Supporting the Entrepreneurial Mindset: Establishing Intellectual Property Infrastructure to Encourage Student Innovation

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ABSTRACT
As universities seek to provide entrepreneurial experiences to their students, it is important to examine existing policies governing intellectual property developed on campus. Often, policies that served institutions well during a time where investment in student projects (in terms of materials and heavy equipment) was significant may discourage student innovation in the digital environment. In addition, existing policies may only contemplate projects developed by students and faculty, creating potential obstacles to working with industry sponsors. As in any legal scenario, whether a policy is sufficient for the activities of a given institution may not be determined until an issue arises. This paper will review some of the major intellectual property issues faced by universities seeking to commercialize student projects, including managing IP ownership when industry sponsors or government funding are involved. It will conclude with common scenarios that arise in this context and ways to address them.

Introduction
Universities both in the United States and globally are increasing efforts to encourage students to be more entrepreneurial, for good reason. As Carl J. Schramm, President and Chief Executive Officer of the Kauffman Foundation, stated: “There is little doubt that ours is increasingly a knowledge economy in which intellectual property is the dominant force, the capital that will continue to drive economic growth” (2004). College graduates today must be ready to deal with a dynamic workforce, where their job description at age 26 may change dramatically by the time they are 36, and so on, as technology’s pace continues accelerating.

In addition, as federal and state funding falls, institutions look to the private sector for financial support, and often see student projects and research as potential sources for raising revenue through commercialization. In the rush to establish innovation competitions, place industry projects in the classroom, and create incentives for students to develop and commercialize their own ideas, universities may overlook the impact of their intellectual property policies. An old infrastructure drafted in an era when student projects were substantially supported by expensive machinery and extensive faculty time may no longer adequately serve in an environment where a student’s idea may manifest into the next Facebook or Google.

This paper looks at ways universities can evaluate their IP policies to ensure they will help, and not hinder, efforts to encourage students at all levels to develop commercially-ready products or services. It bears noting that this paper is not a discussion of whether or not universities should encourage commercialization, nor a discussion of whether or not universities should or can expect to see significant financial revenues from student projects.

Types of Intellectual Property
Patent rights are the primary type of intellectual property addressed by university policies. While there are three patent types available in the United States (design patents that protect non-functional product designs, plant patents that protect distinct and new asexually re-
produced plant varieties, and utility patents), the common use of the word “patent” refers to utility patents. A utility patent protects novel, non-obvious, useful processes, machines, articles of manufacture, or compositions of matter, or new and useful improvements of the same (35 U.S.C. § 101). The process of applying for a patent is time-consuming and can be very expensive. Students may create a patentable technology in a senior project class, as graduate students in the lab, or even on their own time using university laboratory resources. In 2005 (the last year for which the USPTO provides statistics on university-registered patents), 2,275 patents were assigned to a US college, university, or association of US colleges and universities (USPTO 2005). This number represents 1.89% of the total utility patents issued in 2005, an increase from 1985, when only 589 utility patents (0.82% of total patents issued that year) were assigned to US academic institutions (USPTO 2005).

Copyright protection is often acknowledged in university IP policies, but still bears more than just a passing glance. Copyright law protects original works of authorship fixed in a tangible medium of expression. Common examples include written works (e.g., dissertations, textbooks), but copyright also protects choreography, architectural works, and software. Obtaining copyright protection is straightforward, since the protection automatically attaches to the work once it is created. Federal copyright registration is available for a nominal fee, and allows the holder of the registration to sue for infringement. Since copyright applications are not examined with the same level of scrutiny applied to patent and trademark applications, the copyright process is relatively swift.

Trademarks are words, designs, and even sounds or scents that identify the source of goods or services. For instance, the Nike swoosh logo informs the consumer that the shoes he or she is purchasing were manufactured by the Nike corporation. In the university setting, trademark law is primarily implicated in two scenarios: student or third party use of university-owned trademarks, and trademarks adopted by student-owned startups created as part of a course or co-curricular activity. Trademark protection is generally obtained after less time and investment than patent protection.

Mask work protection applies to the design of the layout on a semiconductor chip. Mask work protection applies just to the design and not to the functionality of the chip (17 U.S.C. §§ 1901-1902). An IP policy should consider mask works along with other tangible property that may not be protected by other IP laws, but may still have commercial value (usually referred to as “tangible research property” or TRP). TRP examples include biological cell lines and product prototypes. Tangible materials that result from university-supported research are often claimed by universities in their IP policies (for examples, see MIT 2006 and Stanford University 1983).

