
Spin-Off Companies from University Technologies

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Introduction

As noted by many sources and as detailed more thoroughly in this chapter, "Entrepreneurs are the engine of growth and innovation in the competitive market economy."¹ There are various definitions of spin-offs, spinouts, or start-ups companies, as noted by the Association of University Technology Managers (AUTM) and other technology transfer organizations. AUTM defines start-ups as those companies initiated solely on the basis of university technology. The AUTM's 2001 survey summary reports that 17% of US university technology agreements were with start-up companies, 51% with small companies, and 32% occurred with larger companies.² As discussed later in this chapter, start-ups are an increasingly important licensing vehicle for universities, as well as an important source of growth for the US economy.

This chapter reviews the most recent data on start-ups from academic institutions and explores what start-ups need for success. There is also discussion about what universities gain from start-up collaboration and about the conditions when a university or research foundation accepts equity. Also included in the chapter are models illustrating the successful practices being used today to foster entrepreneurship. This chapter, however, only introduces and briefly explains these concepts to provide general understanding of critical topics of technology transfer. The chapter in no way provides enough information for action, unless the action is to start on an MBA degree or to work for a start-up!

The types of skills and experience needed for competency in technology transfer have grown enormously in the past few years. The opportunity to use a wide variety of skills makes technology transfer positions much more interesting and challenging. Some academics are increasingly focused on industrial funding and the opportunity to be an agent for new product development may attract increasing numbers of experienced people who have industrial backgrounds. Salaries appear to be increasing (anecdotal evidence), and these changes should reduce turnover in technology transfer offices or technology commercialization offices as they are increasingly called. Of course, both of these factors lead to more stability in offices, which in a positive feedback loop, result in better service to the faculty, the disclosure of more inventions from truly creative faculty, and the in-house skills to manage more complex licensing processes.

A Look at Start-Up Activity at Academic Institutions

According to AUTM, between 1980 and 2002 there were a total of 4,320 start-ups that resulted from licenses issued by academic institutions; and 2,741 or 63.4 percent of these start-ups were still in operation by the end of 2002. AUTM's survey included US and Canadian universities, hospitals, and non-profit research institutes.³ Figure 71-1, a graphical compilation of data from the 1994 to 2002 fiscal

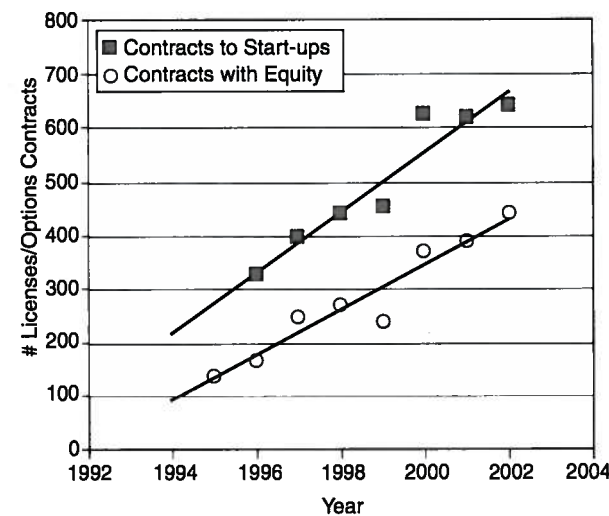


FIGURE 71-1 Contracts to Start-Up Companies and Those in Which the Institution Took Equity.

year AUTM licensing surveys, shows that there has been an increase in the number of licenses to start-up businesses and in the number of licenses in which equity was taken in the start-up by the licensing institution.^{4,5,6} However, upon closer examination, the FY 2002 data show a decrease in company formation over the previous two years of almost 9%; this decrease is probably a reflection of the period of overall economic downturn and decrease in investment capital.

