Technology Transfer at the University of California

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ABSTRACT

The University of California (UC), based on its mission as a land grant university, has a long history of seeking intellectual property protection for its research discoveries and managing those technologies for the public benefit. By some measures, the UC technology transfer program is the largest public program in the world. The program has evolved over the years but has always been at the forefront of intellectual property protection. This article focuses on the history, policy, and organizational framework of the UC technology transfer program, and the information discussed herein may be instructive to administrators and others seeking to learn from the UC experiences. The program has been administered through six functional departments: Information Technology and Communications, General Counsel (legal), Licensing, Patent Prosecution, Financial Management, and Policy Analysis and Development. Perhaps the most distinctive feature of the UC technology transfer system is the development of a distributed institutional network of ten university campuses, which operate under a common policy framework and share resources. At the same time, each office functions relatively independently of the others. This structure could be emulated and implemented at different scales, from a relatively small-scale research consortium made up of a network of institutions, to a larger-scale national network of universities, to a global-scale international network of research institutions linked by common policies and objectives.

1. INTRODUCTION

The University of California (UC) is composed of ten semi-independent campuses: UC San Diego, UC Santa Barbara, UC Los Angeles, UC Riverside, UC Irvine, UC Merced, UC Santa Cruz, UC San Francisco, UC Berkeley, and UC Davis. While each campus represents a significant education and research institution in its own right, collectively, the University of California system is one of the strongest institutions of higher education in the world. This is particularly true with regard to research. The University of California is likely the largest public research enterprise in the world. With annual research expenditures in excess of US$2.9 billion, the size of its collective research programs is comparable to the total research expenditures of entire countries. One of the results of this robust research activity is the generation of a significant technology portfolio that supports the university's mission to use its research to benefit society. In 2004, University of California researchers reported nearly 1,200 new inventions, or approximately one invention for each US$2.5 million in research expenditure—a number that remains relatively consistent from year to year (the full range has been one invention for each US$2.5–4.5 million). As a consequence, the University of California has developed an extensive technology transfer program that provides a potentially

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useful example for large multi-institutional networks and even entire nations.

2. HISTORY OF TECHNOLOGY TRANSFER AT THE UNIVERSITY OF CALIFORNIA

2.1 *The mission of a land grant university*

The University of California was established as a land grant university by the Morrill Act, which was signed into law by Abraham Lincoln in 1862. This Act provided each state of the United States with a grant of large acreages of public lands that the state could sell on the open market to raise funds to support at least one college at which the leading objective would be to broadly educate students in "agriculture and the mechanical arts." But it was the Hatch Act of 1887 that extended the Morrill Act and the mission of land grant universities to encompass research as well as education—specifically, research that contributed to an effective agricultural industry (Box 1).

While originally focused on agriculture, the mission of land grant universities in the United States continues to be reflected in broad mission statements that recognize the university's fundamental role in transferring research results to support applications in all industrial sectors. The principles embodied by the U.S. land grant universities have become important elements of the mission of many American universities and have played an important role in defining the context within which university technology transfer programs have developed.

2.2 *Technology transfer policy development*

Formal intellectual property protection and the management of patented technologies at the UC dates back to the 1920s. The first patent assigned to *"the Regents of the University of California"* covers technology for a *"Film Holder for Dental Work"* (U.S. Patent No. 1,657,230) awarded to Frank Simonton. Thus, there is a long history of biomedical research inventions. Other early UC patents describe methods of producing wood products (U.S. Patent No. 1,805,550 from 1931), an apparatus for cracking nuts (U.S. Patent No. 2,238,368 from 1941) and a method of preserving microorganisms (U.S. Patent No. 2,376,333 from 1945).