Finally, a university may wish to include trade secrets in its policy. Trade secrets may not be registered with a government body (or with anyone – after all, once the technology is disclosed to third parties, it is no longer a secret). However, trade secrets can still be successfully commercialized – Coca-Cola is the most famous example. In one case, a university IP policy that was silent on the issue of trade secrets actually cost researchers money. Dr. Marvin Speck, a faculty member at North Carolina State University, developed new methods for preserving lactobacillus acidophilus and introducing the bacteria to milk without compromising the milk’s flavor. The university partnered with the North Carolina Dairy Foundation, which began successfully selling milk treated with Dr. Speck’s secret methods under the trademark Sweet Acidophilus. Dr. Speck sued after his requests for royalties were denied. The court held that since the research occurred at the university with the university’s resources, “the secret process developed through the research of the plaintiffs belonged to the University absent a written contract by the University to assign.” This case also supports the notion that if a university’s policy omits a particular flavor of IP, courts are not willing to extend existing provisions to cover the omitted types. If a university wants to be absolutely certain that its IP policy will not cover trade secrets, however, it is still best to clarify this intent in writing.

With an understanding of the available types of IP, the rest of the paper will focus on how to structure ownership of that IP to encourage student innovation. With the exception on the discussion of the Bayh-Dole Act, which specifically applies to patents, the use of the term “IP” should be construed to include all of the types of intellectual property discussed above.

Encouraging Commercialization: Student-Created Intellectual Property on Campus
An IP policy should be equitable, clear, and efficient. An equitable policy takes the interests of all parties – including the inventor/creator of the IP (whether student, faculty, staff, or external party) – into consideration. An equitable policy will also help attract new faculty and encourage students and faculty to follow invention disclosure policies. A clear policy is understandable by all parties. While it may be necessary to employ legal terms of art in the policy itself, a university should provide educational materials suited to each constituent. An efficient policy encourages the most efficient use of the IP created at the university. This section addresses some parameters for an equitable and efficient policy from the perspective of encouraging student IP development and commercialization.

1 The PTO reports an average pendency of 34.6 months (USPTO 2010). According to PTO Director David Kappos, as of May they had a backlog of 1.2 million applications, 700,000 of which had not yet received even a preliminary review (Schmid 2010).
3 “[A] bacteria that minimizes or eliminates certain undesirable micro-organisms in the human intestinal tract… believed by many in the scientific community to contribute to more favorable digestion…and longevity.” Ibid., 140.
4 Ibid., 143 (emphasis added).
Equitable Intellectual Property Policies

IP funded by the university

Many universities apply a uniform university-inventor/creator split of revenue from the license or sale of IP interests. Others provide for a graduated difference between shares, often with the university’s share of revenue increasing as the total revenue increases. Although perhaps more workable on paper than other models, if a student perceives that the institution’s share of the revenue will be more than what the institution invested, he or she may be unwilling to involve the university in the project – or to pursue the project at all.

There are two ways to address the concerns posed by a one-size-fits-all policy. One is to create a graduated royalty scale or formula that factors in the university’s investment in the intellectual property. A university will receive a higher share of revenue from commercialized IP if it provides the use of expensive equipment, materials, faculty time, etc., and the resources toward protecting the IP (e.g., filing fees, attorney fees) than if it provides the basic resources received by all students (normal faculty office hours, student-use computers, etc.) Since students tend to believe that they are the primary owner of IP that they work on (Silvernagel et al. 2009), a policy that articulates that the university’s share is commensurate with its investment will relieve students of skepticism that could be attendant to a one-size-fits-all revenue split. A disadvantage to this approach is the difficulty in quantifying the types of university investment. Placing language that the revenue split will be determined by a research committee or technology transfer office could remove the transparency altogether and possibly create bottlenecks later in the process.

Another approach is to set a one-size-fits-all policy for IP developed with significant university resources, but to also create an IP protection scheme for work that falls outside of that definition. In this approach, the term “significant” is clearly defined, and educational materials should provide multiple examples. Revenue from IP developed with “significant” resources would be split between the university and the student. A policy that provides the student with greater than 50% of the revenues will most likely be viewed as creating more incentive for development than one that gives the university the same or greater share.

