

## Intellectual Property: National and International Perspectives

*Requested by*

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*The Caltrans Division of Research and Innovation (DRI) receives and evaluates numerous research problem statements for funding every year. DRI conducts Preliminary Investigations on these problem statements to better scope and prioritize the proposed research in light of existing credible work on the topics nationally and internationally. Online and print sources for Preliminary Investigations include the National Cooperative Highway Research Program (NCHRP) and other Transportation Research Board (TRB) programs, the American Association of State Highway and Transportation Officials (AASHTO), the research and practices of other transportation agencies, and related academic and industry research. The views and conclusions in cited works, while generally peer reviewed or published by authoritative sources, may not be accepted without qualification by all experts in the field.*

### Executive Summary

#### Background

A consistent approach to managing intellectual property (IP) permits the effective transfer of the results of research and encourages the use of products and services by client organizations. This Preliminary Investigation seeks to capture current national and international research related to technology transfer and intellectual property rights (IPR), with a particular interest in transportation agency management of IP.

#### Summary of Findings

We gathered information in four key topic areas related to IP:

1. National perspective—federally funded research.
2. National perspective—state-funded research.
3. International perspective.
4. Implementation issues.

These four topic areas, while not providing for a comprehensive assessment of IPR, were selected to provide a high-level review of current issues. This report begins with consideration of the source of funding, a critical distinction related to IP resulting from domestic research. Research projects receiving federal funds are subject to the terms of the Bayh-Dole Act. Research projects funded solely with state funds are not subject to the Bayh-Dole Act, though they are subject to applicable state law.

We next consider how IPR is handled abroad to inform both domestic practices and collaborative research with international partners. Finally, we consider factors, within the realm of IPR and beyond, that may hinder implementation of innovations resulting from research.

Within each topic area we identified recent research and included related resources where available. Following is a summary of findings by topic area. Each topic area summary concludes with a list of potential future research areas suggested by the current body of research.

#### **Issue 1. National Perspective: Federally Funded Research**

- The Bayh-Dole Act plays a critical role in how participants in federally funded research manage IPR. The Act allows universities, nonprofit corporations and small businesses to retain ownership of inventions made under federally funded contracts and license those inventions to others. This report includes a brief

summary of the Act followed by a series of related resources, including the regulations implementing the Act and the codification of the Act in the U.S. Code, Federal Highway Administration (FHWA) guidance, Council on Governmental Regulations guides that address major implementation issues, and an online tool that assists funding recipients in complying with the Act's reporting provisions.

- Other legislation related to federal technology transfer policy authorizes the use of cooperative research and development agreements and provides guidelines to encourage commercialization of federally owned inventions.
- Reports assessing the impact of the Bayh-Dole Act, which include a Congressional Research Service report, an FHWA report, and a recent journal article, conclude that further discussion is required to ensure the effectiveness of the Act in transferring technology.
- The June 2009 meeting of the TRB Conduct of Research Committee included presentations on IP issues. Presenters addressed issues such as the types of IP that are protected in the United States, overcoming challenges in deploying innovations, and an FHWA regulation that provides conditions for the use of patented or proprietary technologies on federal-aid highway projects.

#### **Potential research areas:**

- How do the IP and business practices at U.S. universities compare to universities abroad?
- Can a national-level operating procedure be developed for the application of IP?
- Are there differences in interpretation of the statute and regulations by universities and industry?
- In what ways does the Bayh-Dole Act promote innovation? Has it created any barriers?
- Are public agencies in the United States turning to foreign universities for research collaboration?
- What changes in the Bayh-Dole legislation may be appropriate in the next 25 years? Should trade secrets be addressed?
- What is the federal role for IP and technology transfer?

#### **Issue 2. National Perspective: State-Funded Research**

- A January 2006 report to the California Legislature offers recommendations for a state IP policy that would create incentives for commerce in California and would require concerted efforts to develop state-funded IP into applications and products that benefit the public.
- A 2007 report by the California Center for Innovative Transportation explores IP and technology transfer issues associated with licensing a Caltrans-patented safety product (the Balsi Beam).
- The 2005 publication *NCHRP Report 355: Transportation Technology Transfer: Successes, Challenges, and Needs*, indicates that states are effectively dealing with IP management, though anecdotal information describes patents and IP as problematic. Examples of how IP is handled by states and sample contract clauses are included in the 2003 publication *NCHRP Report 312: Facilitating Partnerships in Transportation Research*.
- State department of transportation (DOT) activities include:
  - A Virginia Department of Transportation handbook provides guidance for employees developing anything during work hours that could qualify for a patent or copyright.
  - The Oregon Department of Transportation's Commercial Products Research and Development Program, a public-private partnership research program authorized by a 2003 Oregon law, is designed to encourage innovations that improve Oregon's highway system.
- Recommendations and guidelines associated with university-industry research relationships can be relevant to state DOTs wishing to establish research partnership and draft research agreements.

#### **Potential research areas:**

- Can elements of the Bayh-Dole Act be used to guide development of state IP policies?
- How can the use of open source and broad-use licenses be included as a contractual requirement to facilitate wider dissemination of research results?
- Can IP data be used to develop strategies for negotiating retention of IP rights?

- How should exclusive licenses be developed and structured to encourage technology development and use?
- What is the impact of limiting existing patent applications and patents of “future improvements”?