Analysis of the AUTM data shows that the average number of start-ups per reporting institution was slightly more than 1.5 in FY 1994 and slightly fewer than 2.5 per institution in FY 2000. However, this average is misleading in two regards: first, it masks the very high variance among universities. For example, while MIT and the University of California system granted licenses to 23 start-ups in FY 2002, 46 universities reported none at all.⁷ Second, the average masks the increase in the overall number of universities which have licensed to start-ups and taken equity. For example, in FY 1996, 66 of 129 US university respondents reported start-up licensing deals, while 101 of 147 did so in FY 2002.^{8,9} That more than two-thirds of universities reporting in 2002 were involved in start-ups shows the importance of this topic.

What Start-Ups Need for Success

To be successful, companies need some basic ingredients: a good idea, great people, and capital. Start-ups, with early-stage technologies, also require a

degree of nurturing, which must start early on. It is not enough to work with a technology transfer office (TTO) which knows how to market to companies and/or how to efficiently complete licenses (although these are important skills); it is also necessary for the TTO to search out those highly entrepreneurial scientists who not only have creative, useful ideas and can also find funding for the applied work not covered by the federal research institutes and foundations, but still support those scientists who regard patenting and applications as a distraction from their true interest, science.

Many universities now have funds of \$30,000 to \$50,000 per project (or more) targeted to develop prototypes or performance data to demonstrate functionality of concepts. Some technology transfer offices have partnerships with their business schools to provide market assessments; others even prepare business plans. This type of support for university start-ups is much needed for situations where there is an inexperienced entrepreneur. To help facilitate start-up efforts, enterprising universities sometimes allow the university-related start-up to rent lab benches within the university. Others provide support services both before and after the license is complete. One of the most critical support components includes finding the person to lead the enterprise, or the "investable entrepreneur."¹⁰

In the early years of university-start-up licensing, inventors themselves most often held the dual responsibilities of university-affiliated scientist and start-up CEO. As noted in *Utah Business*, "The entrepreneur is probably the single most important factor in a strong economy—individuals willing to step forward and take the risk to start new businesses."¹¹

What Universities Gain from Start-Ups

Most universities (especially state universities) receive a benefit, though usually intangible, from licensing to a start-up company, since more than 80% of start-ups are in the same state as the institution from which they licensed the technology.¹² With the increased pressure on local and state governments for increased tax revenues, most governments strongly emphasize programs that will create new jobs. Whether there is a formal report to the state legislature or merely requests from the university public relations office for company start-up numbers and job creation numbers, successful local start-ups can be an important measure of success

for a TTO. Some universities recognize that entrepreneurial faculty will highly value faculty positions at those universities whose policies are faculty-startup and equity friendly. These same universities may recognize the benefits that a TTO may provide in terms of faculty attraction and retention.

Universities benefit in a number of ways if they take equity. If no existing companies are willing to take on a traditional license, an equity-based license may be the only way for the TTO to complete its mission of facilitating the development of products and services for the public good.

Should a start-up be successful, there are at least two ways the university may receive income in excess of revenue from a typical license issue fee: for example, the TTO takes equity and the company eventually goes public and the stock price rises, buoyed by a successful Phase III clinical trial. The TTO may also greatly benefit when the start-up is acquired by a public company, and, in turn, the TTO (the university) receives stock from the larger company for their equity. However, it should be understood that there have been only a few cases where universities have profited in such manner.

Equity

Institutional Considerations

It is important for the TTO to carefully consider whether to accept equity in lieu of a cash up-front fee in a licensing agreement. As a general policy, if the university wants to encourage this special group of companies, start-ups, the university has to have or develop a policy that allows the TTO to take equity, whether directly or through a research foundation. To do so, some state universities may even need to modify the state law or the state constitution.

Although people may think that taking equity means giving up cash, in most cases where equity is the consideration, the company would not be able to start if a cash payment were required. This leads to the recognition that taking equity is an exchange of one high-risk good, the equity, for another high-risk good, an early-stage technology. Whether this has been clearly articulated in policies or not, the fact that most universities will accept equity in lieu of cash as the license issue fee, but not as payment for patent costs (an example of a situation where the university has already paid out cash), suggests an inherent understanding of this key point.