Since students will likely create IP without “significant” use of university resources, this second approach will also provide students the option to use the university’s IP prosecution/protection and commercialization resources. The university will essentially stand as the student’s agent in obtaining the proper IP protection and developing plans for commercialization. In exchange for this support, the university would take a set percentage of revenue. This approach may alleviate the efficiency concerns posed by a model based strictly on variations in types of university contribution. Universities can address the objection that “significant use” is overly vague by stipulating within the policy that all resources are “significant,” except those that fall into an enumerated list (e.g., student-issued laptops).

A remaining issue is the understanding that “university resources” rarely come from a single source. When a university receives its portion of royalties, the royalties will likely need to be distributed among units (academic departments, technology transfer office, etc.). An individual unit’s contribution of tangible resources is easily quantifiable, but what to do with faculty/staff time or equipment use time? A professor may feel his or her hands-on work with a student in the lab merits more royalty income feeding into the chemistry department than the technology transfer office should receive for its assistance in filing the patent application. Defining such a distribution model is outside the scope of this paper, but it will be important for universities to work with individual units in advance of implementing an IP policy. Institutions must ensure that the policy provides clear guidelines for determining the value of each unit’s contributions to the development of student IP. Alternatively, institutions can follow the lead of schools like San Diego State University, which provides pro-rata compensation to each unit for its “out of pocket” expenses (2003). This definition will likely facilitate faster implementation of a policy than negotiating with individual units.

IP funded by industry

When a university involves external parties in the invention or creative process, the IP ownership scheme becomes more complicated. An IP policy should contemplate the rights of industry firms that might contribute funding or materials to student projects. Some universities allow sponsors the right of first refusal to negotiate licenses to the funded research results (Argyes and Liebeskind 1998). Others provide sponsors the full, exclusive rights to the funded research results, retaining only a research license that allows the university to teach the project within the classroom. In either event, the university should communicate to the student the nature of the relationship with the outside sponsor and the impact of that relationship on any IP developed by the student in the course. A statement by the professor on the first day of the class or of the project would suffice.

Another approach to industry sponsorship of student projects is to give students a choice of working on a sponsored project (normally

that is, a 50/50 split, where each party receives 50% of the revenue. Most universities claim, through their policies, interest in any IP developed with significant use of institutional resources. Other institutions take a broader approach – for instance, The Johns Hopkins University claims a right to IP developed with “financial or other support, regardless of origin, which is used in the discovery or development of IP” and is provided through University channels, without distinguishing the magnitude of the University’s contributions (The Johns Hopkins University 2001).

Another possibility is to end presumptive ownership by the university altogether, and vest ownership in the student with the option to use the university IP protection/prosecution process in exchange for some percentage (Kenney and Patton 2009).
with the requirement of ceding all rights in any resulting IP related to the project) or developing a project on their own. This will not be an appropriate framework for all courses, but deserves consideration particularly in capstone courses, provided that the student-developed project meets the same standards of technical knowledge, business acumen, and rigor as the funded project. Universities can also offer students co-curricular opportunities such as design competitions, where participation is rewarded with the opportunity to receive recognition and perhaps a prize. In any instance where students will give up all rights to IP they develop, clear language, preferably in a signed contract, is important to avoiding misunderstandings that can result in student dissatisfaction, withdrawal from the university, and litigation.

**IP funded by government**

The 1980 University and Small Business Patent Procedures Act (commonly referred to as the Bayh-Dole Act) encourages universities to commercialize inventions developed using federal funds (35 U.S.C. § 200). Bayh-Dole stipulates that the federal government, by default, owns intellectual property developed with its funds, but allows a university to retain the rights to such IP if the university applies for a patent, actually makes use of the invention, and understands that the federal government retains a royalty-free right to practice the invention (35 U.S.C. § 200).

The primary impact of the Bayh-Dole Act on student rights in projects suddenly became unclear after the United States Court of Appeals for the Federal Circuit's 2009 opinion in Stanford v. Roche. In that case, an issue arose as to whether the Bayh-Dole Act not only permits universities to own IP developed with federal funds, but in fact overrides any preexisting contracts between universities and their students or researchers. Under that argument, an IP policy placing ownership of intellectual property in the inventors' hands would be superseded in the event that the IP was developed by federal funds. The Federal Circuit found against Stanford on this issue, holding that Bayh-Dole does not override existing contractual agreements between a university and its researchers. Stanford appealed, and the Supreme Court may review the issue this term.

While the issue of ownership is sorted out, project-specific contracts may be an appropriate stop-gap measure. Beyond the possible implications of Roche, there are not many restrictions inherent in federally funded research that would impact whether a student could own all or part of an invention resulting from that research. Thus, the question of appropriate ownership distribution discussed above and the efficiency discussion below apply to government-funded research as well.

