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The IP Spinout Model

This note examines Intellectual Property (IP) spinouts, or transactions in which a collection of intellectual assets (e.g., patents and trade secrets) is transferred from the original owner into a separate company, newly formed and capitalized to develop viable commercial products or services based on the IP assets. Many successful and well-known companies began as IP spinouts, including Akamai, 3-Com, and Ciena (**Exhibit 1**).

A central question in our study is whether the IP spinout model could be an attractive process for recent MBA graduates to establish themselves in new entrepreneurial ventures, similar to the search fund or the roll-up models. To inform our answer, we interviewed two-dozen people with direct experience in IP spinouts, including entrepreneurs, scientists, licensing officers, lawyers, and VCs. We drew several conclusions based on these interviews, which are summarized below and discussed further in the note:

1. ***At first, the IP spinout model seemed like a promising path to entrepreneurship.*** A fragmented and inefficient market for IP suggests that an entrepreneur can create value by identifying and licensing undervalued or underutilized IP. With an investment of time and a modest amount of cash up front, it's possible to collect and leverage a set of IP assets as the basis for a new venture. Following this model, an entrepreneur might avoid the "two people, a dog, and a business plan" stigma that prevents many concept-only startups from ever getting funding traction.

2. ***But it is actually very difficult to execute,*** for at least four reasons: 1) most IP is commercially worthless, or junk; 2) great IP is hard to locate, assess, and value; 3) spinout deals are complex and time consuming to negotiate and structure; and 4) even world-class IP does not necessarily translate directly into market value.

3. ***Nevertheless, the IP spinout model can be done successfully.*** Our findings suggest that the probability of success is higher for IP spinouts that are led by the right entrepreneur, result from disciplined search processes, and are properly structured. The "right" entrepreneurs, however, tend to be industry or organizational insiders, with relevant business experience and deep technical expertise. Unfortunately, this is not a common profile for recent MBA graduates.

The remainder of this note is divided into several sections. We begin with an overview of the markets for IP and a discussion of the opportunity to create value through IP spinouts. Next, we examine the roles and objectives of different types of players typically involved in IP spinouts. Once this foundation is established, we offer advice about how an entrepreneur might approach an IP spinout, including best practices for the IP search process and deal structuring, based on experience culled from our interviewees. Finally, we conclude with an assessment of the merits of the IP spinout model relative to other paths to entrepreneurship, and a list of key lessons learned in our study.

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Before proceeding, you should have a basic working knowledge of the legal and strategic aspects of IP. If this topic is new to you, refer to the IP Primer in **Exhibit 2** for a brief introduction.

The Market for IP

The market for IP results from skill and strategic mismatches. The skills required to create IP are entirely different from those required to bring IP-based goods and services to market. Universities and laboratories do not possess both sets of skills; and even if they did, their non-profit status gives little incentive to commercialize new IP. Corporations, on the other hand, have all the skills but sometimes decide not to commercialize IP because doing so may dilute strategy or cannibalize business. Of course, if an IP asset cannot be commercialized internally, another logical step is to license or sell it to a third party who can. However, the market for IP is fragmented and somewhat inefficient (although trend data suggest improvement)[1] for several reasons:

- *High search and transaction costs*—IP assets exist in fragmented markets that are riddled with information asymmetries as a combined result of: 1) defensively written patent disclosures with vague and obscure language, 2) non-obvious applications in unrelated industries, and 3) the deep technical expertise required to assess the merits and potential of IP. These factors contribute to high search and transaction costs, and predictably retard the overall IP sale and licensing market.

- *Most IP is commercially worthless*— A prominent venture capitalist succinctly expressed a repeated theme of our interviews: "most IP is complete junk, and doesn't ever deserve to see the light of day." This is not a reflection on IP as an asset class, which can be tremendously valuable. Instead, it is pragmatic commentary on the combined implications of 1) U.S. PTO[2] regulations, which rightfully do not require proof of commercial potential, and 2) IP creators' incentives to patent any potentially interesting work "just in case" it later turns out to be valuable. Consequently, most of the total number patents outstanding have little or no commercial value, which makes finding great IP akin to finding the proverbial needle in a haystack.

- *Insufficient valuation methodologies*— Intellectual assets are difficult to value. They often require large follow-on development investments, face high technical risk, and suffer from highly uncertain future cash flows. Since intellectual assets do not lend themselves to traditional discounted cash flow techniques, they are often priced according to a few "rules of thumb" that evolved over the years, including: 1) 5 percent of net sales, 2) 25 percent of operating profit, and 3) so-called industry norms (e.g., $1 per TV sold). These simple approaches ignore many factors affecting value, including: cost structure, opportunity cost, option value, return on capital, and deal terms (e.g., exclusive vs. non-exclusive, field of use). As a result of inadequate valuation tools, companies sometimes enter into bad deals, pass on good deals, make unreasonable demands, or abstain altogether for lack of the information required for an informed decision.

- *Distorted managerial incentives*—In publicly owned U.S. corporations, executive focus and incentives are driven in large part by GAAP and FASB financial reporting standards. But these standards often fail to capture the economic value of intellectual assets, which look more like real options than easily measurable tangible assets. As a result, IP assets are usually recorded under intangibles on the balance sheet at arbitrary values (e.g., sunk cost, no value), disconnected from the potential underling economic value.

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[1] Worldwide revenues from IP licensing grew from $50 billion in 1996 to $110 billion in 1999, or 30 percent per year. This rapid growth cannot be explained solely by increases in the amount of IP available for license, which grew at the relatively anemic rate of 11 percent per year over the same period.

[2] Patent and Trademark Office (see IP Primer in Exhibit 2)

We cannot directly estimate the potential market value of all new and underutilized IP because it depends on individual, asset-by-asset business and technical factors that are not measured or reported in aggregate. We can, however, get a rough sense for the magnitude of the total IP spinout opportunity by using data that is available on R&D spending, number of patents issued, and licensing revenues as proxies for market size and activity.

- *R&D Spending*—IP activity in any given year is primarily driven by R&D investment the current and previous years (e.g., R&D→invention disclosures→patent applications→patent issuances→licensing). The U.S. invested $227 billion in R&D during 1998, or about 2.7% of GDP. **Exhibit 4** shows historical levels of investment and breaks current R&D down by source of funds, segment performing the work, and stage.

- *Patents Issued* – The number of new patents issued annually has doubled over the last 10 years, reaching 150,000 a year in 1998 (**Exhibit 5**). However, the number of patents issued is at best an imperfect measure of market potential. As our interviewees cautioned time and again, patents alone do not create value, and many patents are commercially worthless anyway. Nevertheless, this metric does give an indication of increasing market activity.

- *Licensing Revenues* – Worldwide revenues from IP licensing agreements grew from $50 billion in 1996 to $110 billion in 1999, or 30 percent annually.[3] Since the value created by licensed IP must be split between the licensor and the licensee, we apply a multiple of 2X the total licensing revenues to arrive at a lower-bound value estimate of IP currently under license of about a quarter of a trillion dollars.

Based on these indicators, we conclude that the market potential of new and underutilized IP—and therefore the derivative opportunity for IP spinouts—is billions of dollars annually and growing moderately, driven by increasing R&D investments, innovation, and market efficiency.

Arguments for IP Spinouts

With an investment of time, expertise, and a modest amount of cash, an entrepreneur can use the IP spinout model to can create value in at least three ways: 1) by exploiting market inefficiencies, 2) by free riding on prior R&D investments, and 3) by taking on high early-stage technology and market risk.

It is well established that IP can be a source of tremendous value, especially in technology-driven industries.[4] IP as an asset class is just as real as any tangible asset class, but the market for IP is not yet as efficient as the markets for other assets such as buildings or stocks, as discussed above. An entrepreneur can exploit these market inefficiencies by employing a systematic search process to locate high potential IP, and by using sound business judgment and valuation methodologies to assess and license it for less than full market value.

Second, an entrepreneur can also free ride on prior R&D investments—especially those of the federal government, thanks to the Bayh-Dole Act[5]. According to the AUTM[6], academic institutions

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[3] "Intellectual Property Rights Benchmark Study," a report prepared for British Technology Group International by Business Planning & Research International, London England, June 1998.

[4] See "References and Resources" at the end of this paper for sources of academic support for value of IP

[5] See IP Primer in Exhibit 2 for more information on the Bayh-Dole Act

[6] "AUTM Licensing Survey: FY1999," Association of University Technology Managers. Northbrook, IL 2000

in 1999 received $27 billion of federal research funding, generated 12,000 invention disclosures, filed 8,800 U.S. patent applications, were issued 3,600 U.S. patents, executed 3,900 new license or option agreements, and collected $860 million in licensing fees (**Exhibit 6**). That same year, at least 350 new start-ups were formed and 420 new products were introduced based on university-licensed technology. Considering that the federal government invested $75 million research funding for each new startup formed in 1999, and that licensing deals average less than $100,000 in up front fees and modest royalties or equity stakes[7], it is clear that *at least the potential* to free ride exists. Of course, IP is properly valued on expected future cash flows, not sunk costs, so actual value captured by the entrepreneur varies on a deal-by-deal basis.

Third, development-stage IP has inherently high levels of technical, product development, and market acceptance risk. According to our interviews, venture-licensed IP is almost never "just another half-turn of the screw," or incremental improvement to an already established product or process. Instead, it is most often potentially breakthrough technology, and may require new manufacturing techniques, new distribution and support infrastructure, or changes in customer behavior. Thus, the risk associated with development-stage IP is high, even by startup standards, and translates into a higher expected return—on average—to entrepreneurs and early investors.

So on initial examination, the IP spinout model appears to be a potentially attractive path to entrepreneurship for early-career MBAs with technical backgrounds for three reasons: 1) the market for new and underutilized IP is large and growing; 2) an entrepreneur can create value by exploiting market inefficiencies, free riding on prior R&D investments, and taking on early-stage risk; and 3) the IP spinout model matches the lots-of-time and little-cash resources of most recent MBA graduates.

The Players

IP spinouts are complex deals to negotiate and to structure because they involve several more players than more traditional start-from-scratch or LBO ventures. As with other types of multi-party negotiations, each player tends to value his or her contribution more highly than do the other parties and each player's interests must be satisfied to reach an agreement. As a result, spinout negotiations are fragile because any one player can veto the entire deal. This section introduces some of the types of players typically involved in IP spinouts and and explores the potential for overlapping roles, differing perspectives, and conflicting objectives that inevitably result from the multi-player structure characteristic of IP spinout transactions. With insight into the general background and incentives of each player, you will be better able to understand player interactions and spot potential opportunities to create value in the spinout process by exploiting differences among the players. We will define and characterize IP creators, IP owners in academia and industry, and entrepreneurs and management. See **Exhibit 7** for a framework for classifying players in the IP spinout model.

IP Creators

The term *IP creator* refers to the person or team who originally conceived the ideas or conducted the research upon which a piece of IP is based. This term is distinct from *IP owner*, which refers to the institution or individual who ultimately holds legal title to the IP. Although individual IP creators are commonly named on patents granted by the PTO, this practice has nothing to do with legal ownership, which usually accrues to the institution employing the creators at the time.

[7] See "Structuring the Deal," below, for more information

IP creators are critical to the spinout process because IP in and of itself cannot create value; it requires the people who come bundled with it to help turn ideas into market value. Interviewees repeatedly stressed that, "IP is transferred through people, not paper." To be successful, IP spinouts must be structured in a way that ensures the IP creators' enthusiastic support and ongoing participation in the deal.

