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TECHNOLOGY TRANSFER FOR ALL THE RIGHT REASONS

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By granting universities and faculty the rights to retain intellectual property arising from federally sponsored research, the Bayh-Dole Act of 1980 provided critical motivation to universities and their faculty members to take an active role in commercializing technology based on their discoveries. While many universities feel it is imperative that their technology transfer operations work to recover costs, and dwindling state funding for higher education has caused some state legislatures and university governing boards to view technology transfer as a potential revenue source, we maintain that revenue generation, in most instances, is not the primary motivation for university technology commercialization. If done with the right goals in mind, technology transfer aligns with universities' overarching research, education, and service missions, helping to ensure that public investment in science is impactful, that it advances broader economic development objectives, and that it serves the public interest. In 2015, the Association of Public and Land-grant Universities (APLU) and the Association of American Universities (AAU) issued recommendations to their members encouraging them to reaffirm their commitment to managing intellectual property in the public interest and calling for an unequivocal declaration by university leaders that technology transfer efforts serve first and foremost the best interests of society. This article relays the recommendations put forth by the associations.

Key words: Technology transfer; Intellectual property; Public good; Societal impact; University policy

INTRODUCTION

By granting universities and faculty the rights to retain intellectual property arising from federally sponsored research, the Bayh-Dole Act of 1980 provided critical motivation to universities and their faculty members to take an active role in commercializing technology based on their discoveries. In recent years, policymakers, members of the business community, and others have suggested that Bayh-Dole created perverse incentives that motivated universities to manage the intellectual property (IP) derived from federally funded and other research solely for the purpose of generating revenue.

While many universities feel it is imperative that their technology transfer operations work to recover costs, and dwindling state funding for higher education has caused some state legislatures and university governing boards to view technology transfer as a

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potential revenue source, we maintain that revenue generation, in most instances, is not the primary motivation for university technology commercialization. If done for the right reasons, technology transfer aligns with and advances universities' overarching missions of research, education, and service. Technology transfer is a mechanism by which universities ensure that public investment in science is impactful, that such investments enhance economic development, and that it serves the public interest. University technology transfer must advance teaching and learning and research and discovery at the same time it contributes to economic and societal outcomes that help advance the national interest and improve quality of life. These are the reasons universities engage in technology transfer. Viewing revenue generation as the primary objective of university technology transfer operations is a misguided notion that will do little to help address university finances or to achieve universities' overarching missions.

Given the growing political and public perception that universities have become overly focused on profiting from their technology transfer operations, however, university leaders must publicly reaffirm their commitment to managing intellectual property in the public interest. There must be an unequivocal declaration by university leaders that technology transfer efforts serve first and foremost the best interests of society. Two university associations—the Association of Public and Land-grant Universities (APLU) and the Association of American Universities (AAU)—have been working with their member institutions to encourage clarity of purpose around university technology transfer.

In 2015, both associations, working with other groups, including the Association of University Technology Managers (AUTM), the Council on Governmental Relations (COGR), and the American Association of Medical Colleges (AAMC), issued recommendations to their members encouraging them to take steps to make such declarations. This article relays the recommendations put forth by the associations and describes follow-on work that the associations are undertaking to advance the conversation.

BACKGROUND

The Successes of Bayh-Dole

In 1980, the Bayh-Dole Act created a uniform patent policy among the many federal agencies that fund research, enabling universities, nonprofit research institutions, and small businesses to retain patent and licensing rights to inventions developed by their investigators and supported by federal research funding. The purpose of Bayh-Dole is to facilitate the rapid transfer of research discoveries into the commercial sector to advance the public good.

Before Bayh-Dole was enacted, the federal government retained ownership of federally funded discoveries, but, in most cases, the government failed to license discoveries to the private sector for further development. In fact, of the 28,000 patents the government owned in 1980, less than five percent had been licensed to industry (1). Bayh-Dole sparked technology transfer by creating an incentive for universities to secure patent protection for inventions resulting from federally funded research. This, in turn, allowed businesses to gain the necessary rights to develop and commercialize research discoveries. So successful was Bayh-Dole that in 2002 *The Economist* dubbed it as "Innovation's Golden Goose," noting that the act had "…helped to reverse America's precipitous slide into industrial irrelevance" (1).