The normal risks involved in licensing any technology exist, of course, compounded by the special challenges in working with start-ups, plus the lost opportunity costs for the increased amount of time spent by people in the TTO in these situations. But there are also special risks involved in equity situations. Some of these are at the institutional level and include potential impact on taxable income and tax-exempt status, as well as institutional conflicts of interest/commitment. Other situations have an impact on both the TTO and the institution: income loss though equity dilution; and individual conflicts of interest/commitment not only for faculty, as earlier discussed, but also for TTO personnel in terms of stock they may own as individuals, their influence on the sale of stock by their institution, and other related issues.¹³ Many of these risks can be reduced if the institution permits only a passive investment role with neither board nor voting memberships in these start-ups, and if the TTO insulates licensing people from certain negotiations. The risk of equity dilution from future investment rounds can be reduced to a degree by a standard term sheet, which requires protection from dilution to some specific investment level, for example, \$2 million dollars.

This raises the question of how an institution deals with equity. Some empower the TTO to put their equity with an outside firm that holds it until the equity has become publicly negotiable and any restriction period has passed, and then sells the stock at intervals. Other institutions or their research foundations commingle the equity with the university's investments and the decision is made in the same manner as for the general funds by the university's investment committee. In either case, the stock may not be sold at its highest point, hence the full potential value may not be realized by the institution. There are many approaches to managing equity, but the key commonality is that the university is shielded from institutional conflicts and the TTO personnel and any university inventors are shielded from individual real or apparent conflict of interest (COI) issues resulting from insider information. Of course the TTO loses any control over whether or when proceeds from cashed-in equity are added to the TTO's bottom line, but that is less important than the COI issues.

TTO Considerations

While the decision of whether or not to accept equity may be a major issue for the university regents or the state legislators, the TTO may have its own issue with accepting equity. In the long run,

all TTOs want and need their licensees to successfully develop their technology into products and/or services and manufacture and market them as quickly as possible. But the situation is considerably different with start-ups. Interestingly, but not surprisingly, while slightly fewer than half (or 46.5 percent) of all FY 02 licenses were exclusive; 91 percent of the licenses to start-ups were exclusive. This is understandable, as companies whose entire technology portfolio is based on licensed technology usually need to be protected from competition, at least from the same technology. The TTO also must consider that the additional effort involved in an exclusive license to a start-up cannot be amortized over a series of nonexclusive licenses. It is important to recognize this as licenses to start-ups, particularly those involving equity, truly take additional effort.

However, less effort on the part of the TTO would be needed, and certainly the likelihood of success would be enhanced when licensing to a start-up, if there were an experienced businessperson, other than the inventor, involved. Besides the benefits of experience, access to investment capital may increase and potential COI issues are reduced. It is uncomfortable for TTO professionals to negotiate with their own university professors; moreover, such situations can place professors at risk for potential COI. Should the technology have been developed with federal funds, it is also necessary for any potential COI to be disclosed by the professor to the COI committee, whereby the conflict, if it cannot be eliminated, must be reduced or managed, through a written management plan.

When a TTO licenses to an existing company, a formal written development and/or business plan, depending on the stage of development of the technology, is typically requested and delivered. However, this is more difficult to accomplish when licensing to a start-up and, in such cases, a TTO alliance with the university business school can be very helpful in the development of business plans and market assessments. In addition, an understanding of the potential applications, time to market, size of potential markets and competitive technologies can provide valuable information to both the start-up and the TTO, particularly for the development of a term sheet agreeable to both parties.

So now you have an early-stage technology, an experienced businessperson, and a "fit" between their plans and your TTO's comfort level. Do you take equity? If so, how and how much? First, you must check that your university or foundation allows equity-based licenses, and you must know

whether your office has a policy or practice requiring at least some up-front cash.