The following are generalizations of data collected from multiple sources—they are, of course, not accurate in every situation. IP creators tend to be accomplished technical people. Especially in university settings, they often have world-class scientific skills and reputations, but are relatively naïve in business matters. As a class, they tend to underestimate the challenges and risks involved in commercializing their inventions, such as financing, manufacturing, and marketing. However, they are very bright and, as scientists and engineers, tend to be objective in their thinking. As such, they often recognize the limitations of a purely technical focus and are receptive to contributions made by someone with business training and experience. Finally, IP creators are often motivated by factors other than money, such as the success of their brainchild, the integrity of their research, reputational benefits, and the opportunity to advance the state-of-the-art in their field.

IP Owners

IP owners can be divided into four segments: academic, industry, government, and individual. From the perspective of an entrepreneur searching for IP to spinout, academic and industry are the two most interesting segments because of the relatively high level of activity, quantity and quality of IP, and willingness to license technology. We will therefore focus only on these two segments, which are compared across several dimensions in **Table 1**.

Table 1 -- Comparison of U.S. IP Market Segments

1998	Academic	Industry	Government	Individual
R&D Spending ($B)	$5	$150	$67	N.R.
R&D Performed ($B)	$27	$168	$18	N.R.
# Patents Issued	3,224	62,401	1,080	16,407
# Patents Owned Total	85,050	1,225,879	47,330	408,617
Licensing Revenue ($M)	$862	>$35,000		N.R.

Source: AUTM, NSF

Academic. Universities are attractive sources of IP because they receive large amounts of federal funding for basic R&D, they have concentrated and accessible portfolios of early-stage IP, and they have strong incentives to disseminate technology for commercialization without necessarily maximizing licensing profits.

- *Significant Basic R&D Funding.* Industry is ill equipped to conduct significant amounts of basic research because it directly conflicts with shareholder demands for quarterly financial performance. As a result, most of the country's basic research is conducted by universities and funded by the federal government. In 1998, $17.5 billion in government funding supported 90,000 academic scientists and engineers in research areas such as life sciences, physical sciences,

and engineering.[8] And since 70% of this funding is applied towards basic research, universities are a rich source of early-stage, potentially breakthrough IP.[9]

- *Concentrated, Accessible IP Portfolios.* As shown in **Exhibit 8,** significant concentration exists among major research universities in terms of the amount of funding received and the number of patents awarded annually.[10] For example, MIT and the University of California system accounted for 17% of the academic patents awarded in 1998. In addition to concentration, university IP portfolios are also easily accessible through their technology transfer offices. Here, licensing directors, in compliance with the Bayh-Dole Act, work with IP creators and entrepreneurs to license out as much university technology as possible under reasonable terms.

- *Incentives to Disseminate IP, not Maximize Profits.* As previously mentioned, universities rely heavily on federal funding for major research initiatives. They serve as the link between R&D investment and public economic good by disseminating as much technology as possible to the private sector. Their primary objective is to maintain support for research funding, rather than to maximize IP licensing profits. In a great year, for example, even MIT – the most prolific licensing university – generates at best $60 million from licensing agreements on $750 million in federal R&D funding. Clearly the universities are not focused solely on generating revenues. Lita Nelsen, director of MIT's Technology Licensing Office, ranks her objectives as "1) getting deals done, 2) getting technology licensed, and 3) generating income for the university."[11] **Exhibit 9** provides a detailed breakdown of MIT's R&D funding and IP licensing profile.

Academic institutions also have a few quirks. Successful universities struggle with the inherent tension between their role in partnering to commercialize IP and their traditional role as society's non-profit purveyor of knowledge. This tension is due to: 1) a cultural disdain for profit seeking activity, 2) pressure to publish research results before all steps are taken to protect patents, and 3) strict conflict-of-interest policies that limit options when structuring a spinout deal.

Industry. Corporations are also potentially attractive sources of IP because they perform the majority of all U.S. R&D, their IP is typically further along in development than that of academic institutions, and they sometimes face strategic mismatches that create incentives to spin out good IP.

- *Perform most U.S. R&D.* As noted earlier in Table 1, corporations perform 75% of the total U.S. R&D ($168 billion in 1998) [12]. Because corporations limit basic research, they invest more into applied research and product development, which increases the adoption and exploitation of basic research. The natural result of this R&D dominance is that corporations receive nearly twenty times more patents each year than universities.

- *More Developed IP.* Industry does not conduct significant amounts of basic research because the uncertain and long-term nature of such research is in direct conflict with shareholder demands for quarterly financial performance. Instead, industry directs the vast majority of its considerable R&D investment into nearer-term, commercially viable product development. As a result, corporate IP tends to be more incremental in nature and it yields more mature, proven technologies closer to commercialization than the earlier-stage IP found in academic institutions.

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[8] Science & Engineering Indicators – 2000, Appendix table 6-32, National Science Foundation, Division of Science Resources Studies

[9] http://www.nsf.gov/sbe/srs/seind00/frames.htm, Science & Engineering Indicators – 2000, Appendix table 6-1 and table 6-2

[10] Science & Engineering Indicators – 2000, Appendix table 6-67

[11] Casewriter interview, Lita Nelsen, Director of MIT's Technology Licensing Office, February 9, 2001

[12] Science & Engineering Indicators – 2000, Appendix table 2-4.

- *Strategic mismatch.* Corporations sometimes license technologies that do not fit with strategic plans at the corporate or business unit levels. For example, Flarion is based on wireless data technology that was developed in Lucent's Bell Labs and which ran contrary to the way Lucent was approaching the wireless voice market. Rather than allow the technology to sit idle, Lucent spun the IP out into Flarion.

However, industry also has several drawbacks as a source of IP for starting new ventures. First, corporations have historically worked with internally trusted and experienced employees to try to commercialize intellectual property. This insider, characterized below, has been directly involved in or has been near to the project and team responsible for the creation of the IP. As a result, corporations are often skeptical and distrustful of external entrepreneurs seeking to license IP from their portfolios. Second, unlike academic institutions, industry generally perceives IP to be strategically defensive in nature and industry is, of course, profit maximizing in all endeavors. Together, these tendencies reduce the accessibility of IP and the likelihood that an entrepreneur will find IP at a reasonably discounted price. Finally, corporations that do license IP suffer a winner's curse. Managers who shelve IP and never report or seek to license it are rarely admonished for failing to do so. On the other hand, if a manager licenses a piece of technology that later turns out to be a home-run, shareholders and senior management may bitterly question why the company was not able to retain more of the value. As a result of these characteristics, industry IP offers far fewer spinout opportunities for the outside entrepreneur than may appear at first glance.

Exhibit 10 summarizes the key differences between academic institutions and industry as potential sources of IP for a spinout entrepreneur.

Entrepreneurs and Management

Our use of the term *entrepreneur* refers to a person who recognizes the market potential of a piece of IP and who works to bring the IP creators, the IP owner, and the financial resources together into a business arrangement capable of supporting a successful spinout and commercialization effort. Of course, a person filling the entrepreneur role could simultaneously be the IP creator or owner, in which case that person would serve in multiple, overlapping roles. Although the focus of this note is on outside entrepreneurs, meaning those who neither created the IP nor are employed by the owner of the IP, the insider is an alternative that deserves mention.

Although not absolute, three dimensions are particularly helpful in explaining different levels of success among entrepreneurs: experienced vs. inexperienced, expert vs. non-expert, and insider vs. outsider. The first two are measured with respect to the industry and technology associated with a particular piece of IP. For example, 4 years of M&A banking experience would not count as experience or expertise at a bioinformatics startup. The third aspect is a matter of vantage point. An insider starts with the advantage of understanding the history and context for the invention, the parent organization, and the reason the IP does not fit with the parent company's strategy. This insider advantage does not mean the odds of negotiating an IP spinout are insurmountable to the outside entrepreneur, however it makes tangible the magnitude of the challenge.

As we discuss in detail below, a person considering the role of entrepreneur in an IP spinout must first make an honest, hard-nosed assessment of where he or she fits along the experience and expertise dimensions. Adding value and establishing credibility with each of the required players is one of the greatest challenges faced by an entrepreneur trying to orchestrate a spinout. For better or worse, judgments are made based on prior experience and technical expertise.

Finally, it is important to note that entrepreneurs and management are not necessarily the same group. Most entrepreneurs do not end up serving as permanent Chairs, Presidents, or CEOs in

companies founded on IP they spun out. The skill set required to pull together an IP spinout is entirely different from the skill set required to run a rapidly growing technology company with venture backing, and one individual rarely possesses the capability to do both. Entrepreneurs would do well to recognize the already heavy skepticism with which VCs view IP spinouts. To improve the chances of securing VC funding, the entrepreneurs we interviewed advised being extremely flexible regarding their post-funding role in the company, with many taking VP of Business Development or VP of Marketing positions.

The Process

Finding good intellectual property (IP) is not an easy task. Most IP has little commercial value yet takes significant time and expertise to find and properly assess. In addition, a growing number of sophisticated players are making it more difficult to find new opportunities. However, the opportunity to find the basis for a technical advantage at a relatively low cost makes time wisely spent worth the effort. Preparation and focus can dramatically improve an entrepreneur's efficiency and success rate. While the typical profile of a successful entrepreneur in the IP spinout process is an insider who has developed an expertise in the area, the right approach will vary according to an individual's capabilities, goals, resources, time, and risk profile. The approach for finding good IP can be broken down into four primary steps: Characterization (what to look for), Sources (where to look), Search Strategies (how to look), and Evaluation (how to know if you found it).

Characterization (What to look for)

Simply owning good intellectual property does not equate to a successful product or business. Many other aspects (great team, large growing market, consistent execution, luck) must come together to build great products and companies. However, good IP can provide the basis for technical advantage and competitive differentiation.

Practitioners of the IP spinout model almost universally state that most intellectual property is junk and value is highly concentrated (**Exhibit 11**) in the relatively few assets that are viable. Knowing what to look for enables the entrepreneur to be more efficient in the due diligence process and increases the chance of future success. Good IP is not an absolute designation. However, six key dimensions help to define good IP and appear consistent across examples, regardless of capabilities and resources. Good IP for a spinout:

1. ***Is created by world-leading scientists*** (e.g. National Academy members, Nobel Prize winners, luminary figures in a field). Through association to the creators, IP developed by leading scientists is faster to assess, easier to consolidate, and more apt to attract first-tier funding.

2. ***Is defensible and extensible***. Individual patents are much easier for a competitor to reverse engineer. A suite of patents focuses on blocking multiple avenues to reverse engineer, effectively creating a minefield. To build the minefield, you can secure an entire suite of patents and/or include ongoing improvement rights in the deal. By starting with a luminary professor, you may be able to follow their network of relationships around the country to rollup the patent portfolio and include all related cutting-edge research.

3. ***Has commercial application***. IP is only valuable if it solves a customer problem and can be translated into a product. Some start here while others find this last, but all successful IP spinouts are able to address a market need and form the basis for a product solution.

4. ***Provides a competitive advantage***. Simply characterized as better/faster/cheaper, the competitive advantage is enabled by a technological solution dramatically different from what exists in the market.

5. ***Is proven***. There are varying stages of technological maturity, from theory, to lab experiment, to prototype, to a commercially viable product. Moving further along on this continuum helps to reduce technology risk for the investors. However, value declines as the patent ages so the patent should have a significant time left to expiration.

6. ***Is trapped***. What makes good IP most interesting as a spinout candidate are the asymmetries in information and incentives that enable access to leading technology at a fraction of the development cost.

Despite the fundamental basis for technical advantage that it provides, IP on its own has limitations. An entrepreneur needs more than just a patent (or even suite of patents) to build a great company and successful products. In the end, technology is transferred through people not paper. The work represented within the patents often must be extended before a commercial product can be produced. As a result, patents without one of the creators are often of little value. Particularly in an early stage product company, the cumulative knowledge and ideas of the inventing team are at least as important as the IP. Ultimately, the real asset is *intellectual capital* (ideas, know-how, and familiarity coupled with patent protection) not just patents.

