



# **The Open Innovation Imperative: Perspectives on Success From Faculty Entrepreneurs**

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## **Abstract**

University spinoffs are an important vehicle for the dissemination of new knowledge – and have the potential to generate jobs and economic growth. Despite their importance, little research exists on the phenomenon of academic entrepreneurship. This paper builds on the emergent Knowledge Spillover Theory of Entrepreneurship (KSTE) to explore how academic entrepreneurs define success and the factors responsible for that success. The findings indicate that commercialization is a distinguishing characteristic of initial spinoff success and that a multitude of factors such as financial resources and the technology licensing process are responsible for that success. Using logit regression, the findings also yield several significant predictors of commercialization including venture capital, multiple and external licenses, and outside management, among others. The results strongly support an open innovation approach for spinoff success and have important implications for university, state, and federal policymakers.

# **The Open Innovation Imperative: Perspectives on Success From Faculty Entrepreneurs: Dissertation Summary**

## **Introduction**

Academic entrepreneurship – the act of establishing a company by a university faculty member based on their research – is an emerging phenomenon in American society. These newly-formed companies are called *spinoffs*. Though we know relatively little about academic entrepreneurship, high-profile university spinoffs, such as Lycos from Carnegie Mellon University and Silicon Graphics and Genentech from Stanford University, have attracted the interest of policymakers who increasingly see universities as an important “driver” of economic growth. This paper summarizes dissertation research supported by the Ewing Marion Kauffman Foundation that examines spinoff success from the perspective of academic entrepreneurs.

The Universities and Small Business Patent Procedures Act of 1980 – otherwise known as the Bayh-Dole Act – laid the policy foundation for academic entrepreneurship. Bayh-Dole was passed to encourage universities and other non-profits to disseminate the results of their research. The Act did this by granting universities ownership to intellectual property (IP) resulting from federally funded research within their institutions and by harmonizing patent policies among federal mission agencies.

Prior to Bayh-Dole, few spinoffs had been established. However, since 1980, the number of university spinoffs established has grown each year. According to the Association of University Technology Managers (AUTM), more than 400 spinoffs were established in 2005, up from 200 in 1996.

Though our understanding is limited by the fact that few studies have been conducted on the topic, spinoffs are important phenomenon. Spinoffs offer university faculty an alternative pathway for disseminating and commercializing their research. Most university research is academic, not

commercial, and requires additional development; spinoffs provide a mechanism to do that. According to some studies, spinoffs have a high likelihood of survival compared to other types of firms. Other studies have found that spinoffs are adept at attracting early-stage finance such as angel or venture capital or an initial public offering (IPO). And all of these elements are important to innovation and regional economic growth.

Very few studies have examined university spinoffs. There is no database of university spinoffs from which contact lists can be drawn making it difficult for researchers to conduct analyses. AUTM collects the number of spinoffs established from universities each year but this tells us little about the success of these companies and their impact. The entrepreneurship research that does exist varies greatly and cuts across many academic disciplines. Other studies of academic entrepreneurship have focused only on highly regarded universities such as MIT or Berkeley, or spinoffs in Europe.

## **The Research**

### ***Methodology and Sample***

Given the importance of academic entrepreneurship, this dissertation attempts to improve understanding of this phenomenon by exploring the perspectives of faculty entrepreneurs in public universities across the United States. This inquiry is guided by three simple research questions:

- How do academic entrepreneurs define success?
- What are the main factors that contribute to- or detract from the success of the university spinoff?
- How do university, state, and federal state policies impact the success of university spinoffs?

Due to the lack of contact information, it was necessary to construct a contact database of academic entrepreneurs. After accumulating a contact list through the personal and professional contacts of the author, 231 academic entrepreneurs were asked to participate in this study. These academic entrepreneurs came from 32 different universities among 18 different states from all the regions of the United States.

Information was collected from these academic entrepreneurs during two research phases. The first phase was comprised of 31 interviews with academic entrepreneurs (out of 36 invited to participate) from a variety of universities, regions, and technical backgrounds. These individuals were asked the three open-ended research questions mentioned above. After the Phase I interviews were complete, common themes were identified and then used to construct a survey for the second phase. The purpose of the second research phase was to test the strength of those first-phase findings among a larger group of academic entrepreneurs. To this end, 193 additional academic entrepreneurs were invited to participate in Phase II, 117 of which responded.