### **Issue 3. International Perspective**

- A 2008 summary report of the International Technology Scanning Program notes differing perspectives on IP ownership generated from government-funded research in Europe and Japan.
- Journal articles discuss IPR policies in Denmark, Sweden, the U.K., and countries in Southeast Asia, often using the Bayh-Dole Act to draw distinctions and note similarities between U.S. and international practices.

#### **Potential research areas:**

- How can international practices inform U.S. management of IPR?
- What are the barriers to collaborative research activities abroad?

### **Issue 4. Implementation Issues**

- Decisions made by research sponsors with regard to IPR may affect the ability of state agencies to purchase a product or adopt new technologies. Case studies of two California projects highlight the need for creative approaches to addressing obstacles in nationwide deployment of research results.
- California state law dictates the use of competitive bid processes over sole source agreements. This can be challenging when only one private company has the expertise needed to commercialize a product for broad technology transfer.

#### **Potential research areas:**

- Can noncompetitive bidding be used to preserve IPR and encourage adoption of new technologies?
- What other approaches can be used by state DOTs to encourage dissemination of research results while preserving IPR?

## **Issue 1: National Perspective: Federally Funded Research**

Federally funded research is subject to the terms of the Bayh-Dole Act and subsequent amendments. This is true even if the federal government is not the sole source of funding. Under the law, universities, nonprofit corporations and small businesses can elect to retain ownership of inventions made under federally funded contracts and license those inventions to others. This section includes links to the regulations implementing the Act and summaries of resources providing guidance to organizations subject to the Act, related federal technology transfer legislation, and documents that assess the Act's impact.

### **Bayh-Dole Act**

Prior to the passage of the Bayh-Dole Act of 1980, inventions arising from federally funded research were made available through nonexclusive licenses to anyone who wanted to use them, and the federal government retained ownership of the invention. In rare cases, waivers were granted to transfer title to universities or other recipients of the federal grants funding the research.

Of the approximately 28,000 patents held by the federal government in 1980, fewer than 5 percent were licensed to industry for development of commercial products. Most sources agree that this was due to industry's reluctance to invest in further research and development or manufacturing of products based on a nonexclusive license that offered no competitive advantage to the licensing company.

The Bayh-Dole Act permits universities, nonprofit corporations and small businesses to retain ownership of their inventions developed in connection with federally funded research and actively participate in the commercialization of their inventions through exclusive licensing of the invention to other parties. The federal government retains a nonexclusive, nontransferable, irrevocable, royalty-free license to use, and authorize others to use, the invention for or on behalf of the federal government.

Actions required of those wishing to retain ownership rights include:

- Disclosing new inventions to the federal funding agency within two months of discovery.
- Electing to retain title to inventions within two years of making disclosure to the funding agency (this time is shortened if, due to publication of results, the one-year statutory patent application requirement has been set in motion).
- Applying for a patent within one year of electing to retain title.
- Including in the patent application a notification of government support and rights in the invention.

If marketing an invention, the patent owner must give preference to small businesses with fewer than 500 employees.

The Act provides exceptions to the transfer of title and licensing rights. The federal government may decide that there are compelling reasons to retain ownership rights before entering into a funding agreement. Agencies wishing to retain rights must file a Determination of Exceptional Circumstances (DEC) with the Department of Commerce and obtain a ruling. A DEC might be filed if the research in question poses national security concerns.

Under certain circumstances, the federal government may also require the patent owner to grant a license to a third party or may take title and grant licenses itself (called "march-in rights" in the Act). These actions may be taken if the invention does not achieve practical application within a reasonable time, to address health or safety needs, to meet requirements for public use specified by federal regulations, or if the government identifies a failure to meet other legal requirements.

### **Resources Related to the Bayh-Dole Act**

Documents providing access to the full text of the implementing regulation and resources that offer guidance to organizations subject to the requirements of the Bayh-Dole Act appear below.

#### **37 CFR 401 Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts, and Cooperative Agreements**

[http://www.access.gpo.gov/nara/cfr/waisidx\\_02/37cfr401\\_02.html](http://www.access.gpo.gov/nara/cfr/waisidx_02/37cfr401_02.html)

The full text of the regulation that implements the Bayh-Dole Act.

#### **35 USC 200-212 Title 35 Patents; Part II Patentability of Inventions and Grant of Patents: Chapter 18 Patent Rights in Inventions Made with Federal Assistance**

<http://www4.law.cornell.edu/uscode/35/pIIch18.html>

Codification of the Bayh-Dole Act in the U.S. Code.

#### **23 CFR 420 Highways; Planning and Research Program Administration**

[http://www.access.gpo.gov/nara/cfr/waisidx\\_03/23cfr420\\_03.html](http://www.access.gpo.gov/nara/cfr/waisidx_03/23cfr420_03.html)

23 C.F.R. §420.121(i) provides language that must be included in all subgrants or contracts for experimental, developmental or research work.

#### **FHWA, State DOT, and MPO Rights to Copyrighted and Patented Items Developed with FHWA Planning and Research Funds, FHWA, March 11, 2004.**

<http://www.fhwa.dot.gov/hep/sprpat.htm>

FHWA's guidance for state DOTs includes the required inclusion of patent rights clauses given in 37 C.F.R. §401.14 in all research contracts involving federal funds. Because the federal government's license cannot be transferred to third parties, including state DOTs, a state DOT wishing to reserve the right to use an invention or discovery resulting from federally funded research must include the appropriate provisions in its research agreements. While state DOTs can include a provision in their research agreements that provides the right to use an invention, the provisions of 23 C.F.R. §420.121(i) prohibit state DOTs from requiring a contractor to relinquish title to an invention as a condition of being awarded the contract.