In 1943, the first UC patent policy was adopted, which provided mechanisms for supporting the licensing of patented inventions.[1] However, assignment of inventions to the university was determined on a case-by-case basis and UC policy was silent on royalty sharing between the university and inventors. In 1963, the university adopted a new patent policy that foreshadowed some of the requirements the Bayh-Dole Act (1980) later made mandatory, including making the assignment of rights to the university mandatory and specifying a royalty-sharing formula (50/50 sharing of any licensing revenue between the inventor[s] and the university, after deduction of a 15% administrative fee). The patent policy has changed a few times over the intervening years but has continued to include mandatory disclosure and assignment of inventions to UC and a royalty-sharing formula that provides,

Box 1: The Hatch Act Extended the Mission of Land Grant Universities to Include Research

It shall be the object and duty of the State agricultural experiment stations ... to conduct original and other researches, investigations, and experiments bearing directly on and contributing to the establishment and maintenance of a permanent and effective agricultural industry of the United States, including researches basic to the problems of agriculture in its broadest aspects, and ... as have for their purpose the ... maximum contribution by agriculture to the welfare of the consumer.

- Hatch Act of 1887, as amended in 1955

after deduction of direct expenses, 35% to the inventor(s), 15% to a campus research fund, and 50% to a general pool for the campus at which the inventor is located. This patent policy is administered by a "patent acknowledgement" (Figure 1) that is signed by all UC employees and that contains a provision which specifically allows the UC to change the policy at any time in the future, including the royalty-distribution formula. This last feature is important because the UC has been sued by an inventor who objected to the change in royalty-distribution policy.[2]

2.3 *Role of leadership*

The evolution of a policy framework to support technology transfer at the UC has been critical in developing the institutional capacity for technology transfer. However, the most important element has been the academic leadership role of the UC in recognizing the importance of technology transfer and promoting it as an activity that is central to the university's educational and research missions. The last two presidents of the UC, Richard Atkinson and Robert Dynes, clearly articulated how and why the UC should be actively engaged in technology transfer (Box 2). University technology transfer programs take nearly a decade to begin to generate sufficient licensing revenue just to break even, and without strong support from academic leadership, technology transfer programs are unlikely to be consistently supported at a level necessary to achieve successful outcomes. Because of its academic leadership, the UC technology transfer program has enjoyed several decades of solid support and, as a result, has been a net revenue generator for the university since the late 1980s.

2.4 *Evolution of a distributed institutional network for technology transfer*

An ongoing trend in the UC technology transfer program has been its gradual movement from a highly centralized network to a decentralized, or distributed, network of semi-independent, campus-based technology transfer programs. The central UC Office of Technology Transfer (OTT) was established in 1978 and for many years provided all technology transfer services from a central location in the San Francisco Bay Area. A single, central OTT providing services to such a large research enterprise allowed the investment of sufficient resources in a single program to reach critical mass and achieve early success. However, while this location is very close to the UC Berkeley campus, it is over 500 miles from the UC San Diego campus, and the lack of direct connections to researchers and the technology itself at more distant campuses proved to be problematic, especially as research programs grew dramatically in the 1980s. As a consequence, there has been an ongoing movement to establish local offices of technology transfer on each of the UC campuses. This trend began in 1990 (Table 1) and is still continuing.

3. THE UC TECHNOLOGY TRANSFER PROGRAM: ELEMENTS AND ORGANIZATION

The UC technology transfer program has been relatively successful in transferring technology to the private sector. In its best year (2002) the program generated over US$100 million in revenue, which, after expenses and distribution to inventors, provided approximately US$30 million to support education and research at the UC. While this represents good business for the university, the financial returns are modest when placed in perspective of the total UC research budget of approximately US$2.9 billion. Expenses for the program in 2004 included US$14.3 million in operating costs and US$13.9 million in unreimbursed legal expenses, reflecting the substantial investment that is required to manage a program on such a scale. A range of technology transfer performance metrics are reported annually by the UC, and there are several published reports that look at technology transfer trends in the UC in relation to other university programs.[3, 4]

The administrative structure of the UC technology transfer program has been in a constant state of flux and evolution since its inception, but the program appears to be approaching a steady state, balancing the range of activities pursued and combining centralized and distributed approaches. The UC technology transfer program has been administered through six functional departments