**Another equitability factor: Whether the university will commercialize IP**

The other consideration in creating an equitable IP policy is the likelihood that the university will actually derive value from commercializing any student IP over which it obtains ownership. If a policy by default vests sole ownership of student IP in the university, and students see that the university is not taking steps to commercialize the property, they will be less likely to understand why they are required to cede their rights. If the university does not have a swift process for review of student-created IP—ideally a process that, if it begins with a presumption of university ownership, creates an option or a trigger for the rights to revert to the student – students may not find the tradeoff to be fair. This may have a chilling effect either on student innovation or disclosure of student innovation.

**Efficient Intellectual Property Policies**

A university IP policy should make efficient use of intellectual property. For instance, if a student's invention must be automatically assigned to the university upon conception of the idea, the onus will be placed on the institution to protect and commercialize the invention. In a survey of university technology managers, respondents reported that less than half of the inventions disclosed to their institutions were licensed (Jensen and Thursby 2001). If the universities in that survey hold sole title to those disclosed inventions, more than 50% of projects have been developed but not commercialized at all. Students may be more likely to distrust a process that has such an inefficient aspect. If a student inventor is interested in pursuing commercialization, and there is less than a 50% chance the university would ever make that effort, efficiency may support providing the student an option to personally take an invention to market.

8 A next area for study in the legal realm is whether a university can bind a student to its IP policy through a student code of conduct. The ability of a university to bind faculty members to an administrative IP policy is more straightforward. Even if the faculty member does not sign an express contract to assign a particular invention, an administrative policy requiring faculty to assign all inventions may suffice, particularly if combined with language in the faculty member's contract that references the policy. Chou v. University of Chicago, 254 F.3d 1347 (Fed. Cir. 2001). In the meantime, a simple assignment contract for the student to execute combined with clear communication of IP policies should protect a university's interest in IP assigned to it by students.

9 In brief, Roche purchased the company Cetus's PCR (polymerase chain reaction) business. Cetus had partnered with Stanford University scientists to use funding from the National Institutes of Health (NIH) to develop and patent a method of using PCR to measure HIV concentration in blood plasma. After Roche's purchase of Cetus, Stanford offered an exclusive license of the patent to Roche. Unable to come to a consensus on whether Stanford even owned the patent, the discussion broke down and Stanford sued Roche for patent infringement. Roche argues that Stanford has no standing to sue because it is not the rightful owner.

10 One difference does remain, but will not be discussed in depth. Bayh-Dole allows the government to retain “march in” rights to re-take title to a patented invention under certain circumstances (35 U.S.C. § 203). Such circumstances include waste by the university (i.e., failing to take appropriate steps to make practical application of the invention). (University and Small Business Patent Procedures Act 1980) 35 U.S.C. § 203(a)(1).

11 Although a 50% chance is not insignificant, the reasons behind decisions not to commercialize IP may sometimes be a lack of time rather than the merits of the intellectual property. If a student has the ambition and dedication to take IP to market where a university may simply be too overwhelmed, a university should consider that empowering the student may be more efficient for all involved.
Efficiency plays not only into the ownership presumption, but into any revenue sharing structure as well. In the aforementioned survey, respondents identified cooperation by the inventor and licensee in further development as a requirement for successful commercialization (Jensen and Thursby 2001). The authors conclude, “[t]he license contract must therefore specify payoffs in a way that induces [inventor] effort.” (Jensen and Thursby 2001, 247). Royalty payments over time or an equity stake in the commercialized IP can help (Jensen and Thursby 2001).

There may not be one “most efficient” way to structure IP ownership that will satisfy the needs of all universities. A university should consider the resources it is able to dedicate to the IP process, the likely return on investment of such protection and commercialization, the likelihood that it will actually take the steps necessary to commercialize a given invention, and the desired approach to encouraging student-inventor participation in the commercialization process.

Clear and Well-Communicated Intellectual Property Policies

An IP policy must be clear. Vague language can create unforeseen loopholes that circumvent everyone’s best interests. There have been several instances where researchers sued their universities, alleging they were excluded from patents on which they were inventors or alleging that their interests were ignored when negotiating license agreements.