Before the 1980 passage of Bayh-Dole, university discoveries were rarely commercialized for the public's benefit. Instead, these discoveries were left to languish because the federal government did not have the time, interest, or resources to see that these inventions moved from the laboratory to the marketplace to advance the public good. In 1980, fewer than 250 patents were issued to universities; by 1993, this number had jumped to more than 1500 (2). According to the most recent survey of the Association of University Technology Managers (AUTM), in 2015, U.S. universities garnered 6,124 U.S. patents, which led to the formation of 946 new start-up companies and generated more than 700 new commercial products (3). A 2015 Biotechnology Innovation Organization (BIO) study conservatively approximates that, between 1996 and 2013, patents commercialized from universities contributed $404 billion to the U.S. gross domestic output, $181 billion to the U.S. gross domestic product, and supported a cumulative total of 1.4 million person years of employment (4).

Thus, the Bayh-Dole Act of 1980 effectively established the field of university technology transfer. It has been a successful public policy instrument for encouraging innovation and increasing the translation of university research into new discoveries and technology useful to society. The system that was created by Bayh-Dole has been extraordinarily effective in helping to facilitate translation of discoveries from university research to the marketplace, creating benefit to consumers and society, creating jobs, and contributing to the economic competitiveness and technology leadership of the U.S. Simply put, Bayh-Dole has provided a rich return on public investment in research.

Criticisms of University Technology Transfer

Despite its successes, critics of Bayh-Dole have questioned whether universities manage their intellectual property for the public good, suggesting that universities use government-funded intellectual property primarily for financial gain and are more interested in the monetization of IP than commercialization and societal benefit. They point to the emphasis on revenue in evaluating the success of technology transfer offices, the challenges faced by potential industry collaborators in coming to IP terms with universities, and reports of universities knowingly licensing to patent assertion entities ("trolls").

By and large, these criticisms are based on a few anecdotes rather than concrete data. Moreover, they ignore the fact that most technology transfer offices and the universities they represent are not deriving significant financial gains from their technology transfer operations. According to one study, more than half of university technology transfer programs bring in less money than the costs of their operations, while only 16 percent generate enough funds to fully cover their operating costs after distribution of revenues to their faculty inventors (5). The National Academies of Sciences, Engineering, and Medicine have concluded that even when university inventions have a high social value, they often don't generate a significant amount of revenue (6). In the few instances where universities do make money from their technology transfer efforts, the Bayh-Dole Act requires that these revenues be reinvested back into additional support for university-based research and education. However, dwindling state support for institutions has resulted in state legislatures and university governing boards viewing technology transfer as a potential revenue source for research and public higher education. They ask, "Why can't our state university be just like Massachusetts Institute of Technology or Stanford University and make technology transfer into a profitable operation?" Such views are shortsighted and, unfortunately, are likely to do more harm than good for improving university technology transfer operations if the focus of such efforts is to serve the best interests of the public and state and regional development. Former president of Stanford University John Hennessey has often noted that the university's success in technology transfer resulted from its technology transfer office's willingness to take risks and to move technology quickly from the lab to the marketplace as opposed to focusing on drafting licensing arrangements aimed at maximizing revenue. Says Hennessey:

> As universities, we need to emphasize flexibility and appreciate the good things that happen when technology transfers. And the ultimate reward to a broad-minded institution consists of the long-term goodwill and philanthropy, and must always be the greater reward for a university—above and beyond the revenue… Jim Gibbons [formerly Dean of Engineering] liked to say, 'At Stanford, we never got a license from Hewlett or Packard for the technology developed here. But, even had we actually charged them for those licenses, those dollars would have only been one one-thousandth of the donations that HP eventually gave back to the university.' (7)

Moving forward, universities must address criticisms by increasing the visibility of the public good derived from managing university intellectual property. Working with colleagues at AAU, APLU, AUTM, and other professional organizations, institutions can raise awareness among policymakers and the public about their responsible and effective IP management and the significant public value derived from this work. Where improvements in institutional policy and practice are necessary, collaboration among institutions can also help by sharing innovative and effective approaches to IP management that help to address criticism and further advance the economic and societal impact of technology transfer.