#### **The Bayh-Dole Act: A Guide to the Law and Implementing Regulations, Council on Governmental Relations, October 1999.**

[http://www.cogr.edu/docs/Bayh\\_Dole.pdf](http://www.cogr.edu/docs/Bayh_Dole.pdf)

This brochure reviews the Bayh-Dole legislation, the implementing regulations that have evolved, and the major issues associated with complying with the law and related regulations.

#### **21 Questions and Answers About University Technology Transfer, Council on Government Relations, undated.**

<http://www.cogr.edu/docs/21QuestionsPaper.doc>

This document describes the Bayh-Dole Act, offers strategies for promoting dissemination of university technologies, provides references for establishing collaborative relationships with industry partners, and discusses the relationship between patents and publishing.

#### **Interagency Edison**

<https://s-edison.info.nih.gov/iEdison/>

Interagency Edison (iEdison) helps the recipients of federal research funding comply with the Bayh-Dole Act by providing a single interface to interact with participating agencies. Features that streamline administrative tasks include the opportunity for grantees and contractors to submit electronic documents that satisfy Bayh-Dole reporting requirements. FHWA is not among the federal agencies participating in iEdison.

## **Related Legislation**

Other legislation related to federal technology transfer is highlighted below.

**Federal Technology Transfer Legislation and Policy (“The Green Book”)**, Federal Laboratory Consortium for Technology Transfer, 2009.

[http://www.federallabs.org/pdf/FLC\\_Legislation\\_and\\_Policy.pdf](http://www.federallabs.org/pdf/FLC_Legislation_and_Policy.pdf)

This legal reference resource addresses the major statutory and presidential executive order policies that provide the framework for the federal technology transfer program. Technology Innovation Legislation Highlights summarize technology transfer legislation and executive orders since the passage of the Stevenson-Wydler Technology Innovation Act of 1980. (See <http://www.federallabs.org/> for additional information about the Federal Laboratory Consortium for Technology Transfer, the nationwide network of federal laboratories that was chartered by the Federal Technology Transfer Act of 1986 to promote and strengthen technology transfer.)

**Public Law 96-480, Stevenson-Wydler Technology Innovation Act of 1980**

<http://www.csrees.usda.gov/about/offices/legis/techtran.html>

This law laid the groundwork for federal technology transfer policy. While the Bayh-Dole Act focuses on inventions created under federal contracts, the Stevenson-Wydler Act focuses on inventions owned by the federal government that remain the property of the agencies that produced them. The Act, as amended, provides guidelines and recommendations to encourage commercialization of federally owned inventions through the licensing of technology to U.S. businesses.

**Public Law 99-502, Federal Technology Transfer Act of 1986**

The most significant feature of this law amending the Stevenson-Wydler Act is its authorization of cooperative research and development agreements (CRADAs) between federal laboratories and nonfederal entities. The law also directs federal agencies to allow employees to commercialize inventions when the agencies themselves do not patent or otherwise promote commercialization. See a model CRADA at

<http://www.netl.doe.gov/business/crada/pdfs/09-Standard%20Model%20CRADA.pdf>.

**Public Law 106-404, Technology Transfer Commercialization Act of 2000**

[http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=106\\_cong\\_public\\_laws&docid=f:publ404.106.pdf](http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=106_cong_public_laws&docid=f:publ404.106.pdf)

This law authorizes the licensing of government-owned technology through CRADAs and streamlines restrictions imposed on the government’s licensing of government-owned inventions. The act clarifies provisions related to license notice requirements, royalties, co-ownership of inventions with nonfederal co-inventors, and assignment of federal employee rights in inventions to the government.

## **Implications of the Bayh-Dole Act**

**The Bayh-Dole Act: Selected Issues in Patent Policy and the Commercialization of Technology,**

Wendy H. Schacht, Congressional Research Service, February 3, 2009.

[http://assets.openers.com/rpts/RL32076\\_20090203.pdf](http://assets.openers.com/rpts/RL32076_20090203.pdf)

This report concludes that the “Bayh-Dole Act appears to have met its expressed goals of using ‘the patent system to promote the utilization of inventions arising from federally-supported research or development; ... and to promote collaboration between commercial concerns and nonprofit organizations, including universities....’” Further discussion is recommended in the area of pharmaceuticals and biotechnology, where some argue that companies receive too many benefits at public expense. Others express concern that the government’s existing rights under Bayh-Dole are too restrictive and are an obstacle in meeting the government’s needs with respect to defense.

**“University Licensing of Intellectual Property: Revisiting the Impact of Bayh-Dole,”** Richard Churchill, Daniel Lorence, James Chin, Frank Peo, Luis Gonzales, *International Journal of Technology Transfer & Commercialisation*, Vol. 8, No. 1 (2009): 98-109.

Abstract at <http://www.ingentaconnect.com/content/ind/ijttc/2009/00000008/00000001/art00005>

Researchers note that the demands of a global marketplace have led some to question the effectiveness of the Bayh-Dole Act as an efficient mechanism to transfer technology. Such questions include:

- Are there differences in interpretation of the statute and regulations by universities and industry? Are there differences in the impact across industry sectors, or for large and small businesses?