### ***First Research Phase Results***

During the first phase, academic entrepreneurs defined spinoff success in a variety of ways. First, these faculty members saw the dissemination of their research results into society vis-a-vis their spinoff as the most important measure of success. Second, academic entrepreneurs established their spinoffs in order to develop their technology further with either short-term commercialization (sales) goals in mind or as a vehicle to pursue external sources of funding for development, the most popular being the Small Business Innovation Research (SBIR) program. The third view of success related to financial success; academic entrepreneurs want to make money but this is typically not their *primary* reason for establishing a spinoff. Finally, respondents defined success for a number of different professional reasons, including giving relevance to their research, improving teaching outcomes, and the need for a career change.

A number of factors responsible for commercialization success were also identified during the first phase. These include factors specific to the academic entrepreneur such as relationships with industry and previous experience establishing a company. University factors such as IP Policy, the technology transfer office, entrepreneurship services, and administrative support were also deemed important. Business factors, including financial resources, outside management, joint ventures with

other companies, and sourcing IP from other sources, were also deemed important. Finally, public policies and programs such as SBIR, state funds, incubators, and science parks were all identified as important during the first research phase.

### ***Second Research Phase Results***

The first phase results were compared to existing studies and then used to create a function/equation to test the strength of the first phase findings. Among the definitions of success, commercialization was chosen as the dependent variable. In other words, the purpose of this research is to try and find out what factors will tell us why a spinoff has sales or not. Commercialization (sales) is an indicator of economic activity and relatively simple to measure: did a spinoff earn revenue (or not) through sales of a product or service. Acquisitions of the spinoff by other companies are also counted for commercialization purposes. Most of the success factors above are used as factors (independent variables) to predict spinoff commercialization.

Statistical analyses (Logit Regression) yielded strong and interesting results. Among academic entrepreneurs in the sample, faculty consulting, having an outside CEO, participating in a joint venture, sourcing IP from other sources, the receipt of venture capital all positively impact the likelihood that a spinoff will commercialize its technology. Other factors including receipt of industrial R&D funding to conduct university research, reliance on university entrepreneurship services, and being in the bioscience industry *decrease* the likelihood of commercialization. The strongest predictors are being in the bioscience industry (negative), having an outside CEO, seeking other external sources of IP, and receipt of venture capital, in that order. The section below reviews these findings in greater detail.

### **Key Findings from the Research**

***Motivations of the Academic Entrepreneur:*** Policymakers would do well to understand that academic entrepreneurs are relatively unique. Academic entrepreneurs are faculty members, they

teach and conduct research in public non-profit institutions. They define success differently than a ‘rational, profit-maximizing’ entrepreneur, emphasizing knowledge dissemination, technology development, and career-enhancement. The key point for policymakers is that many of these individuals (at least among those within this sample) have little interest in commercializing their technology in the near-term. Instead many see their company as a platform for consulting and access to government grants, especially SBIR awards.

***Faculty Engagement with Industry:*** This research shows that academic entrepreneurs with industry experience in the form of formal and informal consulting relationships have a higher probability of commercialization than those who do not. Academic entrepreneurs in the sample suggested that industry relationships helped them understand commercial opportunities prior to spin off. Respondents also spoke of how these relationships helped them ask the right questions once the spinoff had been established: “what is my product, what is the market, and what do I need to do to commercialize my technology – and when?” Furthermore, these relationships collectively provide a “reference network” for academic entrepreneurs to pursue technical assistance, advice, and funding. For example, several academic entrepreneurs in the sample received early-stage funding from companies with whom they have worked and consulted.

***Spinoff Leadership: Presence of a Professional Manager:*** For university spinoffs in the sample, the hiring of an outside CEO within one year of establishment is one of the most significant and powerful predictors of commercialization in the sample. Faculty entrepreneurs come from an academic environment whose culture and norms may conflict with those of a commercial for-profit enterprise. A professional business manager, carefully selected, brings a different and valuable set of skills, perspectives, and outside business contacts to the spinoff. These individuals are hired to lead

and grow the company; find outside investors; develop, produce, and market a product; and earn profits for the owners and investors.

***Venture Capital:*** VC funding is a well-accepted factor for spinoff success; this seems to be no different in the sample. Venture capital provides much needed funds for the hiring of staff, the purchase of equipment, and other capital needs. Venture capitalists also provide what one academic entrepreneur in the sample described as “a guiding role in the development of my company.” Along with their important “mentoring” role, respondents also spoke of the capability of venture capitalists to connect spinoffs with expertise, services, and technologies relevant to the commercialization efforts of the spinoff.

