Leveraging Intellectual Property in Academic and Industrial Partnerships

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Leveraging university intellectual property (IP) is increasingly critical for industry and academia. A study by the American Association for the Advancement of Science (AAAS) shows that industrial support of R&D has increased over the past decade, but new investment in basic research growth has flattened over the past few years (AAAS, 2007). To fill the basic research gap, industry is relying more on externally purchased or licensed technology (Thursby & Thursby, 2002). Universities are major engines of primary research and development largely funded by federal grants. The Bayh-Dole Act, passed in 1980, guarantees universities the rights to technologies and inventions discovered through these federally funded grants. Most agree that this act has spurred growth in higher education patenting and licensing, which are precursors to commercialization of new technology. With overall cutbacks in state higher education funding and record-setting student enrollments, intellectual property revenues are considered by many, perhaps inappropriately, as a potential solution to university budgeting woes. In this article we describe new organizational platforms for university–industry collaboration that we believe offer promise. These new approaches capitalize on industry's interest and use of open innovation and provide a superior learning experience for students.

According to the Association of University Technology Managers (AUTM), academic institutions have seen a significant increase in technology transfer activity. For example, before 1980, fewer than 250 patents were issued to U.S. universities each year and discoveries were seldom commercialized for the public's benefit. In contrast, in FY 2002 AUTM members reported that 5,327 new license agreements were signed. Between FY 1991 and FY 2004, annual invention disclosures increased more than 290 percent (to 18,178), new patents filed increased nearly 450 percent (to 11,089) and new licenses and options executed increased about 510 percent (to 5,329). Moreover, for FY 2002, AUTM members reported 569 new product introductions, and nearly 23 percent of their 26,086 active license agreements were associated with product sales by their licensees.

Universities have traditionally been major sources of basic science discovery and invention. One of the primary missions of higher education institutions, in addition to the dissemination of information and learning, is the creation of new knowledge. Given this objective and their research resources (e.g., faculty, labs and doctoral/postgraduate students), they are prime candidates for both federal, and to a lesser extent, corporate sponsorship. Federal research funding typically comprises the majority of university research dollars, and focuses on basic research issues rather than applied issues. Sixty-two respondents to a survey of research universities by Thursby, Jensen, & Thursby (2001) indicated that 67% of their invention disclosures were the result of federal funding and 19% resulted from industry support. In this same work, departments or schools that were the major recipients of these grants were medical, engineering, science, and agriculture programs.

Despite the historical focus of university research, industry is more frequently seeking academic discoveries to supplement their internal R&D efforts. In a study over the five-year period from 1993-1997, Thursby & Thursby (2003, 2002) found 50% of the respondents increased their licensing activity from universities and only 16% decreased it. These same researchers reported industry increased contracts with university due less to changes in the amount of basic research conducted in-house, but more so because of increased receptivity of universities to licensing and research agreements (2002). Rosenberg and Nelson (1994) claim, "What university research most often does today is stimulate and enhance the power of R&D done in industry." University cooperation in these collaborations is critical for several reasons. First, the majority of technologies licensed from universities are at the proof of concept, preprototype or prototype

stages (Jensen & Thursby, 2001). These less mature technologies are riskier, thus have a higher failure rate. Thursby & Thursby (2007) found early stage technology failure rates (73%) are significantly higher than later stage technologies (43%). Given this high propensity for failure, continued involvement by the university and the inventor is a key enabler for successfully moving basic science to a commercially usable form.

Partnering with university technology transfer offices (TTO) and faculty inventors is quite different from purchasing technologies from for-profit entities. Jelinek and Markham (2007) identify four parties in the relationship: the university TTO, the faculty researcher, the licensing firm and in some cases the sponsoring government agency. Moreover, each of these parties may have differing objectives or goals, which can make collaboration difficult. Sources of contention between these groups are numerous so we focus in this paper on the following: IP ownership and timely deal making by the university. We discuss these topics because they can be positively moderated by the type of agreements universities make with external partners. In addition, we look at two types of agreements: traditional TTO contracts that allow external firms to use university discoveries or support further development of those ideas, and the newer forms applicable to collaborations with external partners that may or may not result in IP creation. The latter approach is not often used since few universities work jointly with industry partners, but the needs of this type of relationships are forcing both partners to reexamine their goals and approaches to achieving those outcomes.