- Are U.S. companies turning to foreign universities for research collaboration? How do the IP and business practices at U.S. universities compare to universities in other developed and developing countries?
- In what ways does the law promote innovation? Has it created any barriers?
- What changes in the Bayh-Dole legislation may be appropriate as we look to the next 25 years?

**The International Technology Scanning Program Summary Report**, Barbara T. Harder, B. T. Harder Inc., June 9, 2008.

[http://international.fhwa.dot.gov/pubs/trpm/trpm\\_report.pdf](http://international.fhwa.dot.gov/pubs/trpm/trpm_report.pdf)

This report of an April 2008 review of international research program administration practices notes that many U.S. practitioners lack an understanding of the limits and application of the Bayh-Dole Act. An implementation strategy to investigate the effects and applications of IPR, as well as opportunities for IPR, in the U.S. and abroad includes a recommendation for a national-level standard operating procedure for the application of IP. (See page 10 of this Preliminary Investigation for a summary of relevant findings from the international scan tour.)

**“Intellectual Property Rights in the Company-University Relationship,”** Karl F. Jorda, *NEOS II International Seminar Intellectual Property & Technology Transfer*, November 11, 2004.

[http://www.ipmall.info/hosted\\_resources/pubspapers/Jorda\\_IP\\_Rights\\_in\\_Company-University\\_Relationship\\_041111.pdf](http://www.ipmall.info/hosted_resources/pubspapers/Jorda_IP_Rights_in_Company-University_Relationship_041111.pdf)

This paper noted that the Bayh-Dole Act fails to address the matter of trade secrets. The author notes that licenses under patents without access to associated knowledge—trade secrets—are often inadequate for commercial use of the patented technology.

## **Related Activities**

**TRB Conduct of Research Committee Midyear Meeting**, June 16 and 17, 2009, Washington, D.C.

This meeting included presentations on IP issues by three speakers:

- **William McComas**, Shapiro Sher Guinot & Sandler  
McComas, an attorney specializing in IP-related issues, addressed the four types of IP that are protected in the United States—copyrights, patents, trademarks and trade secrets—and explained some of the issues related to the four categories of IP.
- **Nancy Chinlund**, Chief, Office of Planning, Policy and Innovation, Caltrans Division of Research and Innovation  
Presenting on behalf of Larry Orcutt, Chief of the Caltrans Division of Research and Innovation, Chinlund discussed the methods used to overcome roadblocks associated with deployment of three innovations developed by Caltrans: Sensys, a compact, low-cost wireless traffic sensing system; Construction Analysis for Pavement Rehabilitation Strategies (CA4PRS) software, which predicts traffic delays associated with simulation scenarios; and the Balsi Beam, a mobile frame designed to protect highway workers. (See page 14 of this Preliminary Investigation for further discussion of the Caltrans case studies.)
- **Debra Elston**, Director, Office of Corporate Research, Technology and Innovation Management, FHWA Turner-Fairbank Highway Research Center  
Elston discussed IP issues as they relate to FHWA’s Exploratory Advanced Research Program, implementation of the Strategic Highway Research Program (SHRP 2), and partnerships with university transportation centers. Elston also touched on IP issues that were encountered during the 2008 international scan of transportation research programs. (See page 12 of this Preliminary Investigation for a summary of relevant findings from the international scan tour.)

Discussion included reference to an FHWA regulation—23 CFR 635.411—that prohibits the use of federal-aid funds for a patented or proprietary product or process used on a federal-aid highway construction project, unless specific conditions are met. Conditions under which federal funding may be applied to the use of proprietary products include when competitive bidding is used as specified in the regulation; when the contracting agency certifies that the specified proprietary product is either necessary for synchronization with existing facilities or is a unique product for which there is no suitable alternative; when a proprietary product is used for research or experimental purposes; or when the use of a proprietary product is approved by FHWA as

being in the public interest. FHWA indicates that the primary purpose of the regulation is to ensure competition in material selection while still allowing for the development of new products and materials.

Resources related to 23 CFR 635.411 include:

- **23 CFR 635.411 Material or Product Selection**  
<http://frwebgate.access.gpo.gov/cgi-bin/get-cfr.cgi?TITLE=23&PART=635&SECTION=411&TYPE=TEXT>  
The full text of the regulation that provides the conditions under which federal funds can be used in connection with patented or proprietary materials or products on a federal-aid highway project.
- **Contract Administration Core Curriculum Participant's Manual and Reference Guide**, FHWA, 2006.  
<http://www.fhwa.dot.gov/programadmin/contracts/cacc.pdf>  
This manual is associated with an FHWA course designed to discuss contract provisions, administrative procedures, and applicable policies related to federal-aid design and construction contracts. See pages 95 through 98 of the PDF for examples of conditions under which patented or proprietary materials may be approved for use on federal-aid projects. See page 88 of the PDF for guidance with regard to public interest findings.
- **Policy Memo: Guidance on Patented and Proprietary Product Approvals**, FHWA, January 11, 2006.  
<http://www.fhwa.dot.gov/programadmin/contracts/011106.cfm>  
The intent of this memo is to establish more uniform interpretations concerning the material selection and product approval issues relating to 23 CFR 635.411.
- **Questions and Answers Regarding Title 23 CFR 635.411**, FHWA, October 31, 2008.  
<http://www.fhwa.dot.gov/programadmin/contracts/011106qa.cfm>  
FHWA posted these questions and answers to provide additional guidance regarding the use of patented and proprietary products on federal-aid projects under 23 CFR 635.411, and to clarify the applicability of the regulation to both National Highway System (NHS) projects and non-NHS projects.