The situation is actually a little more complex since some universities are free to take an equity interest for any portion of the financial components of a license, while others are prohibited from taking equity where the organization has already paid cash. Many institutions are not permitted to invest financially in a company. It is very important to understand the boundaries of your institution; for example, whether the university can accept warrants (options to purchase stock at a later date for a predetermined price); whether you can accept equity as reimbursement for your institution's investment in the patent application; and whether the university can, at a later date, accept additional equity in lieu of cash for a milestone payment. It is important to understand what your institution's charter, laws, and policies permit, but even if permitted a sound understanding of the risks incurred in taking equity needs to underpin the decision of whether or not it is good practice. The circumstances under which an exchange of cash for equity may occur need to be carefully thought through.

Perhaps the biggest surprise for TTOs in recent economic times has been the dilution of their equity in "cram-downs." This developed in the first few years of this millennium as venture capital dried up and companies were unable to proceed with expensive developments (e.g., clinical trials). Investors were then able to exact new requirements on early equity participants; for example, new investors might require early investors to pay-in thousands of dollars per share or risk dilution. An interesting discussion of issues and conflicts of interest may be found in Jaffe's article.¹⁴ Sometimes, these investments result in highly successful companies; other times they do not. But most TTOs do not have the expertise to evaluate whether such investment is warranted, and many, if not most, are not permitted to invest cash. Hence, their shares may be severely diluted. A well articulated set of conditions to reduce these potential negative situations may be found in the "Structuring Equity Transactions" section on the University of British Columbia's Web site.¹⁵

A final consideration is unconscious bias for those TTOs that are not self-supporting. If a TTO does not bring in sufficient royalty and issue fees to pay its costs, and has to be subsidized by the university, then there may be a subtle or unconscious pressure not to spend time on equity-based licenses. All of the factors need to be weighed and dealt with when deciding whether and how to license technologies to start-ups, particularly when equity is a factor.

Comparative Approaches

This section contrasts the most passive start-up strategy (where the university receives equity as a consideration for the license) with a middle role (where the university acquires a larger percent of the equity in consideration of their efforts). This section also discusses the most complex choice, to take founder's equity as compensation for the additional role the university plays in the formation of the company.

If the startup lacks an experienced entrepreneur, universities may take a percentage of the initial formative equity and may choose to license only a limited field. An early or underdeveloped commercial platform provides an opportunity to seek Small Business Innovation Research (SBIR) development funds. But whether there is a license grant to a limited field of use or to all fields, each TTO needs to decide the percentage of equity that is appropriate based on the technology, the level of development by university personnel, the breadth of the field granted, and other licensing considerations.

A more midrange approach is that of Isis, the technology transfer company of the University of Oxford:

The University expects to be a significant shareholder in the spin-out company because of the resources and permissions it makes available to the spin-out. Isis will provide advice about the division of the equity spilt [sic] between the University, the researchers and the investors. The university expects that its shareholding [will] be the same as the founder researchers. There are a number of factors to be taken into account: for example, the roles of the individual researchers, the value of the intellectual property, the amount

of capital required, the involvement of the University in reaching the stage where a spin-out is possible, and the importance of the association with the University.¹⁶

An example of this approach is shown in Stage 1 of Table 71-1, where Stages 2 and 3 show the impact of dilution with increased levels of investment.

A more complex situation occurs where a university participates in both founder's equity and receives equity for the license. In the briefest explanation, founder's equity may be divided among in various proportions among those critical to company development. The par value may vary from a nominal \$0.001/share for the founders to \$0.01/share when the license is negotiated. By tracking through Table 71-2, the valuation of two sample technologies, originally valued at a total of \$300,000 can be compared to founders' shares and their subsequent dilution through various investment rounds can be seen.