Sources (Where to look)

As described previously, there is considerable difference between sources of IP, including: amount of research dollars spent, efficacy in translating research to IP, and incentives for managing the IP asset. These differences result in varying levels of quality and ease of access. Given the high costs to search for and assess IP, knowing where to look can make the process much more effective.

We have segmented sources into three broad categories: Universities, Corporations, and Federally Funded Research and Development Centers. A large disparity exists between the best and the worst within each category. In general, the spinout process is often more similar between the best in each category than within the same category. This is a result of the high level of concentration of research dollars and technology transfer expertise (concentrated in the top tier in each category). With growing competition, particularly at the large and well-known sources for IP, an entrepreneur should consider where they have a comparative advantage. Two potential areas are ease of access and time. In a university, an MBA student may have an easier time walking into a lab and interacting with other graduate students than would a professional investor. They also may have a lower opportunity cost and therefore may be willing to spend more time assessing very-early stage technology. Corporations, on the other hand, almost always require significant expertise from the entrepreneur and are generally working with IP that is further along in the development cycle.

As a general rule, in choosing a source the entrepreneur is seeking to trade on differences in incentives. For example, in the university setting, often the seller is willing to concede economic gain for other objectives such as information and technology dissemination. Trading on these differences presents an opportunity to become the free rider on significant investment dollars spent by universities, government-funded labs, and similar sources. As a research organization goes through the development process, it does not give the same step-up in valuation that a venture capital investor may. Value in the technology is added at the end (not along the way) because it is actually pulled out of the research setting and made ready for commercialization.

There is a clear tradeoff between large, well-known sources with significant experience doing IP spinouts and smaller, more focused sources with significantly less competition. The former has a

much more clearly defined process and is generally better at managing the internal tension between conflicting objectives while the latter presents potentially greater opportunities due to inefficiencies from information asymmetry. Choice of source requires consideration of these tradeoffs and the understanding of your comparative advantage.

Search strategies (How to Look)

To capitalize on the best sources, an entrepreneur must find and gain access better than the competition. Given the early-stage nature of the technology and the complexity of the process, an entrepreneur with inside access and deep expertise has a significant advantage. While this is not the typical profile of a recent MBA graduate, the approach taken to search can vary according to experience. The most successful strategies involve a focused approach capitalizing on relationships to gain a foothold. This is particularly true for an entrepreneur who lacks the track record and brand (of a top-tier VC) to attract the best IP and therefore must be proactive in creating new ventures.

In working through many different examples, three fundamental search strategies emerged which an entrepreneur should consider in relation to their experience and preferences (**Exhibit 12**). Successful spinouts generally encompass aspects of all these strategies, however, each strategy defines a different starting point and ordering of key risks that is reflected in the sequencing of activities. The goal of the process is to effectively build credibility from the circle of players involved in the spinout by managing risks in the most effective manner.

- ***Leading technology (IP first)***. By focusing first on technology, an entrepreneur usually builds on a deep technical understanding and background. There are two distinct approaches for executing this search. The first is to focus on a narrow field of IP and look across many different sources, while the second approach is to focus on a specific source and look more broadly across its portfolio. The former favors sector-specific knowledge while the latter requires a close relationship with the source. Once an attractive technology is identified, an entrepreneur can begin to evaluate and prioritize market applications. The risk of starting with the IP is that it becomes difficult to find an application. Critics characterize this as "taking a square peg and looking for a square hole".

- ***Market (It's all about the products)***. Supporters of this strategy argue that technology is worthless on its own. Ultimately, what is valuable is a product that you can sell. Successful execution of this strategy requires a deep understanding of the market and of the unmet needs of the customers. The approach requires spending considerable time up front talking with potential customers and developing a clear picture of specific opportunities. Concepts for product solutions can then be developed and used to create a roadmap for a targeted search from select sources. The risk in this strategy, of course, is that an entrepreneur may not be able to find IP that meets their market needs. As a result, successful execution often requires detailed knowledge about where to look (e.g. who is working on research in your area) and access to those sources. The systematic nature of this process lends itself to a repeatable model, in some ways extending a typical venture capital perspective by becoming more active in the venture creation stage.

- ***Technical team (Find the People).*** A generalist without an advantage in either an area of technology or an industry, should focus their search for leading technologists with whom they would like to work. The entrepreneur is able to choose the people, while evaluating their technology and helping to more clearly define potential market and product applications. They also have the opportunity to join a researcher at an early stage before a full team has been established. If technology is ultimately transferred through people, the team risk is one which should be addressed up front before time and effort is wasted elsewhere.

The fundamental challenge of matching IP to market needs has spurred several efforts to decrease information asymmetry and thereby increase the chance of effective assessment. One interesting approach employed by Yet2.com, and Internet-based IP exchange, is to augment patent data with key pieces of information not included in a standard filing, including descriptions of uniqueness, benefit, stage of development, and suggested applications (**Exhibit 13**).

An entrepreneur is likely to face competition in the search process from VCs, technology development organizations, and other entrepreneurs. VCs can be segmented into specialists and generalists. The specialists, such as ARCH Venture Partners or DiamondHead Ventures, focus specifically on the IP spinout process for building early-stage companies, preferring to "make rather than buy" their opportunities. The generalist VCs, such as Accel Partners or Highland Capital, typically get involved at a later stage and are more opportunistic about the spinouts they do. With varying levels of expertise in the spinout process, generalist VCs generally draw from strong relationships with a few key sources. Technology development organizations can be segmented into internal and external. Internal organizations, such as Lucent New Ventures Group or ARCH Development Corporation, have deep ties to a captive source of IP. They are able to work with creators at an early stage to spin out non-core technology and to create value for the parent organization. External organizations, such as MILCOM Technologies, approach the spinout opportunity in a systematic fashion. They are usually experts in a market segment, enabling them to define a product roadmap from which they can perform a highly targeted search based on pre-existing relationships with key sources. Both specialist VCs and technology development groups are becoming increasingly sophisticated and therefore making it more difficult for a one-time external entrepreneur to secure undervalued IP.

Most entrepreneurs do not formally structure their search; instead, they conduct the search while employed by the firm that owns the IP. In some cases, an entrepreneur may approach a potential employer with the explicit intent to identify an opportunity and spin out a company. Other entrepreneurs are self-funded. Although it may be a viable approach, we have not identified an entrepreneur who has raised a search fund in advance of identifying the target intellectual property.

Evaluating Opportunities (How to Know You Found It)

IP due diligence can be challenging and time consuming. Although most of the same principles apply to assessing IP spinout as do to any new venture (e.g., people, opportunity, deal, context), three key risks warrant particular attention in IP spinouts.

The first is technical risk. Because of the early-stage and cutting-edge nature of many of the technologies spun out, there is a risk that the technology will never reach a stage where it is viable for commercialization. Some organizations, such as MILCOM Technologies, attempt to mitigate this risk by licensing technology for commercial use that is already being used in a military application. The technology has been proven and only requires slight modification for the new application.

Market risk also is important because of the possible long development times still required for some technologies. One way to mitigate this risk is to identify and develop three separate but viable applications for any technology. As the technology is developed, flexibility allows the product plan to change with market needs. Understanding market needs relative to a technology requires frequent and deep interaction with customers.

Finally, there is legal or patent risk. Without patent protection, many of these technologies would lose their competitive advantage. Even with a strong patent portfolio, there remains the risk of infringement and the costs of fighting a legal battle. Given the difficulty in assessing a patent, those who successfully have done a number of IP spinouts extol the virtues of a great patent attorney. While they use databases that are generally available to anyone, patent attorneys can be much more

effective and efficient in defensively searching while proactively identifying opportunities to enhance your existing IP. A full patent search will examine technical validity, legal nuances/implications, and holes in patents, and may present opportunities to support the anchor and derivative patent strategy.

Structuring the assessment process is similar to experimental design. The goal is to spend the least amount of time and/or capital to return the most information. An experiment properly designed and run should enable the entrepreneur to reduce risk along key dimensions. Some universities will offer a free (or cheap) option on the IP for a set amount of time (generally 3 to 6 months) during which the team can assess the technology and shop the deal without committing to terms. Such options are valuable and should be sought as the entrepreneur balances further assessment of the IP and structuring the spinout.

Structuring the Deal

Unlike "traditional" startups where the risk of poor structuring has been reduced over time by standardized approaches and past experience, considerable execution risk still exists in structuring spinout deals. The process involves numerous parties, each with unique perspective, objectives, and incentives. It is best to approach the task of structuring IP licenses and spinouts prepared for it being more difficult, taking more time, and being more important than anticipated. Our interviews uncovered several cautionary tales of destructive conflicts and entrepreneurs who, after investing significant time and effort, were trapped by unfavorable terms. Finally, structuring and negotiating IP spinouts is path dependent, and restructuring to correct prior errors is very difficult.

A well-structured deal accommodates different expectations, aligns incentives, properly allocates risks, provides the venture with options, flexibility and the necessary support, avoids negative tax consequences, and is fair. Most notably, good structuring prevents restrictive licensing arrangements and provides sufficient independence from the parent.

There are two deal-structuring pieces of an IP spinout to consider: the license or asset transfer arrangement and the new legal entity. The structure that a parent is likely to promote should be discovered early, before much time is invested in search and due diligence.

1. ***IP Licensing***. Intellectual property transfers are more complicated than transfers of traditional tangible assets, demand considerable attention from the entrepreneur, and are best left to the professional IP attorneys. For example, issues involving field of use (application and geography), clawbacks, and access to ongoing inventions are all critical to the newly formed entity, and should be addressed in the licensing agreement.

2. ***Company Structuring***. Intellectual property spinouts have two more parties to consider than the typical startup deal. Specifically, the demands and contributions of the IP owner and IP creator have to be factored into the new corporate structure. This complicates the formation of a new company, influences valuation and capital structure, creates timing issues, and makes the distribution of equity more difficult.

We will discuss IP licensing and IP spinout company structuring in turn.

Licensing the IP Assets

Negotiating and structuring the IP license is a critical activity that significantly shapes the venture's risks, opportunities and future prospects. Valuation and payment form are only two of the many important terms in an IP license arrangement. The IP creators, future management, the licensing office, and the venture's financing sources all need to be concerned with the license

agreement. Venture capital firms typically require a strong patent portfolio and flexible licensing terms before they will become involved.

Terms in the Licensing Agreement and related contracts include field of use or application, geographic scope, access to ongoing research and future derivative patents, exclusivity, and duration. Naturally, most spinouts desire a worldwide exclusive license, no restrictions, with access to related derivative patents. In reality, terms vary substantially across industries[13] and type of IP owner. More complication results from covenants and guarantees, consulting arrangements, and "clawbacks." Consulting arrangements serve to transfer 'know-how' with the assets. IP owners use clawbacks to revoke a license and regain their IP if the licensee fails to perform.

Consideration can be paid in a variety of forms, including: up-front cash, yearly maintenance charges, equity, debt, and royalty streams as a percent of income or of gross sales. As a result, consideration influences the risk-sharing and value-claiming arrangements between the parties. Most company-to-company transfers involve a combination of cash charges and royalty payments, sharing the risk of commercialization but also requiring the licensee to demonstrate serious intent through the up-front charge. Consideration is often a contentious issue for two reasons. First, valuations can differ by orders of magnitude, creating a wide gap to be negotiated. Second, the licensor may not be familiar with the "equity culture" now common in startups and may prefer cash-based considerations to the more equity method which aligns incentives and minimize cash expenditures.

The IP licensing deal is usually finalized concurrent to funding because IP owners are more comfortable committing once the startup's viability has been established. Although deal outlines may be agreed to in advance, VCs often want to shape the terms of the license. Entrepreneurs we spoke with recommend balancing "getting as much up-front" with maintaining proper relations with the IP owner, as it is likely not a one-time negotiation. Most entrepreneurs discover that they need to renegotiate aspects of the licensing agreement over time, and so they should temper objectives of "getting as much as possible up-front." Negotiating the licensing deal often takes as long as six months to finalize. See **Exhibit 1** for a summary table of key IP licensing deal terms.