Elston noted that the TRB Research and Technology Coordinating Committee is looking at the issue of how regulations are implemented and whether differing perspectives affect implementation.

Notes from the June 2009 meeting will be posted on the Conduct of Research Committee's Web site at <http://www.mrutc.org/COR/>.

## **Issue 2: National Perspective: State-Funded Research**

State-funded research projects to which no federal funds are contributed are not subject to the provisions of the Bayh-Dole Act. To augment our research with regard to state agency practices in handling IPR, we include reports directed to the university community from which state agencies can cull recommendations for establishing research partnerships and crafting research agreements with industry research sponsors.

### **California Practices**

**Policy Framework for Intellectual Property Derived from State-Funded Research**, Final Report to the California Legislature and the Governor of the State of California, California Council on Science and Technology Intellectual Property Study Group, January 2006.

<http://www.ccast.us/publications/2006/IPFinal.pdf>

This report discusses the likely benefits associated with IP created with California state funding, describes models

for handling IP, and suggests a policy framework. The report recommends that the state's IP policy should:

- Be consistent with the federal Bayh-Dole Act.
- Create incentive for commerce in California from state-funded research.
- Encourage timely publication of results to diffuse knowledge widely.
- Require diligent commercialization of IP-protected technology into products that benefit the public.

Other IP policy recommendations include the following:

- Permit grantees to own IPR from state-funded research.
- Where appropriate, require a plan describing how IP will be managed for the advancement of science and benefit to California.
- Grant basic research funds without requiring grantees to provide a revenue stream to the state. If a revenue stream should develop, require that revenues be reinvested in research and education.
- Make state-developed research tools widely available to other researchers.
- Require diligent efforts to develop state-funded IP into applications and products that benefit the public.
- Retain Bayh-Dole-like "march-in" rights if the IP owner is not undertaking appropriate steps to transfer or use the technology to benefit the public.
- Allow license owners to determine the licensing options that allow for wide distribution of their discoveries.
- Reserve the right to use IP by or on behalf of the state for research or noncommercial purposes.
- Establish functions to track all IP generated through state funding.

**Intellectual Property Valuation and Licensing of the Balsi Beam**, California Center for Innovative Transportation, University of California Berkeley, Draft Report, 2007.

[http://www.calccit.org/news/2007PDF/Intellectual%20Property%20Valuation%20and%20Licensing%20of%20the%20Balsi%20Beam\\_CCIT%20Report.pdf](http://www.calccit.org/news/2007PDF/Intellectual%20Property%20Valuation%20and%20Licensing%20of%20the%20Balsi%20Beam_CCIT%20Report.pdf)

Developed by Caltrans, the Balsi Beam is a mobile barrier designed to protect workers in a closed lane adjacent to traffic. Pilot deployments of the Balsi Beam have established significant potential safety benefits, prompting Caltrans to explore how best to transfer the design to private parties that can manufacture it for use by other states. This report investigates the intellectual property issues associated with such a transfer, including the following licensing options:

- Free, open license.
- Nonexclusive royalty-based license.
- Exclusive license.
- Public-sector-only license.

## **State Agency Practices**

**Transportation Technology Transfer: Successes, Challenges, and Needs**, *NCHRP Report 355*, 2005.

[http://www.trb.org/publications/nchrp/nchrp\\_syn\\_355.pdf](http://www.trb.org/publications/nchrp/nchrp_syn_355.pdf)

Surveys, a literature review and interviews evaluated for this synthesis report indicate that "legal issues including patents and IP ownership were not reported as primary challenges or barriers to technology transfer or implementation of research results on both surveys conducted for this study. Anecdotal information, however, describes patents and IP as a problem area. In the survey responses, where these issues have arisen, states tended to have some precedent that allows this factor to be overcome without much remark. LTAP/TTAP centers are also inclined to focus their efforts on readily available techniques and processes and not spend scarce resources on technologies or innovations that may have some limitations on use."

**Facilitating Partnerships in Transportation Research**, *NCHRP Report 312*, 2003.

[http://onlinepubs.trb.org/Onlinepubs/nchrp/nchrp\\_syn\\_312.pdf](http://onlinepubs.trb.org/Onlinepubs/nchrp/nchrp_syn_312.pdf)

This synthesis notes that one of the primary challenges to forming partnerships is the ownership of IP. Transportation agency research units most often cited patent rights when asked which IP issues required resolution to resolve conflicting perspectives among partners, followed by copyright and IPR ownership.

Appendix E of the report provides examples of how IP is handled by Alabama, California, Kansas, Louisiana, Maine, Missouri, Montana, Nebraska, North Carolina, Rhode Island, West Virginia and Ontario. (See page 84 of the PDF.)

Authorized by the Federal Technology Transfer Act of 1986, cooperative research and development agreements between federal agencies and nonfederal research partners facilitate the transfer of technology arising from federally funded research and development. The report includes articles excerpted from a CRADA between Honeywell International Inc. (Honeywell is operating through its U.S. Department of Energy contract) and the Missouri Highway and Transportation Commission, which illustrate treatment of IPR for a specific project. (See page 52 of the PDF.)