Figure 1: University of California Employee "Patent Acknowledgement"

UNIVERSITY OF CALIFORNIA
STATE OATH OF ALLEGIANCE,PATENT POLICY, AND PATENT ACKNOWLEDGMENT
UPAY585 (R11/97) E0420 71443-180

EMPLOYEE'S NAME (Last, First, Middle Initial)		DATE PREPARED MO DY YR
EMPLOYEE ID	DEPARTMENT	EMPLOYMENT DATE MO DY YR

STATE OATH OF ALLEGIANCE I do solemnly swear (or affirm) that I will support and defend the Constitution of the United States and the Constitution of the State of California against all enemies, foreign and domestic; that I will bear true faith and allegiance to the Constitution of the United States and the Constitution of the State of California; that I take this obligation freely, without any mental reservation or purpose of evasion; and that I will well and faithfully discharge the duties upon which I am about to enter.

Taken and subscribed before me on: _____ MO DY YR

Signature of Authorized Official:_____

Title:_____

County: State:

Signature of Officer or Employee:_____

(DO NOT Sign Until in The Presence of Proper Witness.)

NOTE: No fee may be charged for administering this oath.

Oath must be administered by either (1) a person having general authority by law to administer oaths - for example Notaries Public, Civil Executive Officers (Section 1001 of Government Code), Judicial Officers, Justices of the Peace, and county officials named in Sections 24000, 24057 of Government Code: such as, district attorneys, sheriffs, county clerks, members of boards of supervisors, etc., or (2) by any University Officer or employee who has been authorized in writing by The Regents to administer such oaths

WHO MUST SIGN THE OATH: All persons (other than aliens) employed by the University, in common with all other California public employees, whether with or without compensation, must sign the oath. (Calif. Constitution, Article XX, Section 2, Calif. Government Codes, Sections 3100-3102.)

All persons re-employed by the University after a termination of service must sign a new Oath if the date of re-employment is more than one year after the date on which the previous Oath was signed (Calif.Government Code, Section 3102).

WHEN OATH MUST BE SIGNED: The Oath must be signed BEFORE the individual enters upon the duties of employment (Calif. Constitution, Article XX, Section 3: Calif. Government Code Section 3102.)

WHERE OATHS ARE FILED: The Oaths of all employees of the University shall be filed with the Campus Accounting Office.

FAILURE TO SIGN OATH: No compensation for service performed prior to his subscribing to the Oath or affirmation may be paid to a University employee. And no reimbursement for expenses incurred may be paid prior to his subscribing to the Oath or affirmation. (Calif. Government Code, section 3107.)

PENALTIES: "Every person who, while taking and subscribing to the Oath or affirmation required by this chapter, states as true any material which he knows to be false, is guilty of perjury, and is punishable by imprisonment in the state prison not less than one or more than 14 years." (Calif. Government Code, Section 3108.)

PATENT ACKNOWLEDGMENT

This acknowledgment is made by me to The Regents of the University of California, a corporation, hereinafter called "University," in part consideration of my employment, and of wages and/or salary to be paid to me during any period of my employment, by University, and/or my utilization of University research facilities and/or my receipt of gift, grant, or contract research funds through the University.

By execution of this acknowledgment, I understand that I am not waiving any rights to a percentage of royalty payments received by University, as set forth in the University of California Patent Policy, hereinafter called "Policy."

I also understand and acknowledge that the University has the right to change the Policy from time to time, including the percentage of net royalties paid to inventors, and that the policy in effect at the time an invention is disclosed shall govern the University's disposition of royalties, if any, from that invention. Further, I acknowledge that the percentage of net royalties paid to inventors is derived only from consideration in the form of money or equity received under: 1) a license or bailment agreement for licensed rights, or 2) an option or letter agreement leading to a license or bailment agreement. I also acknowledge that the percentage of net royalties paid to inventors is not derived from research funds or from any other consideration of any kind received by the University. The Policy on Accepting Equity When Licensing University Technology governs the treatment of equity received in consideration for a license.