Traditionally universities have viewed intellectual property as a proprietary asset, and thus take measures to protect, manage and benefit from it. Intellectual Property (IP) is generated through the research that faculty and their teams conduct. One of the primary objectives of TTOs is to maximize revenues the university (and the faculty) accrues from these capital assets. Funds generated from these assets can be in multiple forms that include license and royalty fees, reimbursements for patenting expenses, milestone payments, sponsored research and, less often, equity ownership in university spin-offs. Notwithstanding the hard work of these university TTOs, most are, at best, breakeven operations (Thursby & Thursby, 2007). Researchers found that less than half of university disclosures are patented (Ku, 2001; Pressman, 2000) and about 41% of disclosures were eventually licensed in some form (Jensen & Thursby, 2001) This is not to suggest that university research is not valuable, but rather reflects the truly embryonic stage of this work. Despite tepid levels of prior success, most universities continue to support technology transfer organizations, because of the obligations under Bayh-Dole and, in part, because of the allure of a major technology success.

TTOs benefit universities and their faculty in numerous ways. The TTO's role is four-fold: 1) to identify university discoveries or inventions that have external value, 2) to protect these ideas through disclosures and patents, 3) to assist in finding buyers and 4) to negotiate agreements for IP use or continued development. Given the basic nature of research, determining a discovery or technology's value is not an easy task. TTOs work closely with inventors to identify potential markets and customers. Not surprisingly, inventor and personal contacts of the TTO staff are the primary ways that new technologies are marketed (Thursby, Jensen, & Thursby, 2001). Researchers benefit from supporting TTO offices because they obtain either contact research revenues or share licensing revenues with the university. Furthermore, revenues from technology licensing can support TTO operations, fund additional IP protection and fund research. Finally, by getting technologies out into commercial use, universities improve society.

However, university technology licensing has been criticized both from internal and external constituents. Faculty complain that university support for technology licensing is often insufficient, thus windows of opportunities for protecting IP are missed. The poor profitability of most TTOs and the continuing budget woes of many higher education institutions portend little improvement in this area. From an industry perspective, firms are concerned that universities overstate the value of IPs, neglecting the risk and uncertainty of embryonic technologies. Corporate partners believe that most IP will require significantly more development funding and market need is often ambiguous. Potential buyers are also concerned about continued faculty support for technology

development in a timely manner. Some pundits even argue that if universities are too aggressive in their pursuit for external funding, they will move away from their core mission of basic research. Finally, both faculty and corporate buyers believe that IP agreements are often inflexible and require too much time to draft, thus stifling innovation and in some cases the ability of parties to reach an agreement.

Given these inefficiencies and concerns with current IP approaches, some universities are re-thinking how they value, leverage and ultimately create new intellectual property. This shift is also occurring in the wake of new curricular opportunities. Leading universities are creating new courses that bring together multiple disciplines of students to envision and develop products for industry partners. In addition, these courses often have industry backing and include company designers and engineers. These programs are beneficial to student learning because they immerse students in a "corporate-like" environment simulating the divergent yet rich viewpoints of a more diverse development team. Industry partners see promise from these approaches not only because they prepare students for cross-functional product development, but also because these student teams transcend firm biases, bring new insights into customer needs and explore unique product approaches. But these new forms also present new challenges.

Of central concern in these industry-supported partnerships is who owns the intellectual property that emerges especially when industry is an integral player in the process. Historically, university rules dictate that IP generated by employees in the scope of their employment and while using university resources belong to the university. This is also the case when the work is funded by external partners. These schools may then assign ownership rights and revenue streams to other parties. University rules were heavily influenced by the federal Bayh-Dole Act, which gives them IP ownership for federally funded research. Even though, this act does *not* extend to industry-sponsored research, many state legislatures require state universities to manage industrial sponsored research like federally funded grants. Thus, universities and industry often face a conundrum. Public universities are typically required by board rules to own and capitalize on IP generated within their walls, yet industry feels they should own work (research) they paid to have conducted. These divergent positions are often "deal breakers" for industry collaboratives.