**Intellectual Property: A Handbook for Employees of the Virginia Department of Transportation**,

Catherine E. Colyer, Stephen C. Schott, Virginia Transportation Research Council, August 2006.

[http://www.virginiadot.org/vtrc/main/online\\_reports/pdf/07-r3.pdf](http://www.virginiadot.org/vtrc/main/online_reports/pdf/07-r3.pdf)

This handbook provides guidance to Virginia Department of Transportation employees with regard to IP. Anything that is developed by an employee of the Commonwealth during working hours (working within the scope of his or her employment or using state-owned or state-controlled facilities) that could qualify for a patent or copyright is the property of the Commonwealth. Should an executive agency, such as VDOT, receive money from commercialization of an invention, it must return the funds to the General Fund, as required by applicable Virginia law, and pay 20 percent of the net royalties to the inventors.

**Oregon Department of Transportation Commercial Products Research and Development Program**

<http://www.oregon.gov/ODOT/TD/COMPRODUCTS/>

A 2003 Oregon law provided for the establishment of the Oregon Department of Transportation's Commercial Products Research and Development Program, a public-private partnership research program. Partnerships take the form of a contractual agreement with individuals, businesses, nonprofit organizations or state universities. The program is focused on "developing products for market, which may reduce the cost of maintenance and preservation or extend the useful life of the state's highways, or which may improve highway safety." Research agreements provide funding for research and could provide ODOT with royalties or other financial benefits from the sale or use of commercial products developed under the agreements. ODOT's primary interest is in encouraging innovations that improve Oregon's highway system, not commercial profit.

See [http://arcweb.sos.state.or.us/rules/OARS\\_700/OAR\\_731/731\\_060.html](http://arcweb.sos.state.or.us/rules/OARS_700/OAR_731/731_060.html) for the administrative rules governing the Commercial Products Research and Development Program.

**"Open Source Development—A Route to Better Software?"** John H. Ewing, *Rail Transit Conference*, 2005.

Abstract at <http://ntlsearch.bts.gov/tris/record/tris/01002196.html>

Software quality, the adequacy of documentation, and the nature and extent of IPR are frequent topics of discussion in connection with software used on rail vehicle projects. This conference paper considers how open source software could be employed to benefit both the purchasers and suppliers of rail vehicles.

## **University-Industry Research Partnerships**

**Guide to University Industry Research Relationships**, Council on Governmental Relations, 2007.

<http://206.151.87.67/docs/UniversityIndustryBrochure.doc>

Issues associated with collaborative research relationships between universities and industry are addressed in this guide. Topics include background intellectual property rights—the IP owned by the university but not developed with the company's support that may be required to practice inventions made during the sponsored project.

The guide notes that the most common research agreements have the university retaining title in IP derived from industry-sponsored research, with certain rights granted by license to the industry sponsor. The scope of the license may range from a nonexclusive, royalty-free right to use results for internal purposes to an exclusive license with royalties for commercial applications.

**“Industry-University IP Relations: Integrating Perspectives and Policy Solutions,”** Mariann Jelinek, Stephen Markham, *IEEE Transactions on Engineering Management*, Vol. 54, No. 2 (May 2007): 257-267.

Abstract at

[http://ieeexplore.ieee.org/xpl/freeabs\\_all.jsp?isnumber=4160146&arnumber=4160165&count=20&index=3](http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?isnumber=4160146&arnumber=4160165&count=20&index=3)

In this paper researchers recommend a series of university policies that might result in more research support and better relationships with industry. IP ownership arrangements and their relevance to industry and universities are examined, including:

- Industry owns IP that results from collaborative research with universities.
- Industry owns IP, but it allows the university to continue to research and publish.
- University owns IP, but it allows exclusive licenses to industry for any use.
- University owns IP, but it allows industry an exclusive license for a narrow field of use.
- University owns IP, but it makes it available nonexclusively to any company that wants it.

Researchers express concern that failure to effectively address the potentially contentious industry-university relationship may result in more research moving to foreign universities.

**In the Public Interest: Nine Points to Consider in Licensing University Technology,** *White Paper*, Association of American Medical Colleges, California Institute of Technology, Cornell University, Harvard University, Massachusetts Institute of Technology, Stanford University, the University of California system, the Chicago and Urbana-Champaign campuses of the University of Illinois, University of Washington, Wisconsin Alumni Research Foundation, Yale University, March 7, 2007.

<http://news-service.stanford.edu/news/2007/march7/gifs/whitepaper.pdf>

Drafted by the nation’s top research universities and the Association of American Medical Colleges, these guidelines are intended to reflect the business needs of the university while protecting the public interest when universities grant licenses to other parties for the rights to university-developed inventions. Pages 10 through 17 of the PDF provide commentary and sample license clauses.

The nine points that form the guidelines are summarized below:

- Universities should reserve the right to practice licensed inventions and to allow other nonprofit and governmental organizations to do so.
- Exclusive licenses should be structured in a manner that encourages technology development and use.
  - While exclusive licenses are often appropriate when a significant investment of time and resources are required to bring a technology to implementation, universities should be careful to grant only those rights necessary to encourage development of the technology.
- Strive to minimize the licensing of “future improvements.”
  - Licensed rights should be limited to existing patent applications and patents.
- Universities should anticipate and help to manage technology transfer–related conflicts of interest.
- Ensure broad access to research tools.
  - An exclusive license should make it clear that the exclusivity relates to the sale, not the use, of licensed technology. Such a provision gives the university the right to nonexclusively license use of the patented technology.
- Enforcement action should be carefully considered.
  - Litigation is seldom the preferred option for resolving disputes.
- Be mindful of export regulations.
- Be mindful of the implications of working with patent aggregators.
- Consider including provisions that address unmet needs.