I acknowledge my obligation to assign inventions and patents that I conceive or develop while employed by University or during the course of my utilization of any University research facilities or any connection with my use of gift, grant, or contract research funds received through the University. I further acknowledge my obligation to promptly report and fully disclose the conception and/or reduction to practice of potentially patentable inventions to the Office of Technology Transfer or authorized licensing office. Such Inventions shall be examined by University to determine rights and equities therein in accordance with the Policy. I shall promptly furnish University with complete information with respect to each.

In the event any such invention shall be deemed by University to be patentable or protectable by an analogous property right, and University desires, pursuant to determination by University as to its rights and equities therein, to seek patent or analogous protection thereon, I shall execute any documents and do all things necessary, at University's expense, to assign to University all rights, title, and interest therein and to assist University in securing patent or analogous protection thereon. The scope of this provision is limited by California Labor Code section 2870, to which notice is given below. In the event I protest the University's determination regarding any rights or interest in an invention, I acknowledge my obligation: (a) to proceed with any University requested assignment or assistance; (b) to give University notice of that protest no later than the execution date of any of the above-described documents or assignment; and (c) to reimburse University for all expenses and costs it encounters in its patent application attempts, if any such protest is subsequently sustained or agreed to.

I acknowledge that I am bound to do all things necessary to enable University to perform its obligations to grantors of funds for research or contracting agencies as said obligations have been undertaken by University.

University may relinquish to me all or a part of its right to any such invention, if, in its judgment, the criteria set forth in the Policy have been met.

I acknowledge that I am bound during any periods of employment by University or for any period during which I conceive or develop any invention during the course of my utilization of any University research facilities, or any gift, grant, or contract research funds received through the University.

In signing this agreement I understand that the law, of which notification is given below, applies to me, and that I am still required to disclose all my inventions to the University.

NOTICE: This acknowledgment does not apply to an invention which qualifies under the provision of Labor Code section 2870 of the State of California which provides that (a) Any provision in an employment agreement which provides that an employee shall assign, or offer to assign, any of his or her rights in an invention to his or her employer shall not apply to an invention that the employee developed entirely on his or her own time without using the employer's equipment, supplies, facilities, or trade secret information except for those inventions that either: (1) Relate at the time of conception or reduction to practice of the invention to the employer's business, or actual or demonstrably anticipated research or development of the employer; or (2) Result from any work performed by the employee for the employer. (b) To the extent a provision in an employment agreement purports to require an employee to assign an invention otherwise excluded from being required to be assigned under subdivision (a), the provision is against the public policy of this state and is unenforceable.

In any suit or action arising under this law, the burden of proof shall be on the individual claiming the benefits of its provisions.

RETENTION: Accounting: 5 years after separation, except in cases of disability, retirement or disciplinary action, in which cases retain until age 70.
Other Copies: 0-5 years after separation.

Employee/Guest Name (Please print): _____

Employee/Guest Signature: _____Date:_____

Witness Signature: _____Date:_____

PLEASE SIGN STATE OATH AND PATENT ACKNOWLEDGMENT -- ATTACH TO PAF, UPAY560.

that support all aspects of invention reporting, licensing, and administration. These departments are: Information Technology and Communications, the Office of General Counsel (legal), Licensing, Patent Prosecution, Financial Management, and Policy Analysis and Development. Each is described in more detail below.

3.1 *Information Technology and Communications*

The Information Technology and Communications department has focused on the development and maintenance of an intellectual property management database called the Patent Tracking System (PTS). This system is critical to all aspects of intellectual property management. A single system that integrates invention disclosure, patent prosecution, licensing, and financial information is invaluable for effective IP management—but rarely available. Early attention to developing such a system was of particular importance for the UC system, since all IP, originating from multiple campus locations, is the property of a single legal entity, the Regents of the UC. As a consequence,

Box 2: Effective Technology Transfer Programs Require Supportive Institutional Leadership

California's economic rise is closely tied to the rise of its research universities. New industries have been invented, new products have been developed, and new medical techniques have been invented to both save lives and enhance their quality.