***Open Innovation: External Technology Sourcing and Joint Ventures:*** Another important finding from the research is the critical importance of sourcing innovations (IP) from other companies, the home university, and other research institutions. By doing this, spinoffs take a proactive, commercialization-centric approach; they are continuously pushing the boundaries of their own technologies by tapping into the innovations of others. Just as licensing outside technologies helps spinoffs understand the importance of codified (written-down) knowledge sourced from external sources to commercial success, joint ventures – another significant predictor of success in the sample – provide an indication of the importance of tacit relationships with individuals in other organizations.

***Industry Classification:*** By definition, the industry classification of a university spinoff is closely tied to the scientific discipline of the founder. Previous studies have utilized samples where life science spinoffs are most common among all industry classifications; this sample is no different. Despite the large number of bioscience spinoffs, studies have highlighted the stark commercialization



challenges faced by the industry, including enormous capital requirements, increasing complex health and drug issues, long lead times for clinical trials and FDA approval, and limited post-approval patent lives. This is also true for this research.

Non-life science spinoffs in the sample are a very diverse group but yield some valuable perspectives. In particular, spinoffs in industries with relatively simple products and therefore low capital startup requirements, such as online training curricula or speech therapy software, seem to enjoy an easier path to commercialization and may hold promise for universities.

## **Policy Implications**

### ***Implications for University Policymakers***

Universities often treat academic entrepreneurship as an outcome of a technology transfer office (TTO). Though not significant, responses from academic entrepreneurs in this sample indicate that most academic entrepreneurs do not see their *TTO* as a barrier to spinoff establishment or commercialization. However, from a broader perspective including the emergence of an Open Innovation model, these factors may indicate inadequacy with the broader role that universities play (or don't play) in academic entrepreneurship.

These findings above suggest that centralized, university-wide efforts to assist academic entrepreneurs may not be effective given the changing nature of innovation: open, complex, interdisciplinary, and global. For policymakers, this does not necessarily mean that universities should not play a role in promoting entrepreneurship. Indeed, university policy and culture are no doubt critical to the spinoff phenomena. But it does signify that – at least within this sample – *how* spinoffs are encouraged and enabled impacts their chances for commercialization success. The following recommendations, detailed in the dissertation, will help policymakers better understand the relationship between spinoffs and university policy.

- Encourage Outside Engagement Among Faculty Members
- Build and Sustain Connections Among Entrepreneurial Faculty and Support Networks
- Provide Early Guidance for Entrepreneurial Faculty, Outside Leadership for Spinoffs
- Consider a “Low Investment-High Volume” Technology Transfer/Spinoff Strategy

### ***Implications for State Policymakers***

States have an important but often overlooked role regarding their public university system.

While independent governing boards manage most public universities and systems, state policy nonetheless can have an enormous influence in the degree to which universities participate in areas of state interest such as workforce and economic development. States do this through a variety of mechanisms and relationships including funding, policy and regulatory frameworks, and directional leadership (or lack thereof).

With regard to economic development, university spinoffs have the potential to contribute to regions within the state. If commercially successful, spinoffs can generate jobs, provide an important example for entrepreneurs – aspiring and current – in a state and region, and help illustrate the relevance and outreach efforts of a state’s public universities. It is therefore important that state policymakers recognize the unique nature and needs of university spinoffs. The following recommendations, detailed in the dissertation, will help policymakers better understand the relationship between spinoffs and state policy.

- Build and Strengthen Relationships Between State Policymakers and University Leaders
- Incorporate Spinoff Success into a Boarder State R&D and Entrepreneurship Strategy
- Connect Spinoffs with Industry, Funding, and Entrepreneurship Support Networks

### ***Implications for Federal Policymakers***

The Small Business Innovation Research Program (SBIR) is a federal program designed to “encourage small business to develop new processes and products and to provide quality research in support of the many missions of the U.S. government.” The SBIR program was very popular among

the sample; 52 (44 percent) second phase respondents have received at least one SBIR award with most companies receiving more than one award. Other respondents have applied to the program or plan to do so.

One of the first challenges among respondents in the current inquiry who have received SBIR awards may be intent. Many academic entrepreneurs established their companies in order to apply for SBIR awards with no immediate timeline for commercialization. These anecdotes support the Phase II empirical findings whereby spinoffs in the sample were no more likely to commercialize their technology than those who did not receive SBIR awards. The following recommendations, detailed in the dissertation, will help policymakers better understand the relationship between SBIR and spinoffs – and how the program may be improved to encourage spinoff success.

- Investigate the Linkages Between the SBIR Program and Universities
- Continue to Expand the SBIR Programmatic Emphasis on Commercialization
- Bolster SBIR Outreach to States and Universities