Structuring the New Company

There are numerous ways spinouts are structured, with substantial variation in ownership percentages and control rights. For the purposes of this note, we describe two basic structures: independent and controlled. These two structures highlight the different goals and reservations corporations may have when they spin out technologies. Because universities have different goals and reservations, they only use the independent structure. Finally, it is important to know that the sequencing of steps in the transaction influences the outcomes of the equity structure, negotiating dynamics, and tax implications[14].

In an ***independent spinout***, the startup is not controlled by the parent entity. Liquidity and control are independent of the IP owner. Whereas most startups have stages of contribution, with clearly delineated equity strips as a result, the independent spinout is complicated and involves multiple parties contributing to the startup *at the same time.* The spinout takes capital from the VC, IP from the IP owner, and time from management and from the IP creators. Founders receive common equity, whereas new investors' equity is preferred. Subordination and valuation can be more difficult issues because of the numerous parties involved. According to Mark Vershel of Matrix, "we

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[13] Bharat Anand and Tarun Khanna. "The Structure of Licensing Contracts", *The Journal of Industrial Economics*. Volume XLVIII, March 2000.

[14] Note IRS Rule 351, which governs the taxability of stock transfers. Improper timing, in combination with equivalent equity strips, may result in taxable events.

view the IP owner as just another founder." He continues, "the spinout must absolutely be structured like an independent company, otherwise VCs won't be interested."

But the IP owner doesn't always view it this way. Given that the IP owner is contributing an asset that cost a lot to develop and may have significant value, they may want some combination of cash up front, quarterly payments, royalties, and/or equity. When the IP owner is a corporation and views the startup as an independent "buyer" of its IP, the corporation argues for preferred equity and clawback rights.

In a ***controlled spinout***, a corporation decides that a technology is better suited to be developed and commercialized in a separate entity, but it doesn't want to give up control over the startup. In structuring a controlled spinout, typically the corporation wants to create a startup culture and incentive structure that it could not create in a lab environment. However, it wants to maintain the upside in a potentially important business that has synergies with its core business. Upon certain milestones, the corporation may wish to have the option of repurchasing, or "spinning-in," the startup. As part of maintaining control, the corporation is often the sole capital provider, and may own over 80% of the startup. Given such arrangements, the corporation is motivated to provide support, to share technologies and customers, and to help grow the startup. However, if the startup's goals differ from any part of the corporation's, conflicts that arise could adversely affect the startup. Without control of either funding resources or strategic goals, the entrepreneur and venture are severely constrained. Furthermore, liquidity for the entrepreneur and any outside capital is uncertain. As a result, VCs don't typically fund controlled spinouts.

Given the dominant role of the founding parent, the use of equity in aligning management's incentives is often problematic. According to an account of the PlaceWare spinout from Xerox, "Xerox wanted the ownership percentage for the principals to be below a certain level…They didn't want some researcher in Rochester working on mainstream technology to perceive that some PARC researchers working on exotic stuff were getting rich…"[15]

Valuation

The two transactions that require valuation are the startup, once the IP has been dropped in, and the IP itself.

Company Valuation. Structures and valuations should adequately attribute value to the appropriate parties. IP is just one of the assets that is being contributed to start the venture. Other contributions – partnerships, management, capital, relationships, and other IP – contribute substantially to the venture's success and overall value. The startup should be valued in a similar manner as other startups, taking into consideration its advanced stage and the economic cost of the IP licensing agreement.

IP Valuation. Although valuable IP tends to have some of the characteristics outlined in the Process section of this note, estimating the value of unproven IP assets is difficult. Complicating the valuation are the varying experience of the parties, their different degrees of optimism, and high average failure rates. Valuation attempts need to realistically consider failure rates and the realistic contribution of the IP to the entity's success – factors which are usually inaccurately understood by IP owners and entrepreneurs. Corporations have been widely accused of over-valuing intellectual property, resulting in unrealistic demands on deal structures.

[15] PlaceWare: Issues in Structuring a Xerox Technology Spinout. HBS case # 9-699-001.

There are three approaches to valuation: cost, market, and income[16]. The market approach is most commonly used, although the income approach is a "purer" approach. Currently, the market approach is commonly used by the application of "rules of thumb." Typically, licensees pay royalties amounting to 5% of revenues, or 25% of gross profits for proven, commercialized technologies. We found no good rules of thumb for equity percentages. These rules serve only as starting points for adjustments, and their indiscriminate use can result in rates that penalize either the IP owner or startup. Usually such rates are unrealistically high for the startup.

Lessons Learned

We hope you get the sense from the last two sections that creating a new business from intellectual property spinouts can be a difficult and time-consuming process. Although successful strategies take many different forms, we have gathered several key lessons reiterated by people who have been directly involved in the process before.

- IP spinouts are complex and expensive; they should only be done when there is a large potential advantage provided by the IP
- IP assets follow the 95/5% rule[17]; consider your search process carefully and say no early
- IP is in people, not on paper; the real asset is *intellectual capital* (ideas, know-how, and familiarity coupled with patent protection) not just patents
- Contract details determine future options; get good legal counsel
- IP owners who are inexperienced with technology transfer practices and startup ventures are significantly more difficult to work with than seasoned owners
- Identify and think about key choices in the IP spinout model – industry, team, structure, application, search approach
- "Insiders" do spinouts, not outsiders; become an insider
- Think deal structuring through the whole process, especially at the beginning
- Avoid "spinouts" without real control – VCs don't like them; neither should you
- The journey is only *beginning* when a spinout deal is finalized; the road is long
- It is harder and riskier than you think

[16] Intellectual Asset Valuation by Gavin Clarkson. N9-801-192

[17] 95% of the value can be found in 5% of the assets

Conclusion

We have posed two primary questions in this note. First, are intellectual property spinouts a good method of creating new ventures? Second, can an early-career MBA entrepreneur follow the spinout model to lead or add significant value in the venture creation stage?

The final assessment on the first question remains uncertain. There are a number of fundamental reasons why the IP spinout model should make sense (market inefficiencies, free-rider effects, etc.) but it is much more difficult and time consuming than it may first appear. Successful products and companies have begun as IP spinouts, but we have not found it to be a repeatable process with returns that consistently outperform the market.

An entrepreneur can create value in the spinout process by matching raw IP to a market need to form a commercial-grade product solution, then building a team to execute. Capturing a portion of this value requires that an entrepreneur develop an advantaged position from which to capitalize on inefficiencies in the market. If an early-career MBA can find or create a comparative advantage, relative to the growing competition for the best research, there is may be an opportunity by successfully following the IP spinout model.

An entrepreneur considering this process should keep in mind:

1. *Great IP is hard to find and does not necessarily translate into value.* IP assets are in fragmented markets that are riddled with information asymmetries as a combined result of: 1) vague and obscure patent disclosures, 2) non-obvious applications in unrelated industries, and 3) the deep technical expertise required to assess the merits and potential of IP

2. *The deals are difficult and time consuming to put together.* IP spinouts must meet the demands of multiple players, each with different perspectives, conflicting objectives, overlapping roles, and veto power. VCs also tend to be more skeptical of IP spinout deals because they are so complex and time consuming and based on difficult past experiences.

3. *Significant technical and market risk remain*. Even after great IP is located and a good deal is arranged, IP spinout ventures face inordinately high levels of technical and market risk. This risk is inherent in early-stage technology targeting

Nevertheless, IP spinouts can be done successfully – if done by the right entrepreneur, following a disciplined search process, and in a well-structured deal. Our research suggests that successful entrepreneurs tend to be 'insiders,' with relevant industry experience and deep technical expertise—not the typical profile of an early-career MBA student. It is also important to follow a disciplined search process to efficiently identify valuable IP and to systematically leverage the entrepreneur's strengths (e.g., technology focus, market focus, or team focus). Finally, the deal must be carefully structured in a way that provides the spinout with resources and flexibility and that fairly recognizes the value added by the different parties, including the entrepreneur.

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Exhibit 1 Successful IP Spinout Examples

Spinout	Source
3- Com	Xerox
Adobe	Xerox
Akamai	MIT
Bandwidth9	Stanford
Ciena	General Instruments
Digital Equipment Co	MIT (Lincoln Labs)
E-Ink	MIT
Flarion	Lucent
Google	Stanford
Inxight Software	Xerox
Lasertron	MIT (Lincoln Labs)
Lycos	Carnegie Mellon University
Molten Metals	MIT
Thermo-electron	MIT
Zaplets	Reactivity
Z-Corp	MIT

Exhibit 2 Primer in legal and strategic aspects of intellectual property

IP Primer

Before considering the IP Spinout model, you should have at least a basic understanding of the legal and strategic aspects of IP. The following overview, based primarily on U.S. law, provides a brief introduction for the purposes of this note. Of course, entire volumes can be—and have been—written on this complex subject. For more comprehensive coverage, refer to the sources cited under "IP Law" in the References section at the end of this note. Finally, whenever working with IP internationally, be sure to consult the World Intellectual Property Organization (WIPO) and the specific laws of each relevant country.

IP Law

IP results from original and creative mental processes that are manifested in a tangible form and granted legal protection against unauthorized use. The U.S. has a time-honored legal tradition of vigorously protecting intellectual property rights to encourage technological progress by providing incentives to invent, invest in, and disclose new technology. Most laws pertaining to intellectual property are written by Congress, administered by the Patent and Trademark Office (PTO) under the Department of Commerce, and enforced through civil litigation in federal courts. For over 200 years, the PTO's mission has been to "promote the progress of science and the useful arts by securing for limited times to inventors the exclusive right to their respective discoveries (Article 1, Section 8 of the United States Constitution)." [18]

Over time, intellectual property law has come to recognize four major classes of IP, each with different legal status and protections:[19]

Patents. Patents provide exclusivity rights that protect inventions, such as a new process for making polymers or Velcro hook-and-loop fasteners, from unauthorized duplication. Applying for patent protection is time consuming (18-36 months), expensive ($10-50k), and rigorous (99% of applications are initially rejected by the PTO). During the application process, an inventor must prove—among other things— that his or her invention is novel. To be novel, an invention cannot have been previously known or used by others in the U.S., or previously described in any printed publication worldwide more than one year prior to filing a patent application. If the PTO does grant a patent, the patent owner has the exclusive right to make, use, and sell the invention for a non-renewable period extending the life of the patent, or 14 to 20 years from the date on which the original application was filed. U.S. patent law provides for the following three distinct types of patents:

- **Utility patent.** A utility patent protects any novel, useful, and non-obvious new process, machine, manufacture, or composition of matter for a period of 20 years from the date of application.

- **Design patent.** A design patent protects any novel, ornamental (rather than useful), and original (rather than non-obvious) design for an article of manufacture. Unlike utility patents, which protect an invention's function,

[18] US Patent and Trademark Office, "Our Business," PTO web page, www.uspto.gov (17 March 2001)

[19] Some of the following was excerpted from Constance E. Bagley, *Managers and the Legal Environment: Strategies for the 21st Century*, Third Edition (Cincinnati, OH: West Educational Publishing, 1999), Ch. 11

design patents protect an item's aesthetics or form from unauthorized imitation (e.g., the Mercedes-Benz 3-point star, the shape of the Coca-Cola glass bottle) for a period of 14 years from the date of application.

- **Plant patent.** A plant patent protects any distinct and new variety of plant that is asexually reproduce and that does not exist naturally. Like utility patents, protection extends for 20 years after the date of application.

Trademarks. Trademarks protect words, pictures, logos, names, and symbols used by a manufacturer or merchant to distinguish its goods and services from those of others in the marketplace (e.g., Coca-Cola, NBC chimes). By granting trademark protection, the government helps businesses by protecting marketing investments and helps consumers by safeguarding against confusion and deception in the marketplace.