- UC President Atkinson (1995–2003)

Our mission is education, research, and public service. Technology transfer is a vehicle that helps us do all three. It boosts research support. It creates internships and educational opportunities for our students. It stimulates the regional economy. And hopefully, it benefits society.

- UC President Dynes (2003–present)

Table 1: Establishment of Local Offices of Technology Transfer within the UC System

Campus	Local office name	Year established
UC Berkeley	Office of Technology Licensing	1990
UC Los Angeles	Office of IP Administration	1990
UC Irvine	Office of Technology Alliances	1994
UC San Diego	Technology Transfer and IP Services	1994
UC San Francisco	Office of Technology Management	1996
UC Davis	Technology Transfer Center	1999
UC Santa Cruz	Office for Management of IP	2003

a single, integrated database provided the basis for integrated reporting and improved handling of the risks associated with management of IP at multiple locations within the system. With changing information technology infrastructure, it is difficult and costly to update and keep these systems current, but it should be a high priority for any technology transfer program.

The department is also responsible for communications and reporting, which involves, for example, the publishing of an annual report and submission of survey information to the Association of University Technology Managers (AUTM). Because most of this reporting is dependent on information aggregated in the database, the department is the logical group to carry out this task. However, it has become increasingly important to also have regular strategic communications with both internal and external clientele of the technology transfer program to ensure continued support for the mission and activities of the program.

3.2 *Office of General Counsel (legal)*

Legal support for the technology transfer program is critical since it routinely enters into contracts (licenses) on behalf of the university. In the case of the UC, legal oversight for the technology transfer program is carried out by a dedicated intellectual property group within the Office of General Counsel (OGC). The OGC reports directly to the Regents and is charged with oversight of all legal issues and legal risks to the university. This structural arrangement assures that the business opportunity associated with a license agreement is not a consideration in the assessment of legal risk or exposure that the agreement carries with it. Because universities, in general, have a lower tolerance for legal risks than does industry, this arrangement is one feature that often makes negotiations with the UC difficult.

3.3 *Patent Prosecution*

This department is responsible for managing the outside counsel who draft and prosecute patent applications on behalf of the university. Primarily, the department performs a "docketing" function to ensure that external counsel meets critical filing or response dates and that fees are paid on time. The department works closely with licensing officers, inventors, and counsel during patent prosecution to ensure that UC maximizes its IP rights and that it does not inadvertently lose rights due to failure to meet bar dates in the United States or foreign patent jurisdictions.

3.4 *Policy Analysis and Development*

Because the UC is a large, risk-averse institution, it operates in a policy-rich environment. The Policy Analysis and Development department is responsible for interpreting existing policy and providing consultation to licensing officers and researchers in order to assist them in their efforts to comply with university policy, as well as with state and national law. In addition, the department plays an important role in analysis of national and state legislation and in developing new institutional policy to meet these changes as they occur. This analysis is important in developing positions for the UC with regard to new legislation that will impact the university's capability to effectively transfer technology to industry.

3.5 *Financial Management*

Depending on the scale of a technology transfer program, there can be significant infrastructure required simply to manage the program's finances. For the UC this involves monitoring the receipt of approximately US$100 million annually, payment of approximately US$20 million in attorney fees, and the distribution of net revenues to inventors and to campuses where the technology originated. This is an area where inconsistencies in financial management can lead to substantial losses in revenue, loss of IP rights, and exposure to lawsuits by licensees as well as the university's own inventors. The Financial Management department provides a dedicated financial management infrastructure for uniform and consistent financial management for the technology transfer program. It is important to recognize that the finances managed by this group are somewhat less "routine" than those managed in other university programs. The department needs to understand the legal processes surrounding IP management and also balance the differences in culture and demands

arising from private industry, law firms, the university community, and individual inventors, all of whom have significant interests in the financial outcomes of the technology transfer process.