Nine Points to Consider

Sometimes lost in the face of public criticism is that university IP management, by and large, adheres to a set of "core values" that are consistent with universities' missions of learning, discovery, and engagement in societal challenges. In 2007, ten leading research universities, along with the Wisconsin Alumni Research Foundation (WARF) and the Association of American Medical Colleges (AAMC), distilled these core values into *In the Public Interest: Nine Points to Consider in Licensing University Technology* (8). AUTM endorsed the *Nine Points* and solicited endorsement from universities and other organizations. APLU and AAU, along with more than 100 other research universities, associations, and other organizations, endorsed the statement. Universities and their IP management efforts would benefit from reviewing the *Nine Points* and checking for continuity between these principles and university policy and practice.

Managing University Intellectual Property in the Public Interest

In 2011, the National Research Council (NRC) of the National Academies examined a "generation of experience, research, and dialogue" (6) in university intellectual property management. The findings and recommendations included in the NRC report collectively create a compelling story about the successes of the Bayh-Dole era. The findings and recommendations also caution universities to be clear about their commitment to the public good through management of intellectual property and to be vigilant in making sure that university policy and practice align with public purposes.

The first recommendation of the NRC committee's 2011 report, *Managing University Intellectual Property in the Public Interest,* states:

> The leadership of each institution—president, provost, and board of trustees—should articulate a clear mission for the unit responsible for IP management, convey the mission to internal and external stakeholders, and evaluate effort accordingly. The mission statement should embrace and articulate the university's foundational responsibility to support smooth and efficient processes to encourage the widest dissemination of university-generated technology for the public good.

The NRC report further stresses the responsibility of university leaders to develop and adhere to patent and licensing policies and practices that do not predicate licensing on the goal of raising significant revenue for the university, but, to the greatest extent practicable, aim to "...maximize the further development, use, and beneficial social impact of their technologies."

The NRC report endorses several of the principles set out in *In the Public Interest: Nine Points to Consider in Licensing University Technology,* the white paper described above. Many universities have developed and implemented policies and procedures drawn from key recommendations made by the NRC. We provide some examples later in this article.

AAU and APLU Committees

In 2014 and 2015, both the APLU and AAU commissioned committees to examine the issues surrounding the management of university IP in the public interest. The APLU Task Force on Managing University Intellectual Property was charged with examining purposes of university innovation, technology transfer, commercialization, and entrepreneurship (9). The AAU Working Group on Technology Transfer and Intellectual Property was tasked with reaffirming that the primary goal of university technology transfer operations is to advance the public interest (10).

Both the AAU and APLU groups asserted that universities have a responsibility to be good stewards of discoveries and IP developed from federally funded research. The groups recognized that in recent years, however, some critics have asserted that universities' technology transfer operations place too much emphasis on maximizing revenues and not enough on moving discoveries quickly into the marketplace, where they can advance the public good. Both groups released statements outlining principles and proposing specific steps that research universities should take to strengthen their commitment to IP management policies and practices aimed at advancing the public interest, which aligns with the core university missions of education, the creation and dissemination of knowledge, and public service.

The recommendations disseminated by APLU and AAU are presented below, along with examples of the ways in which member universities' policies and practices align with the recommendations.

RECOMMENDATIONS

1) *Provide a clear statement of purpose for technology transfer at your university.*

University leaders should follow the recommendation of the National Research Council's 2011 report, *Managing University Intellectual Property in the Public Interest,* to create a clear university IP policy. As noted above, the NRC report's first recommendation underscores the need for clear university IP policy that strengthens the connection between this work and the public good. This recommendation and other aspects of the NRC report make clear the need for clarity around the underlying purposes of university IP management—public benefit and societal impact. Such policies should communicate that universities protect intellectual property first and foremost to provide incentive for investment in early-stage technology, which helps to "encourage the widest dissemination." Universities must, of course, balance the need for wide dissemination with the need to recover costs and to emphasize the economic value of university discoveries. While discoveries and IP ownership can lead to additional resources and important support for university missions, this should not be the primary goal of such activities. Keeping this necessary balance in mind, it is essential that university leaders articulate a clear mission and purpose for university IP management, as recommended by the NRC.