Copyright. Copyright protection is automatically extended to all original literary, musical, dramatic, and audiovisual works. Copyright is unique from other forms of IP because it is automatically granted. That is, neither formal registration nor the display of a formal copyright notice is required for legal protection of qualified original works. Importantly, only the expression of an idea—rather than the underlying idea itself—is protected from unauthorized use.

Trade Secrets. Trade secrets are a broad category of IP that can cover almost any information that gives one company a competitive advantage over others. Examples of potential trade secrets include: formulas (e.g. Coke's secret formula), specialized manufacturing techniques, customer lists, plans, and sales and pricing data. Unlike the other three classes of IP law, trade-secret disputes are settled in state, rather than federal, courts. The specific application of trade secret law is sometimes unpredictable, since it can vary from one state to another. However, unlike patents, trade secret protection does not require PTO approval or full public disclosure, and is therefore advantageous in certain situations.

As summarized in **Exhibit 3**, the four classes of IP apply to different types of property, vary in duration of legal protection, and have specific advantages and drawbacks relative to one another. In general regardless of category, however, an IP owner who prevails in an IP infringement or misappropriation lawsuit will be awarded some combination of preliminary and permanent injunction, actual and punitive monetary damages, and reimbursement of reasonable legal fees.

Bayh-Dole – In addition to the basic types of IP, you should also be familiar with the Bayh-Dole Act, because of its enormously positive impact in accelerating the transfer of federally funded technology to the private sector by way of research universities and national laboratories. The Bayh-Dole Act created a uniform patent policy among federal agencies that fund research, enabling small businesses and non-profit organizations (notably universities) to retain title to inventions made under federally-funded research programs. Co-sponsored by Senators Birch Bayh of Indiana and Robert Dole of Kansas, the legislation was enacted in 1980 and amended under the 1994 Patent and Trademark Law Amendments Act. Major provisions of Bayh-Dole include:

- Non-profits and small businesses may elect to retain title to innovations developed under federally-funded research programs

- Universities are encouraged to collaborate with commercial concerns to promote the utilization of inventions arising from federal funding

- Universities are expected to file patents on inventions they elect to own and to give licensing preference to small businesses (e.g., start-ups)

- The government retains a non-exclusive license to practice the patent throughout the world and retains march-in rights.

The Act encouraged universities to participate in technology transfer activities. Prior to Bayh-Dole, fewer than 250 U.S. patents were issued to universities each year. In recent years, patents issued to U.S. universities have exceeded 2,000. There are now more than 200 universities engaged in technology transfer, eight times more than in 1980. Facilitated by Bayh-Dole, university technology licensing generated $41 billion in economic activity and supported 270,000 jobs in 1999, according to estimates by the Association of University Technology Managers (AUTM).[20]

IP Strategy

From the perspective of an entrepreneur trying to launch a new company based on IP spun from a preexisting institution, patents and trade secrets are far more interesting classes of IP than either trademarks or copyrights. Typically, a combination of patents and trade secrets will be bundled together in a spin out or licensing deal—patents grant rights to a new technology and trade secrets provide key pieces of specialized know-how required to successfully commercialize the patented technology. So for simplicity and clarity, the terms *intellectual property*, *intellectual assets*, and *IP* in this note refer primarily to patents and trade secrets.

IP strategy is most commonly defensive in nature. Practitioners we spoke with analogized a well-executed IP strategy to laying a minefield, erecting a fortress, playing a game of chicken, and exercising veto power. Generally, the strategy is to surround core *anchor* patents with as many related *peripheral* patents as possible to protect not only a company's specific approach, but also any other approach that could conceivably allow others to circumvent anchor patents. Companies must also decide, as a matter of strategy, which innovations to protect with patents and which to protect with trade secret law. Patents require full public disclosure but guarantee exclusivity once granted if they are not circumvented (by a different approach producing similar results) or successfully challenged in court. Trade secrets, on the other hand, apply to a much broader class of IP and do not require public disclosure, but they also do not provide exclusivity protection from competitors who independently develop identical IP. The tradeoffs between patent and trade secret protection vary on a case-by-case basis, and are central to a comprehensive IP strategy.

Because patents require full public disclosure but are generally used for defensive purposes, they are usually written in vague, obtuse language and are notoriously difficult to read. Engineers and patent attorneys work hard to make it as difficult as possible to reverse-engineer, learn from, or replicate their patents. As a result, patents historically have been terrible marketing documents, making it almost impossible to uncover hidden value or find potential matches when conducting a high-level search through a IP portfolio and relying solely on public patent documents. This is one reason why so few corporations succeed in licensing-out their IP, although new intermediaries (such as Yet2.com, discussed in the *Players* section) are addressing these information asymmetries.

[20] "AUTM Licensing Survey: FY1999," Association of University Technology Managers, Inc. Northbrook, IL. 2000

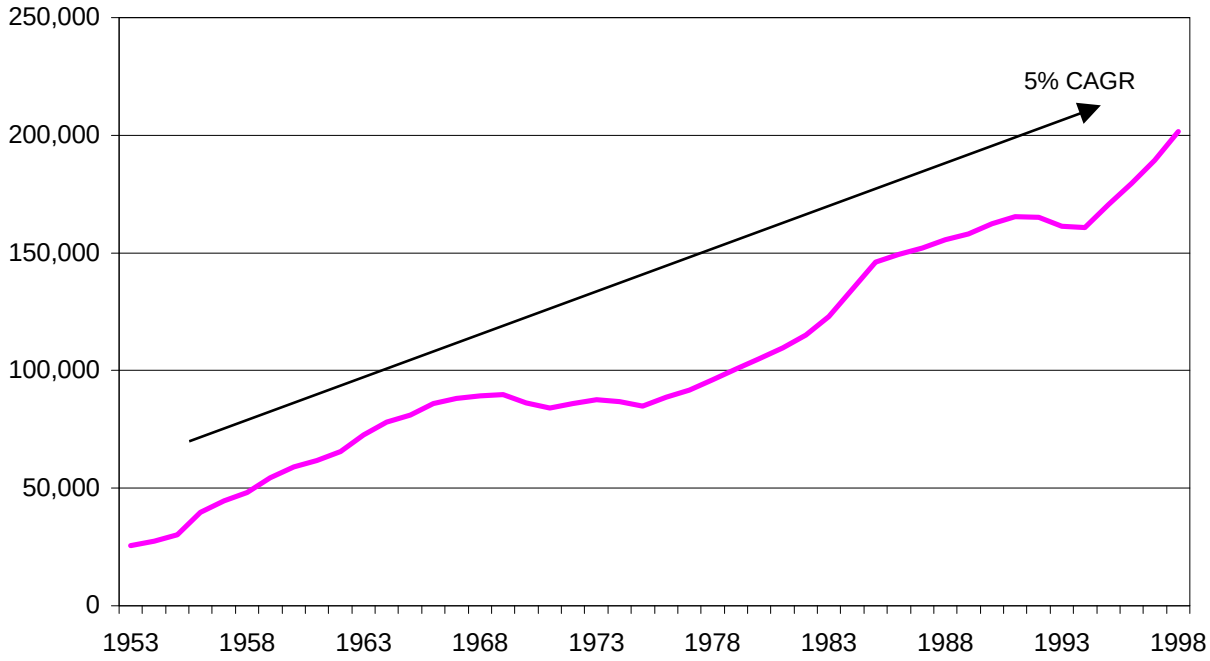
Exhibit 3 Comparison of Major Intellectual Property Categories

	Patent	Trade Secret	Trademark	Copyright
Applied To	New designs and inventions	Proprietary data and know-how	Identifying names and marks	Original expressions
Duration	20 years from date of filing utility or plant application; 14 years from date of filing design patent application	As long as the information remains valuable and is kept confidential	As long as the mark is not abandoned and steps are taken to police its use	Life of the author plus 50 years; for corporations, shorter of 75 years from publication date or 100 years from creation date
Advantages	Strong protection; provides exclusive right to keep others from making, using, and selling an invention. Protects the idea itself	Broad protection for sensitive and competitive information; very inexpensive	Protects marks that customers use to identify a business; prevents others from using confusingly similar identifying marks	Prevents copying of a wide array of artistic and literary expressions, including software; very inexpensive
Weaknesses	Must meet high standards of novelty, utility, and non-obviousness; expensive and time consuming application process; must fully disclose the invention to public	No protection from accidental disclosure, independent creation by a competitor, or disclosure by persons without a duty to maintain confidentiality	Limited scope; protects corporate image and identity but little else; can be costly if multiple overseas registrations are needed	Protects only the particular way in which an idea is expressed, not the idea itself; weakening protection for software; hard to detect coping in digital age
Required Steps	Must file detailed application with U.S. PTO; requires prior art search and hefty filing fees	Must take reasonable steps to protect from disclosure; generally requires a trade-secret protection program	Only need to use mark in commerce; however, filing with U.S. PTO is usually desirable to gain stronger protections	None required; however, notice and filing can strengthen rights and registration is required before an action for infringement can be filed in court
Internationally Valid?	No. Separate patent examinations and filings are required in each country	No. Trade secret laws vary significantly by country, and some have no trade secret laws	No. Separate filings are required in foreign jurisdictions, and marks available in the U.S. may not be available overseas	Generally, yes

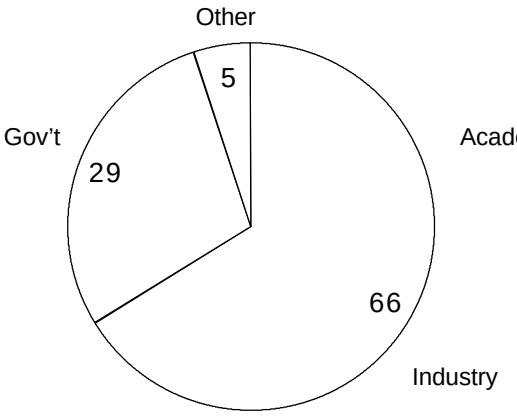
Source: Adapted from Constance E. Bagley & Craig E. Dauchy, *The Entrepreneur's Guide to Business Law,* pp. 471-72 (1998). Note: Get permission before publishing publicly.