3.6 *Licensing*

The largest department within the UC technology transfer program is licensing. The UC has historically maintained sector-specific licensing groups in life sciences/pharmaceuticals, physics and engineering, and agriculture. It is particularly helpful to have technical expertise in each group as well as to have knowledge of licensing norms in the various industry sectors, which differ significantly. Licensing officers typically have one or more technical degrees (usually a Ph.D.), a law degree, and/or a business degree (M.B.A.), and are assigned primary responsibility for a case—defined as an invention disclosure—from its inception, through to licensing, and on to expiration. This practice has been referred to as "cradle to grave" management and differs markedly from the practice, typical of many institutions, of segregating invention disclosure and patenting processes from licensing negotiations and postagreement management.

Another chapter in this *Handbook*[5] provides a case study on the strawberry licensing program at UC Davis that illustrates an example of the types of licenses and licensing programs that the university has entered into as a means to transfer technology to the private sector.

4. TECHNOLOGY TRANSFER IN A DISTRIBUTED INSTITUTIONAL NETWORK

Perhaps the most distinctive features of the UC technology transfer system are its size and the development of a distributed institutional network of campuses that operate under a common policy framework and share certain resources, but function relatively independently. Valuable lessons can be learned from this system that may have applications in, or provide guidance to, other institutional networks seeking to develop capacity in technology transfer.

The first lesson is that a situation where a decentralized technology transfer program is in close geographic proximity to major research centers can lend itself to success. Decentralization and proximity are particularly important because active engagement by researchers in the technology transfer process typically requires a cultural shift that can only be made through continuous and systematic contact between technology managers and researchers.

There are, however, elements of a technology transfer program that can be effectively centralized. Candidates for centralization are, specifically, those elements of the program for which (1) uniform activities are required to minimize legal or financial risk or (2) economies of scale can be achieved by a consolidation of the activities.

Using these criteria, the UC technology program has, in general, retained centralized financial management, information technology (database) services, policy analysis and development, and legal oversight. These activities are generically referred to as our "back office" functions, which are essential for the program but do not require direct interface with our institutional clients (researchers) or our external clients (licensees).

In contrast, we have identified for local management those program elements that directly interface with researchers, research sponsors, licensees, or regional business interests. Based on this criteria, the following activities have been the focus of most of the campus-based technology transfer offices: invention disclosures and evaluation, patent prosecution, technology licensing, and business development activities.

The centralized/decentralized structure, or distributed network, described here could be emulated and implemented at different scales, from a relatively small-scale research consortium made up of a network of institutions, to a larger-scale national network of universities, to a global-scale international network of research institutions linked by common policies and objectives.

5. CONCLUSION

The UC has a long history of seeking intellectual property protection for its research discoveries and managing the technologies for the public benefit. By some measures, the UC technology

transfer program is the largest public program in the world. Although it has evolved over the years, it has always been at the forefront of this endeavor. This article has focused on the history and policy and organization frameworks of the UC technology transfer program. We hope this discussion will be instructive to administrators and others seeking to learn from the UC experiences. ■

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1 Mowery DC, RR Nelson, BN Sampat and AA Ziedonis. 2004. *Ivory Tower and Industrial Innovation: University-Industry Technology Transfer Before and After the Bayh-Dole Act in the United States*, Stanford Business Books: Stanford, California.

2 *Shaw v. University of California,* 67 Cal. Rptr.2d 850. 58 Cal. App. 44 (1997).

3 Graff G, A Heiman and D Zilberman. 2002. University Research and Offices of Technology Transfer. *California Management Review* 45:88–116.

4 See *supra* note 1.

5 See, also in this *Handbook*, chapter 17.25 by AB Bennett and M Carriere.

Figure 2: Schematic of the Functional Division of Program Elements in a Distributed Institutional Network for Technology Transfer