The State University of New York's Stony Brook University, for example, declares the mission of its Office of Technology Licensing and Industry Relations on the home page of that office's website:

> Our mission is to bridge Stony Brook innovation with public benefit in partnership with SBU inventors and the business community. By successfully commercializing innovative discoveries into new products and services, we enhance well-being, return economic benefit to the university community, and strengthen the long-term vitality of our innovation ecosystem. (11)

"Public benefit" and "well-being" are primary in this statement of purpose. While Stony Brook does recognize the importance of "economic benefit to the university community," it is clear from this mission statement that financial return is not the driving purpose of the unit. University leaders should work to emulate Stony Brook's example by asserting the primacy of public benefit in their technology transfer office's mission statement and by making the policy highly visible and transparent on the university's web site. These policies should also be agreed upon and endorsed at the highest levels within the university, including the university's governing board.

2) *Make visible policies that restrict the university from working with entities that acquire intellectual property rights with no real intention of commercialization.*

University leaders should make visible existing institutional policies that restrict the university from working with entities (so-called patent assertion entities—PAEs—or patent "trolls") that acquire IP rights with no real intention of commercializing the technologies and instead rely solely on threats of infringement litigation to generate revenue. In instances where such policies do not exist, university leaders should move swiftly to establish them. For universities, working with such entities does not support a commitment to public benefit of intellectual property. University leaders should require that technology transfer offices carefully vet the credentials, practices, and reputations of third-party entities that might assist universities in asserting their patent rights against infringers.

Asserting legitimate patent rights is an essential element of the patent system, and other entities may provide needed expertise and resources to support universities in this area. University policies should not prevent the institution from seeking assistance from entities that can legitimately help them protect their intellectual property. Universities should base their decision about whether to assert any unlicensed patent against a company based on the legitimate facts of the claimed infringement and only after good faith attempts to negotiate a license to such a company on commercially reasonable terms have failed. In recent years, a growing number of universities have developed specific policies and practices that restrict licensing to entities whose primary business model is based on using patents to obtain licensing fees from practicing companies. These universities include Louisiana State University, the University of Illinois, Western Michigan University, the University of Delaware, and Washington State University. It is also standard practice for universities to include in technology license agreements language that requires of the licensee commercialization milestones and benchmarks for the development of the technology.

If these are not met, the license is withdrawn by the university.

At the University of Mississippi, for example, the Division of Technology Management maintains safeguards against working with PAEs. Patent rights are not sold to third parties, and the university does not participate in patent auctions. Further, the university does not work with entities that lack the expertise and resources to develop a technology, and the university's standard license agreement requires a written development plan in which the licensee summarizes the proposed product development activities with a timeline. The university is entitled to terminate the agreement if the licensee fails to meet pre-established development milestones. This ensures that the technology will not be licensed to a patent "troll" and guards against technology being licensed to an entity that is only interested in protecting its own IP from the competition. Policies and practices such as these have become the norm—not the exception—for most public and private research universities.

3) *Reaffirm commitment to* In the Public Interest: Nine Points to Consider in Licensing University Technology.

University leaders should review and support, as appropriate, the document *In the Public Interest: Nine Points to Consider in Licensing University Technology* and align IP management policies and practices with the *Nine Points*. Universities should publicly document current policies and procedures and implement new ones as necessary that align with these principles.

Washington State University's Office of Commercialization provided the following articulation of the ways in which university policies align with the *Nine Points:*