Exhibit 4 U.S. Research and Development Spending

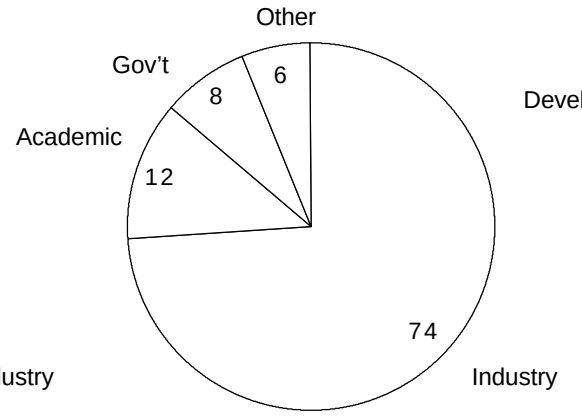
Total R&D Expenditures by Year
Millions of constant 1992 dollars



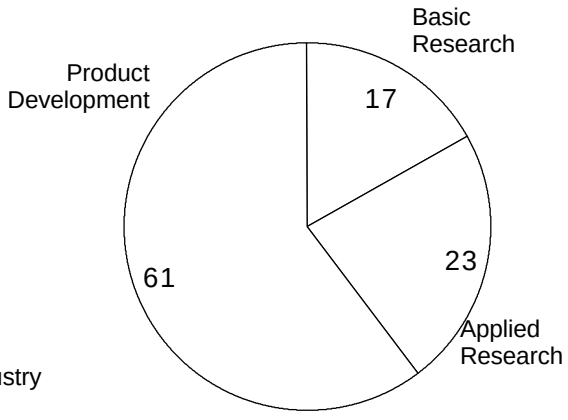
1998 R&D by Source of Funds
Percent



1998 R&D by Performing Segment
Percent

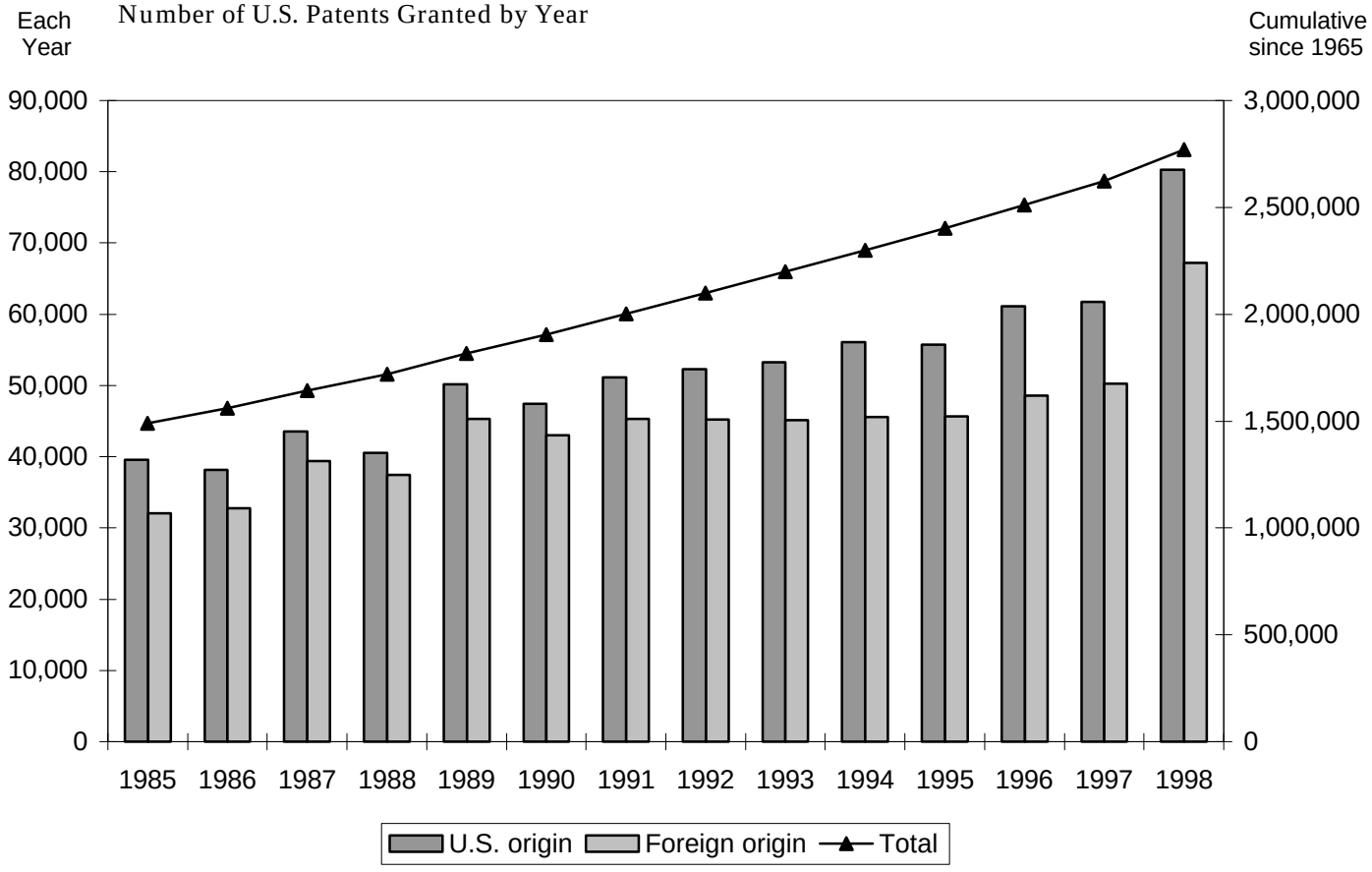


1998 R&D by Type of Work
Percent

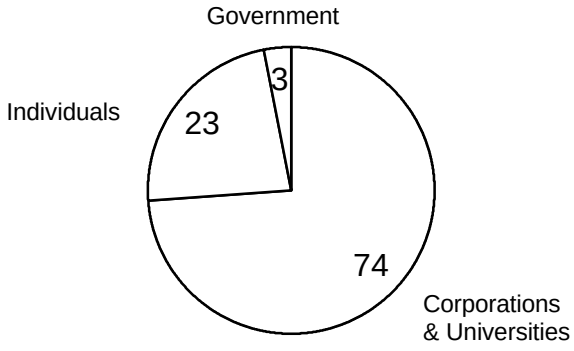


Source: National Science Foundation, Science and Engineering Indicators 2000

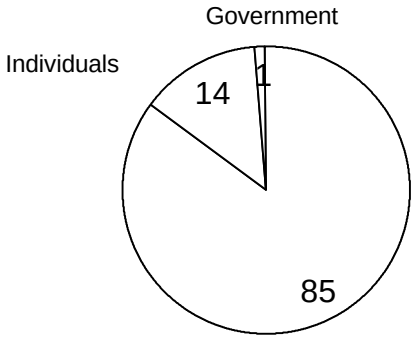
Exhibit 5: U.S. Patent Statistics



Total U.S. Origin Patents by Owner
Percent

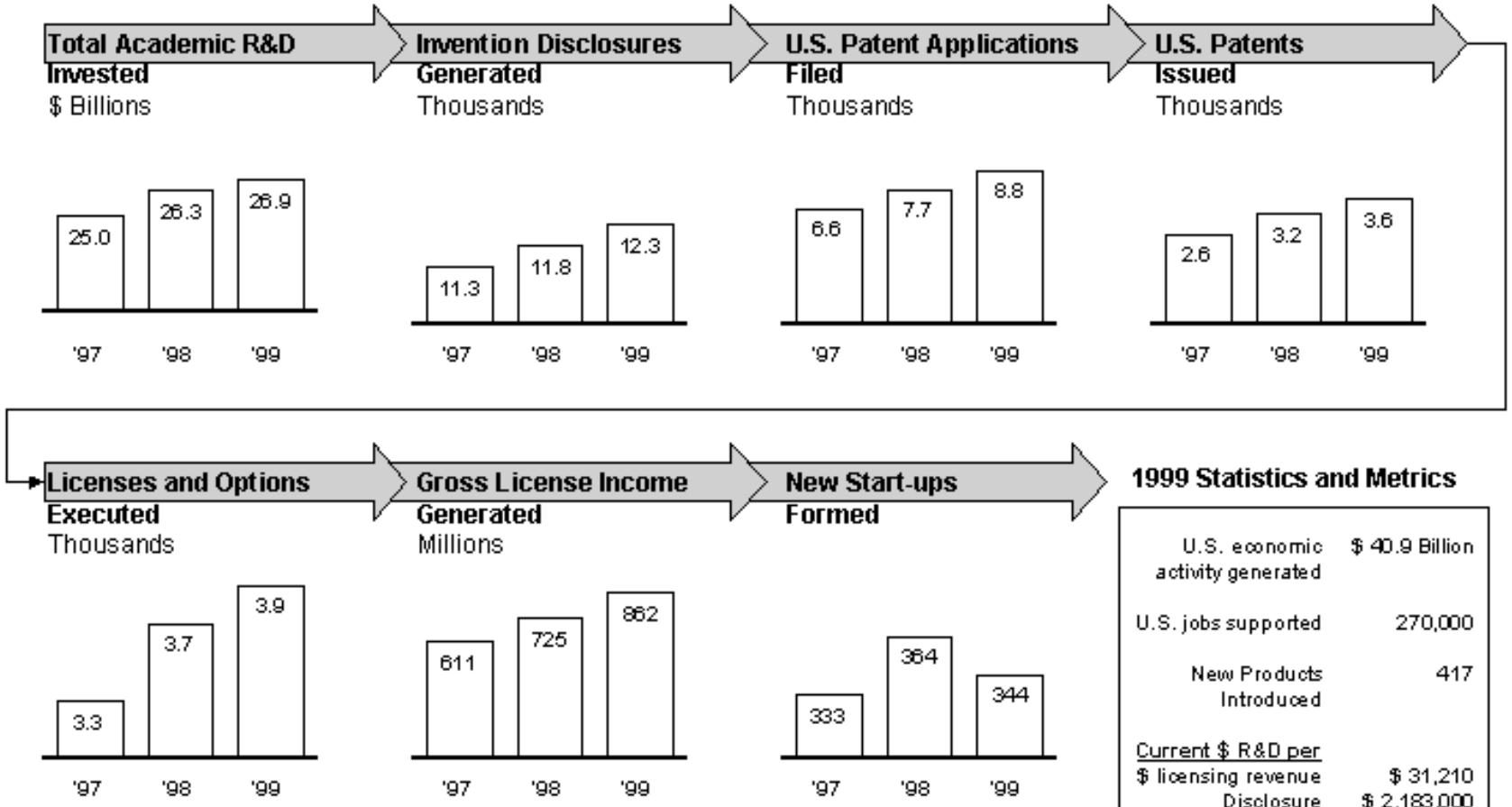


Total Foreign Origin Patents by Owner
Percent



Source: National Science Foundation, Science and Engineering Indicators 2000

Exhibit 6 University Technology Licensing Market



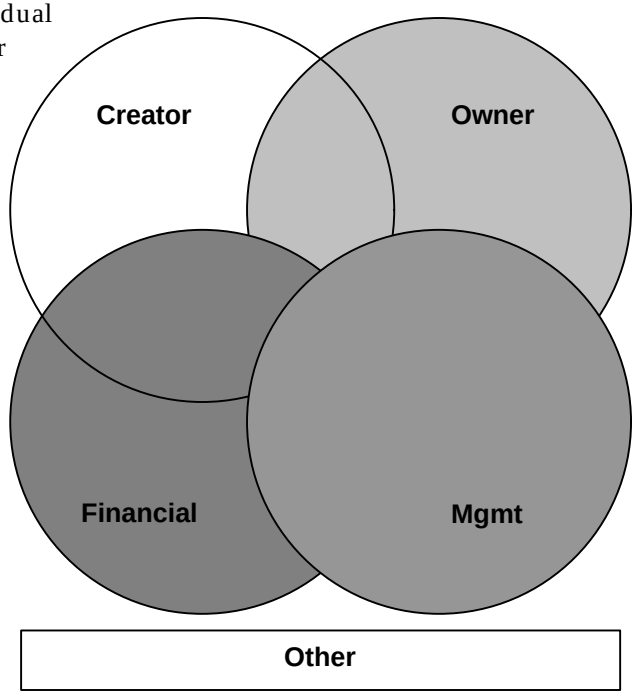
1999 Statistics and Metrics

U.S. economic activity generated	$ 40.9 Billion
U.S. jobs supported	270,000
New Products Introduced	417
Current $ R&D per	
$ licensing revenue	$ 31,210
Disclosure	$ 2,183,000
Patent application	$ 3,056,000
Patent issued	$ 7,348,000
License or option	$ 6,873,000
Start-up formed	$ 78,200,000
New product	$ 64,510,000

Source: AUTM 1999 Licensing Survey

Exhibit 7 Players in IP Spinout Process

IP Creator
- Team or Individual
- Technologist or Entrepreneur



IP Owner
- Universities
- Corporations
  - Fortune 100
  - Other public
  - Private
- Laboratories

Financial Partner
- VC
- IP Owner
- IP Creator
- Angels or other

Entrepreneur and Management
- Expert or Non-Expert
- Experienced or Inexperienced