Industry collaborations are new organizational forms in universities that bring together colleges to envision, develop or re-design products and services. Unlike historical industry sponsored research that is basic science work; collaborations are more applied and often target specific customer groups. Given the development orientation of these collaborations, multidisciplinary expertise is key. For example, University of Cincinnati's (UC) medical device collaboratives include student and faculty from engineering, design, business and medicine. The consumer products and services programs bring design, engineering and business students together. Having engineering, design, manufacturing, financial, competitor and marketing perspectives in the design and development conversation provides a more realistic preview of industry development programs for students.

Another unique aspect of these collaboration teams is that they also include industry partners. Industry involvement can range from just sponsorship of the work to actually including corporate members on the design and development team. When the external partner invests more of its own people and funds in a codevelopment process, the IP ownership becomes more critical to the firm. Collaborative processes result in innovative ideas in part because team members are exposed to different perspectives and assumptions about customer needs. When firms involve their own people, they don't want to argue whose ideas led to a breakthrough. Furthermore, shareholders of these public companies expect them to assess and control financial and market risk prior to engaging in any project. Thus, industry prefers to negotiate ownership at the beginning of the project so they know their total financial exposure if a new idea emerges. The challenge for universities is to create cooperation agreements that meet all parties' needs yet abide with university and legislative guidelines.

University legal agreements for sponsored work take a number of forms. A standard industrial sponsored research agreement is typically the starting template for negotiations. The terms and conditions set forth in the agreement include the following: 1) project description and purpose, 2) responsible parties, 3) project period, 4) remuneration and payment schedule, 5) project deliverables (e.g., report), 6) IP and equipment ownership and 7) publishing rights. These agreements will also have confidentially requirements for the academic team. The standard language around intellectual property rights offers the sponsor exclusive right for a period of time to option or license any intellectual property created through the funded research, but the IP belongs to the school. For basic science discoveries that reflect little corporate contribution, this approach has historically been satisfactory. Note that financial and market risk is higher with this form because the firm will likely need to fund additional development of the discovery, and later pay license fees for some extended period. Furthermore, universities almost always retain the right to publish these new ideas, which is very importance professionally for the researcher's career.

Sometimes, master agreements are used when a continuing, multiperiod relationship with an external partner is expected. In these cases, a master agreement can be developed that defines all the collaboration terms for future interactions and when a special project is identified a simple one page "purchase order" can be quickly executed with little to no negotiation delays.

To enhance UC's collaborative programs, two new organizational forms have been developed: the design collaborative and a consortia system. Both of these forms are more flexible and recognize the potential value of all parties' contributions. In addition, they reduce business risk for external partners and reward universities for superior deliverables. Both the design and consortia approaches provide ways to share IP and create cooperation agreements more quickly between university and external partners. Thus, these new programs create a more balanced, efficient, win-win outcome for participants.

The design collaborative approach was developed to facilitate university and industry multi-disciplinary collaborations. The agreement used for these groups is a simplified version (one page) of the standard sponsored research form and clearly sets out the negotiated terms including IP rights and publication restrictions. Generally these collaboratives extend for one to two quarters. Students and faculty from engineering, business, design, and biomedical engineering participate in a one quarter (10-week) studio based project on a clearly defined problem proposed by the corporate sponsor. Often these studios are funded through corporate design or marketing departments rather than the corporate research and development groups. The agreement is structured so that the faculty member with training can directly negotiate the terms of the agreement with the sponsor. One unique feature of the design collaboration agreement is the check off feature for assignment of intellectual property. The faculty member can negotiate directly with the sponsor on the disposition of the intellectual property. If the sponsor retains intellectual property rights, then the cost of the sponsorship increases. Essentially, the sponsor agrees to purchase the IP rights before the studio begins. After assurances are made that the faculty member agreed to the assignment of IP rights, the contract is processed through university administrative channels.