The previous discussion is more illustrative of concepts that need to be understood than it is explanatory in a textbook sense. For a more thorough discussion of start-up equity, consult Buz Brown and Jon Soderstrom's excellent chapter in the AUTM's training manual.¹⁷

Models for Universities to Support Start-Ups

Increasingly, universities understand that it is to their advantage to provide seed funding for early-stage development of a concept or for applications testing either directly or through their foundations.^{18,19} Some create protected mini-incubators

TABLE 71-1 Initial Share Dilution.*

Illustration of Share Dilution						
	Stage 1		Stage 2		Stage 3	
	shares	%	shares	%	shares	%
Founders	50	50.0	50	33.3	50	29.4
University	50	50.0	50	33.3	50	29.4
Investors	0	0	50	33.3	50	29.4
Management	0	0	0	0	20	11.8
Total Shares	100		150		170	
Total %		100		100		100

*From "Starting a Spin-out Company," page 12.²¹

TABLE 71-2 Sample Deal Structure.

Shareholder	(M = Millions of Dollars)									
	Founders Equity	% Class	Option Pool	% Class	Common Stock	% Class	Series A Preferred	% Class	Total Issued & Outstanding	% Total
Yale University	2.0 M	25		0	2.0 M	19		0	2.0 M	7.8
Yale Inventor	2.0 M	25		0	2.0 M	19		0	2.0 M	7.8
Yale Scientist	2.0 M	25		0	2.0 M	19		0	2.0 M	7.8
CEO	2.0 M	25		0	2.0 M	19		0	2.0 M	7.8
Option Pool		0	2.25 M	100	2.25 M	21		0	2.25 M	8.8
Technology A		0		0	0.2 M	2		0	0.2 M	0.8
Technology B		0		0	0.1 M	1		0	0.1 M	0.4
Lead Investor		0		0		0	7.0 M	47	7.0 M	27.4
Investor 2		0		0		0	4.0 M	27	4.0 M	15.7
Investor 3		0		0		0	4.0 M	27	4.0 M	15.7
Totals	8.0 M	100	2.25 M	100	10.55 M	100	15.0 M	100	25.55	100

Used with permission from Brown and Soderstrom's chapter in AUTM's Technology Transfer Practice Manual.²² Modified to fit page.

on-campus,²⁰ while the most advanced institutions themselves find seasoned entrepreneurs and venture capital.²³ Additionally, many universities partner with state, federal, and commercial groups to speed up this important economic development process. For example, some states fund university researchers to develop platform technologies with the potential to spin-out a number of local companies;²⁴ some universities partner in regional incubator organizations;²⁵ others partner directly with venture capitalists.²⁶ Overall, there are a number of reasons for technology transfer or commercialization offices to become directly and actively involved in the development of technology, not the least of which is to avoid the "valley of death" situation that can occur between the time when R&D funding may run out and when a commercial interest can be identified, as characterized by Betten.²⁷

Following are examples of cases that only begin to illustrate the many ways in which universities, local economic groups, and states can enhance growth and development processes. If these examples do not seem appropriate for your institution or situation, it is recommended that you read through Tornatzky, Waugaman, and Gray's review²⁸ of programs at twelve different universities, which provides an additional array of ideas for consideration.

Many universities have development program funds. For example, a review of the results of the

Technology Commercialization Program at the University of Utah²⁹ shows how even small amounts of funding, if carefully distributed and monitored, can have large economic returns. At the University of Utah, individual programs are funded for \$35,000 per year and are renewable for a second year and results from an unpublished report (J.F. Carney, University of Utah) show that from the \$1.98 million invested over the five-year period from 1999 to 2003, more than \$6.75 million in return was realized (this includes license income and grant monies received, excluding value of job creation or potential sales of equity).