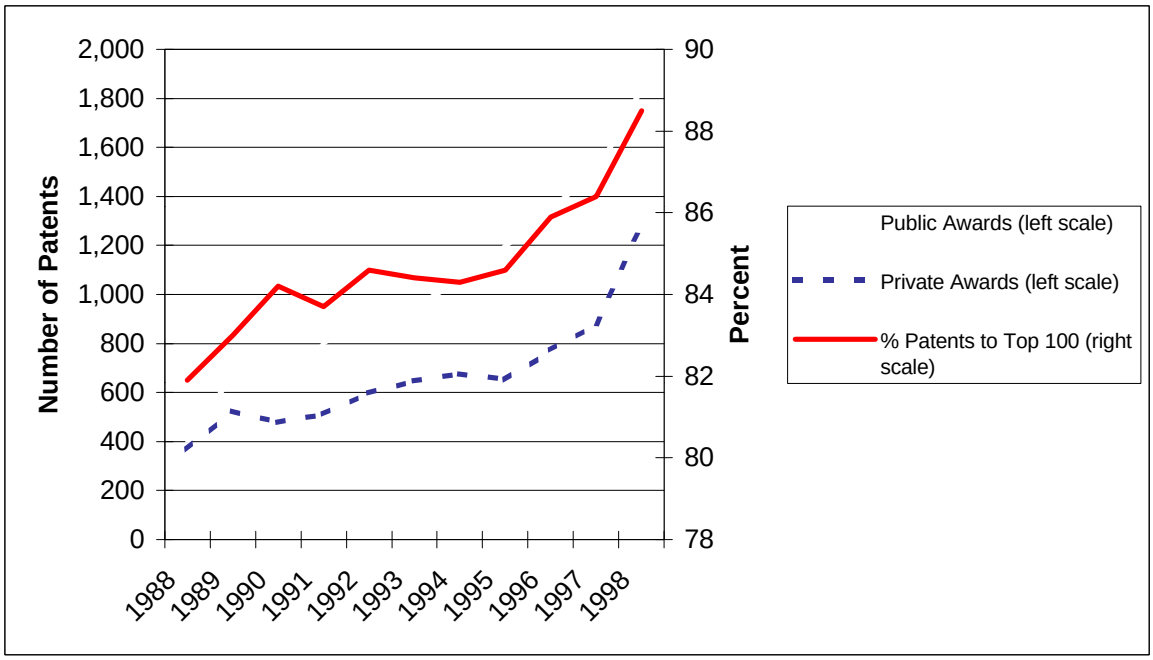
Other Supporting Players
- PTO
- Lawyers
- Intermediaries

So why is this so hard?
- Multiple players
- Roles often overlap
- Conflicting incentives
- Different objectives
- Wide variance by player sub-class (e.g., corp. vs. university IP owner)

…in addition to normal startup issues
- Size the pie
- Divide the pie
- Allocate risks:
  - Technical risk
  - Market risk
  - Execution risk
  - Legal risk
  - Financial risk

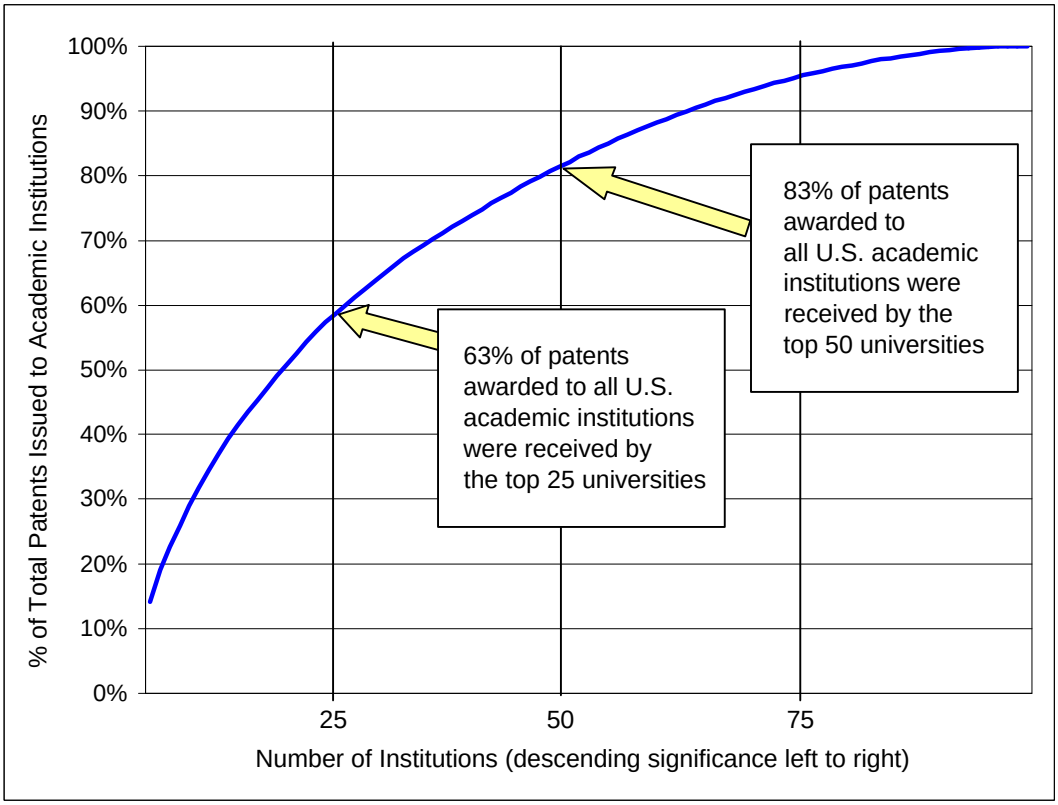
Result: inefficient process = opportunity

Exhibit 8a Patents Awarded to Top 100 Public and Private Universities



Source: Adapted from NSF, Science & Engineering Indicators – 2000, Appendix table 6-67

Exhibit 8b Concentration among Universities for Patent Awards in 1998



Source: Adapted from NSF, Science & Engineering Indicators – 2000, Appendix table 6-67

Exhibit 9 MIT TLO Statistics (CM)

	FY 2000	FY 1999	FY 1998	FY 1997	CAGR
Number of Invention Disclosures Total	423	381	356	360	6%
Number from On-Campus	378	331	310	324	5%
Number from Lincoln Labs	45	50	46	36	8%
Number of U.S. Patents Filed	329	260	276	195	19%
Number of U.S. Patents Issued	150	143	119	130	5%
Number of Licenses granted (not including trademarks)	80	69	73	59	11%
Number of Trademark Licenses granted	10	18	0	0	
Number of Software End-Use Licenses granted	59	110	208	96	-15%
Number of Options granted (not including options as part of research agreements)	22	28	25	11	26%
Number of Companies started (venture capitalized and/or with minimum of $500K of other funding)	25	17	14	8	46%
Gross Revenue (in millions)	$ 34.5	$ 19.9	$ 18.6	$ 21.2	18%
Royalties	$ 16.8	$ 14.3	$ 15.4	$ 13.2	8%
Patent Reimbursement	$ 3.2	$ 2.3	$ 2.3	$ 2.2	13%
Equity Cash-In	$ 14.5	$ 3.3	$ 0.8	$ 5.8	36%
Overhead	$ 2.2	$ 2.2	$ -	$ -	
Expenditures on patents	$ 6.2	$ 5.9	$ 5.1	$ 4.2	14%

M.I.T.'s FY 2000 R&D Budget ($ millions)	$ 727.6	100%
- On-Campus Federal	$ 253.7	35%
- On-Campus Industrial	$ 73.6	10%
- Other (Non-profit, Internal, etc)	$ 56.6	8%
- Lincoln Laboratory Federal	$ 343.7	47%

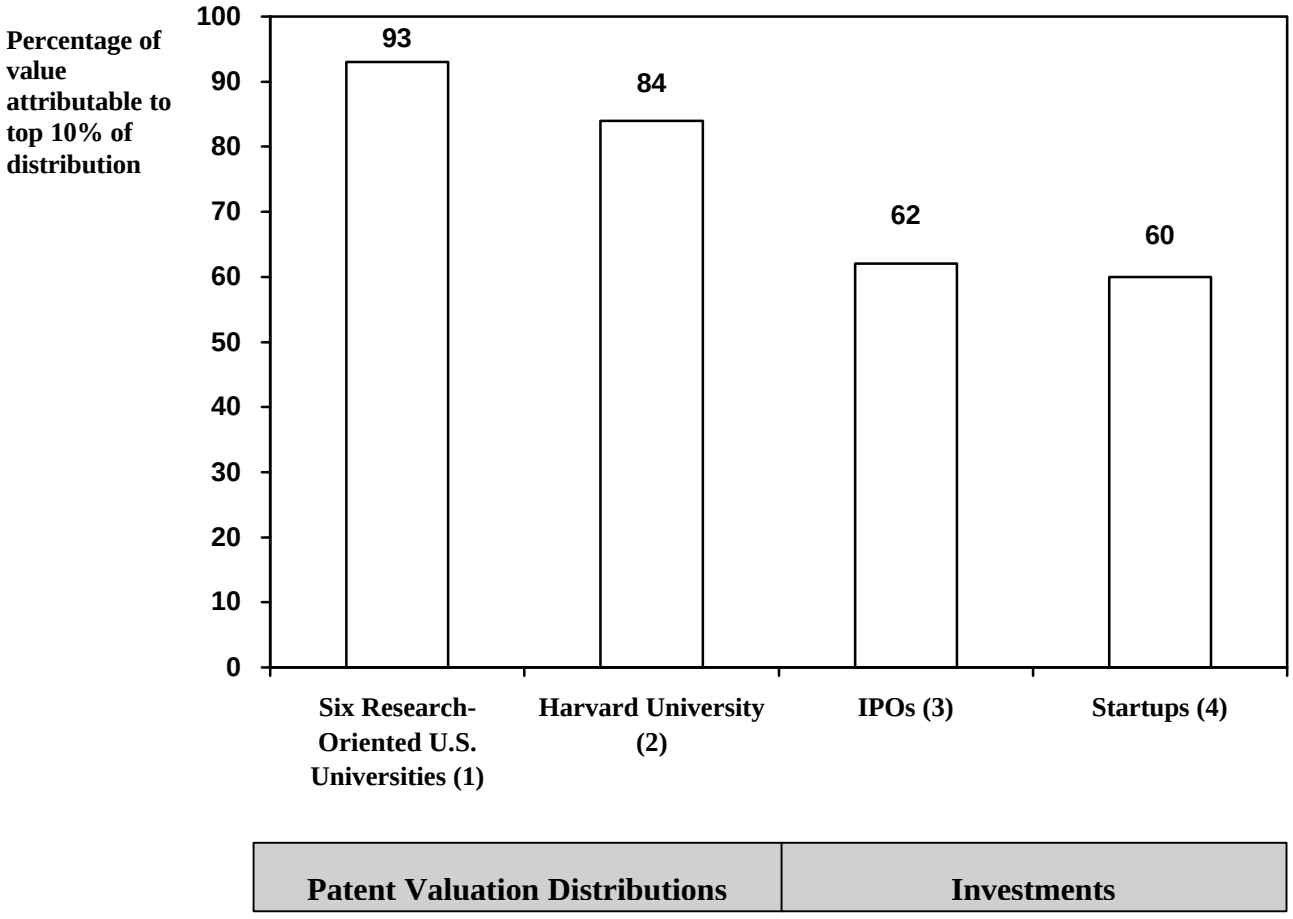
Source: http://web.mit.edu/tlo/www/fy00.html and http://web.mit.edu/tlo/www/qfa.html (accessed April 11, 2001)

Exhibit 10 Corporations vs. Universities as Sources of IP (CM)

