administrators, technology commercialization officers, and researchers working on innovation, entrepreneurship, and technology.

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Foreword

For fifty years I have been actively engaged in researching, describing, and developing policies and programs for enhancing academic transfer from research and technology-based universities all over the world.[1,2,3,4,5] I have studied academic transfer in Belgium, England, and Japan, and especially in the United States, with a primary focus on the Massachusetts Institute of Technology. My experience, and that of my esteemed colleagues Tom Allen and MIT Sloan Visiting Assistant Professor Rory O'Shea, clearly shows that what works in one university does not necessarily work in another. The many different kinds of resources both within and near the university have a great influence on what can be invented, innovated, and commercialized by students, staff, faculty, and alumni. But resources are much less important than culture, attitude, habits, role models, and even rules and regulations. In a complex feedback system of many influences, it is difficult to determine the relative strength of each factor, but my impression is that students are far more important to entrepreneurial transfers than faculty, and passion is significantly more critical than intellectual property.

Let me focus on observations from our recent publication, written with Charles Eesley, "Entrepreneurial Impact: The Role of MIT," readily accessible from our MIT Martin Trust Center for Entrepreneurship website, http://entrepreneurship.mit.edu/impact.php. The history of

[1] *Entrepreneurs in High Technology: Lessons from MIT and Beyond* (New York: Oxford University Press, 1991).
[2] "Policies and structures for spinning off new companies from research and development organizations" (with D. Malone), *R&D Management*, Vol. 26, No. 1, January 1996, pp. 17–48.
[3] "Overcoming weak entrepreneurial infrastructures for academic spin-off ventures" (with J. J. Degroof), *Journal of Technology Transfer*, Vol. 29, No. 3/4, Summer 2004, pp. 327–352.
[4] "Technology transfer from Japanese universities to pharmaceutical companies" (with M. Fukuda), *International Journal of Technology Transfer and Commercialisation*, Vol. 3, No. 3, 2004, pp. 243–262.
[5] *Entrepreneurial Impact: The Role of MIT* (with C. Eesley) (Kansas City: Kauffman Foundation, February 2009).

MIT described in our report provides numerous and detailed examples of how one major institution achieved significant entrepreneurial impact over its first 150 years. Early examples of engagement of the academic with the outside world, including entrepreneurial actions by senior and respected faculty and university officials, did much to capture the attention of more junior faculty members, as well as students and alumni. Technology transfer and commercialization flourished as a result of strong leadership and a culture of entrepreneurship.

MIT's history also suggests that rules and regulations need to be carefully administered to avoid creating barriers to faculty participation in industrial consulting and, more vitally, to faculty initiatives to form new companies. At MIT, active engagement between the university and the industrial community was more than just tolerated, it was the essence of an institution devoted to binding mind and hand, "mens et manus." The lesson for advocates of entrepreneurship in other institutions is to create incentives rather than barriers, with guidelines that reduce the risk of conflict that might challenge the path to commercialization.

In contrast to many other universities in the United States and abroad, MIT adopted a "hands-off" approach toward entrepreneurial engagement. With no internal incubator or venture capital fund, MIT has sidestepped internal conflicts that have plagued other academic institutions that have tried to hurry the entrepreneurship process. MIT has had the advantage of a surrounding community that performs these functions as well as providing other support for new enterprises. Most institutions have to provide active help and at least some funding to get entrepreneurial ventures off the ground, dragging the university into issues around licensing rights. MIT demonstrates that it is far better if the university can create an open door policy that provides outside financiers and business partners with a level playing field of access to faculty and intellectual property licensing opportunities. The increased interaction between the outside and inside worlds will nourish competition among the various forms of human and financial sponsorship that want to attach themselves to university programs.

Rather than launching top-down programs, MIT has created independent faculty, student, and alumni initiatives, building vibrant ecosystems that help foster the formation and growth of new and young companies. This strategy has significantly increased the number of interested and involved participants, but it is a process that evolved slowly over time. Institutions looking for a quick-fix approach to becoming more entrepreneurial must be aware that the MIT approach takes patience and self-restraint.

Educational programs inside the university can be vital contributors to educating engineers, scientists, and managers in many aspects of new

company formation and growth. The best scenario is when these classes cross internal university walls to bring together the technically educated with the managerially educated students (and faculty too, if possible) in joint project courses targeted toward real problem-solving, real product development, and real new business planning. Such programs require investment and a faculty to design, develop, and teach them. The problem is that effective and well-trained academics are still scarce in most entrepreneurship-related disciplines. Fortunately, successful practitioners are available everywhere and, as MIT history indicates, they are quite willing and enthusiastic about sharing their time and experiences with novice and would-be entrepreneurs.

The long list of MIT student clubs linked to entrepreneurship and described in our report shows many ways to encourage students to become more entrepreneurial. The MIT $100K annual business plan competition is the most vibrant and perhaps most effective of these clubs. Many new companies have formed as a result of the high-profile competition. Students at other universities can learn how to get involved in starting something similar by attending the MIT $100K Global Business Plan Workshop, which MIT students conduct annually in different cities around the world. Furthermore, the MIT one-week intensive Entrepreneurial Development Program, conducted in January by MIT's Entrepreneurship Center, may well be a helpful supplement for those institutions attempting to create an overall program of education and student activities that will encourage entrepreneurship.