**Guiding Principles for University-Industry Endeavors**, National Council of University Research Administrators, Industrial Research Institute, April 2006.

[http://www7.nationalacademies.org/guirr/Guiding\\_Principles.pdf](http://www7.nationalacademies.org/guirr/Guiding_Principles.pdf)

The preamble to this report notes that “intellectual property issues and relationships between industry and universities are becoming increasingly contentious and complex over time, and the urgency of addressing these is paramount.... With the increase in global competitiveness, industry is facing intense pressure to increase innovation, contribution, economic development, and profitability. Within this perspective, we need to plan for increasing the success rate of collaborations.”

The report recommends gaining a better understanding of the probability that IP will result from a particular sponsored collaborative research project, and using that information to develop different negotiation strategies. The estimated percentage of industry-university collaborations that generate IP is very low—about 3 percent. If a research project is not likely to result in an invention, highly fundamental research may favor the university’s retention of IPR; applied research based on existing industry technology may suggest favoring the industry. In cases where interests are essentially equal and the probability for a resulting invention is greater, more rigorous negotiations are likely. But in most cases, the report recommends simplicity when it comes to IP terms, suggesting that research collaborators consider more detailed negotiation of specific licensing terms only if an invention results from the research.

### **Issue 3: International Perspective**

Some researchers have speculated that a failure to ensure effective public-private research collaborations may move more research to foreign universities and research institutes. Gaining a better understanding of how other countries treat IPR can inform domestic handling of IP issues and provide the background necessary to work toward a more global approach to managing IPR. Our findings include reviews of practices in France, Denmark, Sweden, the U.K., and countries in Southeast Asia.

### **Related Research**

**The International Technology Scanning Program Summary Report**, Barbara T. Harder, B. T. Harder Inc., June 9, 2008.

[http://international.fhwa.dot.gov/pubs/trpm/trpm\\_report.pdf](http://international.fhwa.dot.gov/pubs/trpm/trpm_report.pdf)

Evaluating transportation research program administration practices was the focus of a delegation of U.S. transportation experts in their April 2008 visits to Sweden, Netherlands, Belgium (European Commission), France, Japan and Korea.

The report summarizing the scan team’s findings states:

Europeans have a decidedly different perspective than the U.S. on the ownership of intellectual property generated from government funded transportation research. IPR is addressed before the transport research is initiated and included in the research partnership contract. In general in Europe, IP development is seen as an opportunity to build a business based on the specific IP, and thus to create an economic engine for the country. There is no barrier to the government funded organizations seeking patents, in fact for France’s LCPC, the number of patents is a performance measure used to evaluate the program. Japan’s PWRI also tracks and uses as an indication of “practicalization” (application to practice) of its research efforts the number of patents owned and its applications for patents and registrations.

One of the items that came up in discussions with European host countries is the need for the U.S. to “figure out its IP issues.” In particular, the U.S.’s methods for addressing IPR for surface transportation do not fit well within the European context. This issue can be a barrier to U.S.-European collaborative activities.

**“Effects on Academia-Industry Collaboration of Extending University Property Rights,”** Finn Valentin, Rasmus Lund Jensen, *Journal of Technology Transfer*, Vol. 32, No. 3 (June 2007): 251-276.

Abstract at <http://www.springerlink.com/content/d41156174214wx46/>

Researchers conducted a quasi-controlled experiment to determine the effects of reforms of university rights inspired by the Bayh-Dole Act. The Danish Law on University Patenting (LUP), effective January 2000, transferred to the university the patent rights on inventions made by Danish university scientists working alone or collaborating with industry. Sweden’s law leaves patent rights with academic scientists, which had been the case in Denmark prior to the 2000 reform.

Post-LUP, researchers noted significant reductions in contributions from Danish academic inventors, and a simultaneous increase from non-Danish academic inventors. While data indicated a modest increase in university-owned patents after LUP, company-owned patents significantly decreased after the reform. Researchers conclude that exploratory research, most commonly conducted through joint university-industry projects, is a poor fit with the LUP’s predetermined assignment of IPR to the university. Less complicated research requiring little research and development after the initial discovery may be a better fit under the new law.

**“Global Technology Transfer Infrastructure Is Maturing,”** Greg Goth, *IEEE Software*, Vol. 23, No. 4 (July/August 2006): 93-96.

Abstract at [http://ieeexplore.ieee.org/xpl/freeabs\\_all.jsp?tp=&arnumber=1657946&isnumber=34708](http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?tp=&arnumber=1657946&isnumber=34708)

This article reports on the success of global technology transfer in the research community. The climate in Asia is characterized as committed but immature. Japan’s legal and political infrastructure, while much more sophisticated than China’s, is relatively new. The author notes that it will take more time for Japan’s universities to reap the benefits of royalty income, just as it took decades for some U.S. universities to fully realize the economic benefits of the Bayh-Dole Act. Europe’s social-welfare structure and a less well-developed entrepreneurial business culture are cited as mechanisms working against effective technology transfer. Initiatives like the European Commission’s CISTRANA (Coordination of Information Society Technologies Research and National Activities) are designed to facilitate improved multinational communication and exchange of best practices.