	Corporations	Universities
Type of IP	• Applied Research and Development focus leads to more advanced, proven technology, often with a specific target market.	• Predominantly basic research results in early stage, nascent technology, often with no defined business application.
Objectives	• To generate profits, establish and maintain a competitive advantage, and provide a good return on investment to shareholders.	• Disseminate technology to attract federal funding for more research. • Attract talented students and faculty.
Risks to spinning out	• Divulge too much proprietary information, exposing core business to competition. • Winner's curse: spinning out a big winner will leave shareholders upset that the technology wasn't exploited in-house.	• Being perceived as 'pipelining', tainted by commercialism . • Risk that the team to which the technology is licensed isn't the most capable, likely to commercialize.
Issues	• Companies are not structured or motivated to actively market their technology for license. • Further investment is often unavailable. • Parent may want to sit on the Board. • May require access to technology in the future.	• Harvard and MIT won't allow research to be sponsored if researcher has an equity stake. • Faculty inventors must be leaders in their field to attract VC backing.
Performance Metrics	• Driven almost exclusively by economic returns. • No 'cost' for not exploiting licensing opportunities.	• Judged on number of licenses and options, the portion of the portfolio that has been licensed, the portion of the portfolio that has ended up in products.
Strengths	• Proven applications, lower uncertainty • Better chance for technology to come with an application and market. • Shorter times-to-market • Ability to preserve "group DNA" by spinning off the entire working group • Access to parent; some credibility based on parent's brand name.	• Relatively easy access through academia. • Licensing Office *wants* to license the technology out, so a strong dedicated team will have considerable power to renegotiate licensing terms. • Universities primary business is not commercializing technology, so they do not value opportunities as a VC would
Weaknesses	• A corporation is not likely to divulge the areas in which they are willing to negotiate – the process is very proprietary • Incremental technology (e.g., if you license this process improvement, you will improve yield by 1.25%) • The IP dealmaker does not usually have the technical expertise to make the connection with the scientist / buyer • Cherry-picking the corporate IP assets won't last long and so is unsustainable as a long-term strategy • More difficult to convince a corporation that you can add value in commercializing their technology	• Nascent technology not suitable for startups – still very much a science project • Need the university's cooperation to expand the patent portfolio to protect the future course of the technology • Universities primary business is not commercializing technology, so they are slow. • Universities are under pressure to publish quickly, which is at odds with filing for U.S. and international patent protection • University's goal of propagation may conflict with licensor's goal to establish a legal monopoly, shutting out competition.

Source: Adapted from Casewriter Interviews.

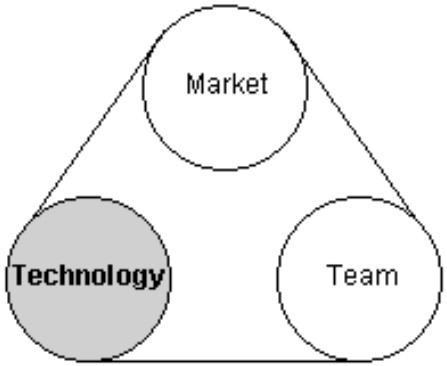
Exhibit 11 Concentration of Value in IP Assets

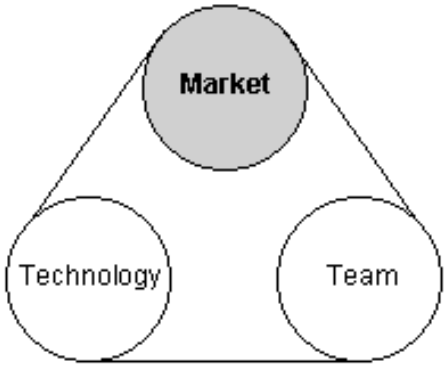


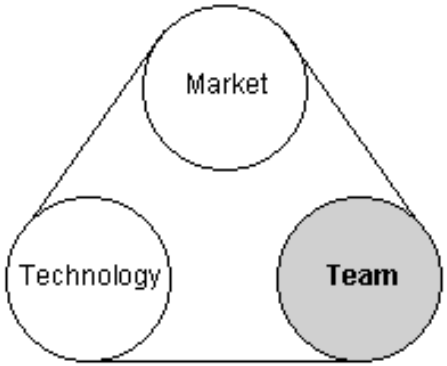
(1) Royalties received from 1991 to 1995 on inventions made at six research-oriented U.S. universities
(2) Royalties received between 1977 and 1995 on 188 patent bundles licensed by Harvard Office of Technology Licensing
(3) Appreciation of common stock values as of 1995 for 131 high-tech companies which had IPOs between 1983 and 1986
(4) Value appreciation experienced on 1053 investments made in startup firms by U.S. venture capital firms between 1969 and 1988

Source: Technology policy for a world of skew-distributed outcomes, Scherer and Harhoff, Research Policy, April 2000

Exhibit 12 Three IP Search Strategies



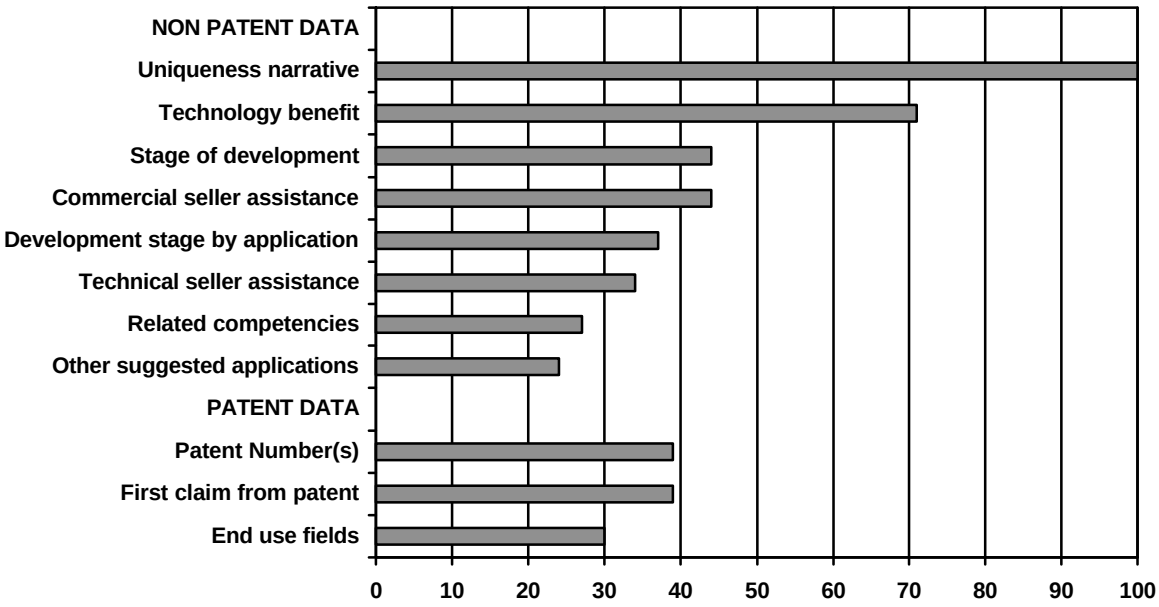




Search Focus	**Interesting Technology** 1. Focused search for new and innovative IP, either: ▪ Narrow technology field ▪ Single source (e.g. lab) 2. Evaluate and prioritize market applications for IP	**Market Need** 1. Identify unmet, compelling market opportunities 2. Understand customer needs and define product solutions 3. Search for leading IP to build product and address needs	**Technical Team** 1. Search for a technical team with existing IP 2. Evaluate quality of team and market for potential IP applications
Typical Entrepreneur Profile	**Techie** ▪ Science or engineering undergraduate or graduate degree ▪ Deep understanding of specific technology field, limits, trends	**Industry savvy** ▪ 2-5 years of industry experience ▪ Deep understanding of market and customer needs ▪ Existing industry contacts	**Generalist** ▪ Good 'all around athlete' ▪ Focused on choosing people to work with more than technology or application
Key Skills and/or Resources	▪ Evaluate technical merits of IP and spot potential applications ▪ Access to source of technology	▪ Identify market opportunities, know customers, understand products ▪ Deep sector knowledge, experience	▪ Network of leading technologists ▪ Ability to bond with technical team
Examples	▪ Kent Kalar at Extreme Devices ▪ Lars Johnsson at LNVG	▪ Jason Rottenberg at MILCOM	▪ Russ Wilcox at e-Ink ▪ Greg Schmergel at Nantero

Exhibit 13 Key Attributes for IP Evaluation

The eleven most important attributes (of thirty-three) given by technology buyers of what they would like to see in a patent description. Note that only three are available from a patent description today.



Source: Arthur D. Little, Yet2.com

Exhibit 14 Deal Terms[21]

Below is a table listing the most important terms included in typical licensing spinout arrangements. Lawyers specializing in these transactions practice at most major law firms, and can provide needed structuring counsel.

Term	*Definition and common term*
• Field of Use – Application	Patent licenses can limit the application the licensee can use the patent for. Owners of well-developed patents with multiple existing uses are likely to limit the entrepreneur's applications. Owners of undeveloped intellectual property are more favorable to unrestricted use. Restrictions limit option value of the firm, increase risk of failure, and may reduce the interest of funding sources.
• Geographic Scope / Territory	Similar to field of use, geographic constraints are typical with more mature intellectual property.
• Access to ongoing research	Licensee may wish to have access to the licensor's ongoing research in an area.
• Future related patents	Some spinouts have rights on future advances of the core technology made by the licensor.
• Guarantees and warranties by licensor	Licensees protect themselves from improperly filed patents, licensor misrepresentation, etc.
• Covenants by licensee and clawback arrangements	Licensors want commitments from the licensee that the licensee is going to use best efforts to commercialize the technology (MIT's agreement states, "COMPANY shall commit itself to a thorough, vigorous, and diligent program of exploiting the patent right so that public utilization shall result there from"). Licensors can protect themselves from poor performance by the licensee by either allowing themselves to get the technology back if the licensee fails to hit certain milestones. This is useful for the licensor in situations where the fees are related to the performance of the entity, such as in royalty arrangements. For this reason, licensors typically require clawback rights or a minimum quarterly maintenance fee. Tough clawback agreements can add substantial risk to a venture. Covenants include minimum capital raised, working model development dates, minimum R&D dollars, minimum net sales amounts, etc.
• Exclusivity	Owners of technologies that have been completely developed and may be industry standards (such as high-definition TV technologies) tend to be licensed on a non-exclusive basis. Licensors of technologies that still require significant expense to commercialize usually demand exclusivity.
• Duration	The entrepreneur usually desires perpetual licenses if the technology is critical.
• Sublicensing	Sublicensing rights provide additional flexibility to the venture., but make it hard for IP owners to enforce terms and prevent abuse. Sublicense income is treated differently than net sales – sublicense income is usually shared at a higher rate (such as 50%) than other royalty rates.
• Retained Rights	IP Owners may require that they are also able to use the patent under certain circumstances. Under the Bayh-Dole Act, the Federal Government retains royalty-free, non-exclusive, non-transferable license of government-funded patents.
• Confidentiality and Publicity	Terms of the licensing deal may be confidential; use of institution names may also be restricted.
• Reports and Records	IP owners require financial records in order to verify the royalty income streams. Universities may require written plans documenting how the company intends to commercialize the licensed technologies.
• Patent Prosecution and Infringement	The responsibility of Patent prosecution may fall on the licensor, licensee, or both.
• Consulting, technical assistance, and other knowledge transfer arrangements	Intellectual property usually requires the inventor or other familiar party to work closely with the startup to transfer the knowledge. In cases where the inventor does not join the startup, formal arrangements with the inventor's employer should be part of the licensing agreement.
• Consideration (valuation and form of payment)	Consideration received by the licensor varies substantially across deals. Consideration may include components of equity, fees paid up front, annual fees, sales royalties, and profit royalties.

[21] These terms were accumulated through access to the MIT Exclusive Patent License Agreement, our interviews with practitioners, Technology Licensing by Russell Parr and Patrick Sullivan, and numerous other articles.

Notes