Alumni activities and educational and student endeavors provide a strong basis for building an entrepreneurial ecosystem, but formal institutional activities are also critical. At MIT, changing the Technology Licensing Office into a proactive and supportive-of-entrepreneurship program office has made a significant contribution to technology transfer from the research labs. This change occurred twenty years ago and has had the time to mature in its effectiveness. More recently, MIT's creation of the Venture Mentoring Service, its own modest form of incubation with coaching by interested local alumni and other "neighbors," has generated a model of help that is clearly possible in other university communities. And targeted funding of faculty research with commercial potential, exemplified by the MIT Deshpande Center, can certainly be emulated elsewhere. In this unique organization, MIT has recruited outside entrepreneurs, venture capitalists, and intellectual property lawyers to join with internal senior faculty in judging the quality of research proposals, especially from a transfer potential perspective.

The Allen–O'Shea volume has assembled a wealth of experiences worldwide in this robust area of academic transfer. In reading and learning from these chapters, one will recognize that the university is far more

than its present students and faculty and their intellectual resources. All research and technology-based universities have as their principal asset the well-educated population of alumni, many of whom are ready to apply and commercialize their accumulated learning from the university and their later work experiences to new market opportunities.

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Foreword

This book addresses the managerial and policy implications of an important trend: the rise in the rate of technology commercialization at universities. While many scholars have analyzed university patenting and licensing, some researchers have assessed the entrepreneurial dimension of university technology transfer (e.g., startup formation). According to the Association of University Technology Managers (AUTM), the number of startup firms at U.S. universities rose from 35 in 1980 to 705 in 2012. This increase in entrepreneurial activity at research universities has attracted considerable attention in the academic literature.[1,2]

This volume constitutes a major advance in the analysis of academic entrepreneurship. It contains numerous illuminating case studies of private and public research universities, based on economic, sociological, and organizational perspectives, yielding important new global evidence on how research universities have stimulated academic entrepreneurship. Based on this evidence, the editors draw important conclusions on how to enhance this activity. As an economist, I tend to focus on the importance of incentives, in terms of inducing academics to be entrepreneurial. However, the book reveals that cultural and organizational factors are also critical.

The volume will also be extremely useful to university research administrators, technology transfer office directors, and others involved in the commercialization of intellectual property, as many research institutions search for ways to maximize the output and effectiveness of technology transfer. Given that academic entrepreneurship is a relatively

[1] Some scholars use the university as the unit of analysis, while others focus on individual entrepreneurs (see Phan, Phillip and Siegel, Donald S. "The Effectiveness of University Technology Transfer: Lessons Learned, Managerial and Policy Implications, and the Road Forward," *Foundations and Trends in Entrepreneurship*, Vol. 2, No. 2, 2006, pp. 77–144).

[2] Siegel, Donald S., Veugelers, Reinhilde, and Wright, Mike. "Technology Transfer Offices and Commercialization of University Intellectual Property: Performance and Policy Implications," *Oxford Review of Economic Policy*, Vol. 23, No. 4, 2007, pp. 640–660.

new phenomenon for many research universities, there is considerable uncertainty among administrators regarding optimal organizational practices relating to academic entrepreneurship (e.g., incentives, legal issues, strategic objectives, and measurement and monitoring mechanisms). Finally, from a broader perspective, the book also provides important new evidence on the relationship between academic entrepreneurship and technology-based economic development. This is critical from a public policy perspective, since regions are increasingly viewing their local research universities as potential engines for economic growth.

DONALD SIEGEL
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During our time writing this book, we were fortunate in having many good friends and colleagues whose help and support was central to its completion. The first mention goes to the authors who contributed to this edited volume. Each worked tirelessly to develop a chapter that is meaningful, relevant, and of high quality. We are grateful to them for their willingness to participate in this endeavor. We would also like to thank all of the people who gave of their time and talents to providing peer reviews of papers for this volume. We are indebted to them for their willingness to provide thoughtful and timely feedback.

We would also like to pay special tribute to our editors, Chris Harrison, Phil Good, and Claire Poole, for showing unparalleled faith in our ability to deliver and for providing us with wise counsel throughout the publication process. We also appreciate the wise counsel provided by Tim Bresnahan at the commencement of this project regarding coordinating a volume of this nature and magnitude.

We would like to pay special thanks to Ed Roberts, founder and chair of the Martin Trust Center for MIT Entrepreneurship, for being such a kind and supportive colleague to us over the years. His insights into the major theoretical and empirical threads surrounding the field of university-based entrepreneurship were truly valuable in the compilation of this volume. To Lita Nelsen, Director of MIT's Technology Licensing Office, who was always available to provide us with in-depth insight about the practice of technology transfer from an MIT perspective. Special thanks also to renowned technology academic entrepreneurs Charles Cooney, Nobel Laureate Philip Sharp, Robert Langer, and Anthony Sinskey for providing us with some very valuable insights about the context and nature of academic entrepreneurship at MIT.

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On a personal note, we would like to thank our families for their unwavering support and belief in us over the years, making this book all the more worthwhile and meaningful. We would not be where we are today without their love and support, so an everlasting note of appreciation.

We dedicate this book to William Barton Rogers[1] and Richard Cantillon,[2] whose scholarly insights have provided us with much inspiration.

THOMAS J. ALLEN AND RORY P. O'SHEA

[1] William Barton Rogers believed that MIT's work should advance and develop science and then apply that knowledge to world problems. His vision for MIT was to engage with the community for the advancement and development of science and its application to industry, the arts, agriculture, and commerce.

[2] In his *Essai sur la nature du commerce en general* (1732), Richard Cantillon was credited with giving the concept of entrepreneurship a central role in economics. Cantillon held that much of the economic exchange of the State is conducted by the medium of entrepreneurs.