**“Technology Transfer and IPR Policy for SMEs in South-East Asia,”** S. Macdonald, T. Turpin, *2006 IEEE International Conference on Management of Innovation and Technology*, Vol. 1: 238-242.

Abstract at [http://ieeexplore.ieee.org/xpl/freeabs\\_all.jsp?tp=&arnumber=4035831&isnumber=4035774](http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?tp=&arnumber=4035831&isnumber=4035774)

This conference paper discussed a report for the Association of South-East Asian Nations (ASEAN) on the relationship between the region’s IPR system and the innovations of subject matter experts. The report evaluated ASEAN policymakers’ belief that SMEs needed IPR to be competitive. Extensive surveys and interviews with SMEs found little evidence to support this belief. The vast majority of SMEs in most ASEAN countries are not involved in IPR activity. Researchers note that use of a one-size-fits-all IPR system would do a disservice to researchers in the developing world.

**“Government Policy and University Technology Transfer Practices in the U.K.,”** Mark Van Hoorebeek, *International Journal of Technology Transfer & Commercialisation*, Vol. 4, No. 4 (2005): 500-517.

Abstract at <http://pi2.ingenta.com/content/ind/ijttc/2005/00000004/00000004/art00005>

Researchers examined how governmental policy affects university technology transfer. Results indicate that, although the U.K. did not follow the legislative lead of the U.S., U.K. universities enjoy weak but beneficial Bayh-Dole-type effects. University technology transfer and the patenting of academic innovation is a concept not yet fully embraced by the U.K. higher education sector. The Research Assessment Exercise, a process to produce quality profiles for each submission of research activity made by institutions, is presented as an opportunity to encourage further Bayh-Dole type effects within the UK university sector. Researchers also suggest that slanting patent law in favor of the university can be achieved by clarifying the interpretation of the experimental use defense contained within the Community Patent Convention (COMPAT). COMPAT is a patent law measure under consideration by the European Union that would allow individuals and companies to obtain a patent right that is consistent across Europe.

## **Issue 4: Implementation Issues**

Moving the results of research into the marketplace for public benefit is the final phase of a research project, and can be problematic. Creative approaches to licensing were used to overcome challenges encountered in encouraging nationwide adoption of new technologies resulting from two California research projects.

### **California Practices**

#### **“Overcoming Roadblocks Facing the Implementation of Innovations: Three Case Studies at Caltrans,”**

Lawrence H. Orcutt, Mohamed Y. AlKadri, California Department of Transportation, *TRB 88th Annual Meeting Compendium of Papers DVD*, Paper #09-3671.

Abstract at [http://www.trb.org/am/ip/paper\\_detail.asp?paperid=28492](http://www.trb.org/am/ip/paper_detail.asp?paperid=28492)

This paper examined challenges faced by Caltrans in deploying three recent innovations. Two of these projects encountered roadblocks associated with IP:

**Balsi Beam.** A study determined that Caltrans may have hampered the marketing of the Balsi Beam, a mobile frame designed to protect highway workers, by patenting it. If a patent requires an exclusive, noncompetitive bid, public sector procurement driven by competitive multiple low-bid processes may preclude purchase of the product.

An alternative to the bidding process—“gifting” the Balsi Beam license to other states or vendors—is not permitted under California law. This prohibition led Caltrans, which owns the patent for the Balsi Beam, to develop license agreements to allow other states to purchase the right to use the Balsi Beam. A request for proposal to sell licenses to vendors will allow other potential customers to purchase the Balsi Beam through commercial channels.

**Construction Analysis for Pavement Rehabilitation Strategies (CA4PRS).** CA4PRS is a schedule and traffic analysis tool that helps planners and designers select effective, economical rehabilitation strategies. The software was developed by the University of California Berkeley under an FHWA pooled-fund study in 2002. Caltrans and the State Pavement Technology Consortium, a collection of state DOTs from California, Minnesota, Texas and Washington, provided funding for CA4PRS development. The University of California Berkeley holds the CA4PRS software copyright. In 2008 FHWA formally endorsed CA4PRS as a priority, market-ready technology ready for nationwide deployment.

Lagging national deployment of CA4PRS led the University of California Berkeley to partner with FHWA, which initiated changes through the pooled-fund project to allow for licensing of the CA4PRS software by state DOTs. With a \$150,000 payment to the University of California, a 50-state group license provides unlimited access to the CA4PRS software and associated technical support for each DOT upon request. FHWA funding will also provide state DOTs with basic training in the use of the software at no cost for a limited period of time on a first-come, first-served basis.

A critical lesson learned in the deployment of CA4PRS is that attractive licensing arrangements may not be enough to encourage adoption of new products. Prior to FHWA involvement, an unlimited license to CA4PRS was being offered to individual state DOTs for \$5,000 each. While price did not appear to be an obstacle, noncompetitive bidding issues like those encountered with the Balsi Beam were identified. The FHWA group license addressed this concern but, surprisingly, did not result in significant interest in the software.

Two implementation issues unrelated to IP also played a role in CA4PRS deployment: training and installation. Even with FHWA’s efforts to provide the software at no cost to state DOTs, interest in the product did not pick up until hands-on training was proactively offered to potential users. While implementation of the product is relatively quick and easy, providing support to the licensing agency’s information technology staff *before* product acquisition was also cited as essential to ensuring implementation of the new tool.