Educating the entire university (including industry partners) is also necessary to ensure all parties understand their rights, options, and responsibilities. Nearly 95% of respondents to a Journal of Entrepreneurship Education survey of faculty, students, and administrators reported that they were “Not At All” or only “Somewhat” knowledgeable about legal issues related to IP ownership, and were unclear on the differences among types of intellectual property (Silvermagel et al. 2009). Several methods of communication (videos, interactive quizzes, diagrams, etc.) will help to ensure the majority of students and other university constituents understand a university’s IP policy. Like an institution’s honor code, the IP policy should be discussed at all relevant opportunities, including orientation, initial major-based courses, project courses, and in the literature accompanying co-curricular projects.

Hypothetical Scenarios

The following hypothetical scenarios illustrate the need for policies that are equitable, clear and efficient. They do not purport to analyze in-depth the application of the equitable/efficient/clear standard, but to provide practical examples of where the university’s IP policy can affect student commercialization motivation.

Scenario 1

Joe, a student, uses his university-issued computer to develop a software program that has commercial promise. After reviewing the university’s IP policy, which requires that the university retain 50% of the revenues from commercialization of copyright-protected material, Joe decides not to seek advice from the entrepreneurship programs at his university. Joe’s commercialization may either fail for lack of resources that the university could have provided, or may attain great success without benefit to the university.

This IP policy appears to be inequitable. The university expects 50% of revenues for technology to which it contributed nothing more than the normal resources that students receive. A restructuring of the share, or the exchange of a share of revenue for helping Joe commercialize his program, will encourage Joe to seek university help and still leave the university with a financial interest in the software. Collaboration is more likely to result in a successful commercialization of the software than if Joe pursues the project alone.

Scenario 2

A university’s IP policy is silent on the role of industry sponsors for research or other projects. Target and the university contract for Target to present a real-world problem to Dr. Smith's product design class. Target provides $5,000 to purchase materials that students can use to create designs; in exchange, Target will own all rights to the designs and related intellectual property. Dr. Smith’s student Sally, under the impression that she will own the IP to the design, creates a prototype for a new coffee maker. A year later, Target begins selling a new coffee maker similar to Sally’s design. Sally complains to her university that Target should have to pay her for her idea. Target explains that it already had the idea in development. Sally becomes upset with the university.

The university’s IP policy’s absence of coverage regarding outside sponsors creates a lack of clarity for Sally, university administrators, and Dr. Smith. In addition, it seems Sally was not aware of the the Target-university contract. A clear policy with clear communication would help the university avoid having students feeling cheated.

Scenario 3

As part of their entrepreneurship class, business students Jenni and Frank co-create Happy Dormday, a web-based company that allows parents to send birthday gifts and other items to students residing in dormitories. They register the Happy Dormday trademark and operate the business for a year. They are approached by a large company, asking to buy the site and the Happy Dormday mark for a similar

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12 See Chou v University of Chicago, 254 F.3d 1347 (Fed. Cir. 2001), where a researcher sued for being omitted from a patent in which the student played an inventive role.
business. Jenni and Frank begin arguing about how they will divide the licensing fee.

If the university’s IP policy does not address works co-created by student teams, this dispute may end up in court. The law already provides default provisions regarding ownership of jointly-developed IP, which normally indicate equal ownership of all co-inventors/creators. An IP policy can follow this default, but it should be supplemented with simple form contracts that students can execute at the beginning of such project-based courses.

**Conclusion**

A university’s intellectual property policy should cover not only patents and copyrights, but other types of intellectual property as well. The policy should be equitable, distributing rights based on resource input. If the university intends to work with industry or government funding, the policy language should allow for the variances created by such relationships. A simple contract through which a student can assign his or her IP rights in a project will help protect the university, and ensure that the student is making an informed decision.

The policy should result in efficient realization of the university’s goals. A policy designed to immediately put all rights and ability to commercialize a work in the hands of the university risks leaving potentially valuable IP languishing for lack of additional work required by the inventor/author who no longer has incentive to develop the project, or creating a backlog of IP in the university’s portfolio that remains underutilized. Finally, an IP policy should be clear and carefully disseminated to all students, faculty, administrators, and third parties. A clear policy with support can provide students a valuable educational opportunity as they review the language and consider its implications on their current and future work. Communication of the policy can also raise overall student awareness of opportunities to go above and beyond the core course requirements and create projects that are innovative and creative.

Future opportunities for research in this area include quantifying the actual effects that university IP policies have on student commercialization, and an analysis of best practices in university IP policy implementation and execution.

**References**


Board of Trustees of Leland Stanford Junior Univ. v. Roche. 583 F.3d 832 (Fed. Cir., 2009), cert. pending No. 09-1159.