- Point 1: Universities should reserve the right to practice licensed inventions and to allow other non-profit and governmental organizations to do so.
  WSU always reserves the right to practice licensed inventions and to allow other non-profit and governmental organizations to do so.
- Point 2: Exclusive licenses should be structured in a manner that encourages technology development and use.
  Exclusive licenses are structured to encourage diligent development of the technologies and ways to pull the technology back if licensees are not actively pursuing the technology by building measures to track development.
- Point 3: Strive to minimize the licensing of "future improvements."
  WSU strives to minimize licensing of future improvements by limiting the licenses to currently developed IP. In cases where the licensee's investment and risk taken in developing the invention warrants, an option to license a narrow scope of future license is agreed to. In cases where this is warranted, WSU bears in mind the rights of other WSU researchers and does not issue options to a broad field of use that might tie up other research conducted at WSU.
- Point 4: Universities should anticipate and help to manage technology transfer related conflicts of interest.
  WSU has a well-run conflict of interest management committee that handles the conflicts that arise when WSU faculty and students start companies based on their research. This was implemented as a result of Washington State ethics board giving the state institutions the ability to set up a body to manage these conflicts. This has been in existence for many years now.
- Point 5: Ensure broad access to research tools.
  WSU also makes the research tools developed with public funding widely available via material transfer agreements to other academic institutions and the research community in keeping with the policies of the funding agencies and scientific journals.
- Point 6: Enforcement action should be carefully considered.
  WSU has not had an occasion to enforce its patents; however, should such occasion arise, WSU would strive to approach these actions with a mission-oriented rationale and/or to protect the rights of a licensee as obligated by a contract.
- Point 7: Be mindful of export regulations.
  WSU's licenses include export control regulation language to ensure federal compliance and to

safeguard the fundamental research exclusion provided to academic institutions.

- Point 8: Be mindful of the implications of working with patent aggregators.
  WSU strives to enter into licensing arrangements with only those entities that further develop the technology and diligently attempt to commercialize it. Attempts to engage with entities that do not further commercialize the technologies are actively discouraged. WSU pays particular attention to the patent aggregators to ensure the primary licensee's intent is to compile the body of IP needed to diligently advance the technology for public benefit as opposed to those aggregators whose primary intent is to enforce them against users for solely monetary benefit.
- Point 9: Consider including provisions that address unmet needs, such as those of neglected patient populations or geographic areas, giving particular attention to improved therapeutics, diagnostics, and agricultural technologies for the developing world.
  WSU's license agreements include measures to reserve rights for continued academic freedom of research as well as the need to meet humanitarian needs.

Universities should clearly articulate the ways in which the university's intellectual property policies align with the *Nine Points,* as Washington State University's Office of Commercialization has done, and clearly articulate how the *Nine Points* are reflected in appropriate contractual clauses and language when it licenses university intellectual property. Universities should also make sure that this articulation of alignments is transparent to the public.

4) Implement innovative and effective approaches to managing university intellectual property.

University leaders should identify and implement innovative and effective approaches to managing university IP and, more broadly, to engaging with entrepreneurs and industry. University leaders should work to emulate practices that have been effectively adopted by peers. Universities are constantly evolving in how they engage with licensees, entrepreneurs, and large corporations. For example, researchers, technology transfer professionals, and other university leaders are increasingly focused on long-term relationship development and strategic initiatives—beyond simply striking the best licensing deal. University leaders need to examine changes happening in the field, benchmark for effective practices, and work toward implementing practices that help the university, along with its public and private partners, to accelerate realization of the benefits of university intellectual property.

Washington University in St. Louis has worked to implement an innovative approach to addressing one often-cited type of challenge that universities face in undertaking IP management. Critics frequently note long timelines and complexity of negotiations associated with licensing deals. Many universities have sought to overcome this challenge by implementing new policies that speed up the process and ensure that technology is available to develop as quickly as possible at reasonable cost to the licensee. Washington University has established the Quick Start license agreement. Recognizing that the primary goal of a technology transfer office is to enable public utilization of university-generated technologies, Washington University devised the Quick Start license agreement to reduce time spent on haggling over IP price and royalties. The Quick Start license agreement is a back-end loaded deal structure with no upfront payments, no maintenance fees, no past patent costs, one low flat royalty rate, and a success fee at the time of an exit/liquidation event. The agreement allows start-up companies to invest time and money in developing the technology without the burden of an immediate payout to the university. Quick Start offers a robust streamlined approach to execute start-up license agreements expeditiously and turns the spotlight on the company's management team, commercialization strategy, R&D timelines, and funding status—critical success parameters for a start-up enterprise. University leaders must continue to study the effectiveness of novel approaches such as Washington University's Quick Start license agreement—as well as practices at Penn State University (12), University of Minnesota (12), and Georgia Tech (13), among others—and adopt those that are found to be most successful at addressing the challenges of managing university intellectual property in the public interest.