A new approach to a mini-incubator has been also been developed at Utah State University. Their Office of Technology Management and Commercialization (OTMC) established what they refer to as a "bridge fund." "This fund, coupled with business and marketing support from OTMC, is directed at providing marketing and sales efforts for developed products/services. The concept is to create a business incubator for 'inside' spinout companies that will allow them to move rapidly from a cash-consuming development phase to a cash-producing business with revenues. Once profitable, these business can be transferred to 'external' spinout companies or moved to an independent unit of the USU Research Foundation."³⁰ These funds have subsequently allowed the office to hire a market

development manager with direct commercial experience to develop a business strategy for a new software system.³¹

In a state and university partnership effort, the Utah State Legislature funded a university-based Centers of Excellence Program to support, "Highly targeted, market-driven projects that perform the applied research, prototype development and business planning necessary to successfully commercialize promising technical innovations..." In 2001, \$1.6 million in state program funding at four Utah universities resulted in matching funds of \$20.5 million, an 11:1 ratio. As a result of the multiyear centers program, at least 150 Utah-based companies have been started and by 2001, those companies directly employed over 1,300 people at an average salary of \$68,000.³²

The University of Central Florida's incubator has received a number of awards in the brief time since it was formed:

Since its founding in 1999, the UCF Technology Incubator (UCFTI) has helped more than 70 emerging technology companies create over \$100 million in revenue and more than 400 new jobs with an average salary of \$68,000. As a result of this success, the UCFTI has been lauded as one of the top 10 performing technology incubators in the country by the National Business Incubation Association. Headquartered in Research Park adjacent to the University, the Incubator is a collaboration in economic development between UCF, Orange County, the City of Orlando and the Florida High Tech Corridor Council.³³

The programs referenced heretofore have each resulted in technologies that have been directly licensed to start-ups. While any individual TTO may not be equipped to support the extent of these efforts, these examples show the success that can be realized from even one program. Perhaps the most important thing for any TTO to consider is that any development program starts with an invention, and so the starting place is the inventiveness of the University's faculty.

While working and investing in a start-up can be time-consuming and undoubtedly risky, there can be enormous rewards. The author writes these words in a TTO office in a university research park, surrounded by several dozen companies that were started with university technologies licensed years ago by technology transfer people in this very office. Now, thousands of people are gainfully employed, lives around the world have been improved by prod-

ucts from these start-ups, and royalties from these products support today's tech transfer people and further provide funding to inventors for exciting new research inventions that will become inspiration for tomorrow's start-up companies.

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Establishing a Spin-Off Company

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What Is a Spin-Off Company?

For the purpose of this discussion, a "spin-off company" is a small, newly founded company formed around one or more innovations arising from the results of academic-based research, and there is involvement of the inventor and cooperation/participation of the institution, usually through the technology transfer office (TTO) and/or through an institutional organization established to facilitate technology transfer and spin-off company development. There exists considerable debate about definitions of the terms "spin-off company" and "start-up company." In many of the referenced materials supporting this discussion, the term "start-up company" is used, thus it is important for the reader to keep the foregoing definition in mind.

Why Engage in Spin-Off Company Development?

Academic-based research institutions encourage and participate in new venture creation encompassing technologies developed within their research facilities. They do so for many reasons, including to:

- Increase perception of and contribution to public benefit.
- Support of the academic mission.
- Enhance the reputations of the institution and its researchers.
- Increase opportunities for relevant industrial development experiences for faculty, staff, and students.

- Maximize the opportunity for success of a particular technology.
- Provide a positive impact on economic development.
- Aid in faculty recruitment and retention.
- Extend service and supply opportunities to local and regional business.
- Expand employment opportunities for graduates.
- Provide financial incentives.
- Attract investment to the community.

Most spin-off companies are located and remain within the region in which they were created. Since it first began to collect data on spin-off company creation, the Association of University Technology Manager's (AUTM) annual licensing survey has determined that companies tend to locate and stay near the institution from which their technology was sourced or created.¹ This provides the local and regional businesses with new opportunities and also serves to attract new investment into the community.

Institutions in the United States, Canada, and in many other countries are increasingly challenged to contribute to public benefit, not only through the graduation of highly qualified personnel and the expansion of knowledge, but by providing public access to information on government-funded (and some industry-funded) research that is conducted at their institutions. In fact, in some countries, such as in the United Kingdom, regional economic development is a stated part of the new academic mission. In Canada and the United States, economic development is often a less obvious part of missions that