Another organizational form we use is a consortium, which is designed around a broad-based theme. One example of an UC consortium is the Live Well Collaborative (LWC). In this organization, the university partners with a major consumer product firm to design products and services for the 50-plus population. Interdisciplinary teams of students and faculty work together in a studio environment to address member topics of interest. Currently, the Colleges of Design, Business and Engineering participate in the LWC with future plans to include other disciplines such as Anthropology, Nursing, Medicine and Communications. As industry searches for external sources of research and innovation, the LWC is one model for providing leading edge products and applied research.

Noncompeting consumer companies may also join this consortium. As a member of the LWC, industry partners may use the proprietary studios to address firm-specific needs. Thus, a consortia member may propose a project for one or more of the studio groups. The outcomes from these studios are a series of concepts, product models, ideas that are generated from a 10-12-week project period. To support the team's work, an informatics database provides knowledge and insights about the 50+ consumer population. All members of the collaborative have access to the informatics database.

This intellectual property structure for these consortia offers unique opportunities for co-invention between the institution and its industry partners. Structured under a master collaboration agreement, all members of the consortia agree upon joining that the intellectual property created in the interdisciplinary studios will belong to the industry partner. The cost of the IP is built into the cost of the studio, and if the industry commercializes the intellectual property, it pays a "commercialization fee" back to the collaborative. Industry partners work directly with the students and faculty to provide information and ideas through the process and essentially "co-invent." All parties sign a confidentiality agreement so that proprietary information is protected. Finally, students assign their intellectual property rights to the sponsor of the studio.

In summary, these new organization forms for teaching, leveraging intellectual property and innovation at UC represent the trend in industry toward using open innovation models. As described in Wikipedia, "The central idea behind open innovation is that in a world of widely distributed knowledge, companies cannot afford to rely entirely on their own research, but should instead buy or license processes or inventions (i.e. patents) from other companies." The Design and Consortia systems at UC take advantage of industry's willingness to create and use ideas that were not invented in-house. University TTOs foster and support innovation as well as facilitate leveraging these assets for the benefit of the university, the inventors and the community. The new organizational forms described in the paper show how this institution is taking advantage of new business models, re-thinking how it handles the complex issue of intellectual asset management as well as improving the quality of education for our students.

References

AAAS website, http://www.aaas.org/spp/rd/guitotal.htm

Chesbrough, H. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Boaton, MA: Harvard Business School Press.

Jelinek, M., & Markham, S.. Industry-university IP relations: Integrating perspectives and policy solutions. *IEEE Transactions on Engineering Management 54*(2), 257.

Jensen, R., & Thursby, M. Proofs and prototypes for sale: The licensing of university inventions. *American Economic Review 91*(1), 240.

Ku, K. (2001). Effects of patenting and technology transfer on commercialization, in National Academies Board on Science, Technology and Economic Policy Committee on Intellectual Property Rights in the Knowledge-based Economy, Washington, DC, April 17, 2001.

Pressmen, L. (2000). AUTM Licensing Survey: FY2000, in *AUTM Licensing Survey*. Northbrook, IL: Association of University Technology Managers.

Rosenberg, N., & Nelson, R. R., (1994). American universities and technical advance in Industry. *Research Policy 23*(3), 323.

Thursby, J. G., Jensen, R., & Thursby, M. C. Objectives, characteristics and outcomes of university licensing: A survey of major U.S. universities. *Journal of Technology Transfer 26* (1-2), 59.

Thursby, J. G., & Thursby, M. C. Are faculty critical? Their role in university-industry licensing. *Contemporary Economic Policy 22*(2), 162.

Thursby, J. G., & Thursby, M. C. Industry/university licensing: Characteristics, concerns and issues from the perspective of the buyer. *Journal of Technology Transfer 28*(3-4), 207.

Thursby, J. G., & Thursby, M. C. University licensing. *Oxford Review of Economic Policy 23*(4), 620.

Thursby, J. G., & Thursby, M. C. Who is selling the ivory tower? Sources of growth in university licensing. *Management Science 48*(1), 90.

Wikipedia, Search term: Open innovation, http://en.wikipedia.org/wiki/Open_innovation