5) *Develop appropriate measures of success for intellectual property management and technology transfer.*

University leaders should develop procedures and criteria for evaluating a university's technology transfer unit without relying solely upon measuring revenue generation. Rather, evaluation approaches should focus on aligning the work of these units with the research university's core missions of discovery, learning, and the betterment of our communities and society at large. There are many indicators of success of university intellectual property management, and university leaders should develop a framework for assessing their technology transfer intellectual property practices and effectiveness to include multiple measures that capture and reflect the university's IP management mission and do not overly emphasize revenue generation.

APLU's Commission on Innovation, Competitiveness, and Economic Prosperity (CICEP) has examined assessment and measurement of university economic engagement broadly and has identified indicators, including growing faculty and student interest in IP-related entrepreneurship, expansion of university-industry relationships, and others. Licensing activity is a good measure, as a starting point, of the university's efforts toward commercialization. Revenue, however, is frequently not a good indicator since it is often driven by having one major blockbuster drug or home run discovery and is not representative of the ability of the university to effectively disseminate and transfer knowledge across a wide spectrum of disciplines and commercial and non-commercial venues. While universities should continue efforts to recover the costs associated with IP management and to make their technology transfer operations revenue neutral and profitable, measures of success should emphasize economic and social impacts of university discovery. A set of non-revenue indicators must be part of IP management policies and practice if we are to ensure public benefit of this work.

The University of California Berkeley Office of IP & Industry Research Alliances (IPIRA) provides an excellent example of shifting away from a sole focus on patents and licensing as measures of success. IPIRA considers technology transfer to be a long-term relationship with industry, not just one agreement or another. New metrics of success in technology transfer include: measures of both what is brought in to the university and what is sent out; how relevant the institution is to the local innovation ecosystem; how much diversification of research funding IPIRA supports; engagement through public-private partnerships and product development partnerships; speed and efficiency of transactions; and streamlining of approaches. Gifts to the university are also part of IPIRA's success metrics. Enhanced reputation achieved through actions of IPIRA is manifested, in part, by gifts even though gifts are not accounted for in IPIRA. Gifts might also be received a decade after a given company has a good experience with IPIRA. To recognize IPIRA's contribution, however, a small percentage of gift funding that comes to the campus as a whole is allocated to the office. Universities should consider, as UC Berkeley has, a variety of indicators that can be used for measuring the success of technology transfer efforts. Doing so will reduce the impression that universities are managing university intellectual property solely for financial gain.

FOLLOW-UP EFFORTS

AAU and APLU continue efforts to support institutions in clarifying the public interest purposes of university technology transfer. APLU and AAU are collecting and disseminating examples, like the ones included above, of universities implementing innovative new policies and effective approaches to technology transfer—examples that demonstrate alignment with the *Nine Points* and the NRC recommendations or that, in other ways, demonstrate good practice that is responsive to economic and societal needs. CICEP is also convening a working group on the evolution of technology transfer, focused on highlighting the ways in which technology transfer operations are adapting to become more engaged with and responsive to other stakeholders in regional innovation ecosystems. AAU is leading an effort to develop a comprehensive framework and identify examples of alternative ways universities are assessing the effectiveness of university technology transfer operations. The two organizations will continue to work together on these efforts and to help raise the visibility of the impacts in the public sphere of university technology transfer.

CONCLUSION

The fundamental purpose of university technology transfer offices is to ensure that federally funded and other university research outcomes serve the public interest. AAU and APLU support universities pursuing technology transfer to enhance the public good and to promote economic development. We provide recommendations to help assure the public and policymakers that universities continue to be focused on the primary missions of research, education, and service and that technology transfer operations management serves theses missions. Research universities and their management of intellectual property and technology transfer are fundamental to ensuring that outcomes of federally funded and other university research serve the public interest. Our universities should—and most often do—pursue technology transfer with the primary goal in mind of making the world a better place, not generating significant additional revenues. We encourage university leaders to continue efforts to demonstrate that their institutions do this work for all the right reasons.

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