

Technology Transfer by Universities in the U.S. and Abroad

by Arun K. Sood



Public and private universities are recognizing the importance of technology transfer mechanisms as a powerful catalyst for economic development.

In 1980, the U.S. Congress passed the Bayh-Dole Act, formally referred to as Public Law 96-517. This legislation assigns the intellectual property rights derived from federal-government-funded research to a university. Most university research in the United States and abroad is directly or indirectly supported by governments. Thus, in the U.S., the Bayh-Dole Act has provided a strong incentive for the research-oriented universities to pursue technology licensing opportunities. Universities already participate in technology transfer—the students are the vehicle for this transfer, and the licensing opportunity provides an additional dimension for the technology transfer mission of the universities.

In this the Information Age, all governments see technology transfer as an important element of economic development and comparative trade advantage, and technology licensing and enterprise creation has implicitly become part of the mis-

sion of research universities all over the world. Technology licensing and related spin-off activities are handled at two U.S. universities and four foreign universities—each with research agendas and an organized effort to interact with industry.

Comparative Overview of Six Universities

Public and private universities are recognizing the importance of technology transfer mechanisms as a powerful catalyst for economic development. This is an international trend. Carnegie Mellon University in Pittsburgh, Pennsylvania; Feng Chia University in Taiwan; Indian Institute of Science in Bangalore; the Indian Institute of Technology in Delhi; Stanford University in Palo Alto, California; and the University of Oxford in England have made organized efforts at technology licensing. These organizations oversee and coordinate patent filings, patent, and “know-how” licensing, and they nurture university technology spin-offs. Additional

information about these institutions can be found at the Web addresses at right.

The universities structure the technology transfer organizations in different ways. Some of the institutions establish organizations independent of the university structure. For example, University of Oxford has set up a company—ISIS Innovations Ltd. Technology transfer operations at IIT Delhi are managed by an independent foundation. Oxford's ISIS has in turn formed Oxford University Consulting, which provides the expertise of Oxford faculty to solve specific problems. Oxford University Consulting has offices in Japan and the U.S. The ISIS Enterprise division offers support to the technology transfer offices at other institutions.

University Technology Transfer Organizations

University technology transfer operations benefit the community. Licensing arrangements provide financial returns for the university, inventors, and business owners. Revenue supports operational costs, including patent filings. Institutions report large variation in the annual income. The Stanford Office of Technology Licensing revenue was \$50 million in 2004, \$61 million in 2006, and \$384 million in 2005. The order of magnitude increase in 2005 was related to the Stanford investment in Google. The Feng Chia University average annual technology licensing revenue is \$4.5 million New Taiwan (NT)—about \$150,000 U.S.—with a peak of \$10 million NT in 2005. Feng Chia has found that technology transfer enhances the FCU image and is an effective faculty and student recruitment tool.

Spin-Offs Require Institutional Support

All the universities have active spin-off programs. The Stanford and Oxford efforts are more mature than those at other institutions. The Stanford Office of Technology Licensing has a staff of thirty and the Oxford ISIS a staff of forty. However, even the smaller units play a crucial role in encouraging entrepreneurship at the university. Establishing an administrative unit for patent filings and spin-off management

Six Leading Global Universities & Technology Transfer

Institution	Unit	Web Address
Carnegie Mellon University	Center for Technology Transfer	www.carnegiemellonctt.com
Feng Chia University (FCU)	Office of Technology Licensing	www.ord.fcu.edu.tw/Organize/enOrganize_otl.html
Indian Institute of Science, Bangalore (IISc)	Centre for Scientific and Industrial Consulting	www.csic.iisc.ernet.in/index.htm
Indian Institute of Technology, Delhi (IITD)	Foundation for Innovation and Technology Transfer	www.fitt-iitd.org
Stanford University	Office of Technology Licensing	http://otl.stanford.edu
University of Oxford	ISIS Innovation Ltd	www.isis-innovation.com

leads to more enterprise creation. At Oxford, ISIS started spin-off creation activity in 1997. Pre-1998 there were ten spin-offs over the previous forty years; in 1998 there were four spin-offs; and subsequently an average of more than five spin-off companies have been created per year. At Carnegie Mellon, seven spin-off companies were created in 2005. The IIT Delhi Business Incubator was started in 2000. In the first five years, twelve spin-offs were sponsored and six companies left the incubator. In March 2005, six companies resided in the incubator; all of them had active faculty involvement.

The importance of organizational support for technology transfer is highlighted by the Bangalore India Institute of Science experience. IISc is a premier graduate and research institute in India started in 1909. Although the master's and doctoral research efforts at IISc are well-known, the enterprise creation efforts have not had organizational support. Typically, IISc has provided consulting services to industry. Discussions with faculty indicate that IISc has recognized the need, and is now establishing an organization to support technology transfer. The Society for Innovation and Development has been set up in collaboration with IISc.

Angel Networks for New Venture Support

Oxford has established the ISIS Angels Network. Angel groups are useful as a

source of start-up funding, and also provide the researchers with key commercial contacts. The network increases community involvement in the university and provides a critical resource to the faculty entrepreneur. For example, early in the process of enterprise spin-off, the faculty entrepreneur negotiates a licensing agreement with the university. Since each new enterprise is different, each licensing arrangement is different. All these agreements involve different combinations of upfront payment, royalties, equity participation in the enterprise, and sub-licensing arrangements. The degree of exclusivity has an impact on these terms. Carnegie Mellon provides a template for a term sheet. The angel investor provides important input to the entrepreneur and ensures that the terms do not impede venture funding.

Conclusion

Organized technology transfer is taking on increasing importance in the context of increased international trade and the globalization of businesses. Legislation in the U.S. and foreign countries supports this undertaking. Traditional university research focus on scholarly work is now being influenced by the commercial pull. Since this research is often government funded, the Bayh-Dole Act has been instrumental in increasing the technology licensing focus at universities. Not all faculty members participate in the technology licensing efforts, but the presence of

organized technology licensing initiatives on the university campus is increasing faculty involvement. Universities are using incentives such as a share in the revenue derived from licensing fees to encourage faculty involvement. This article, by examining six universities in four countries, demonstrates that the trend for university technology licensing is widespread.

In conclusion:

- There is an increasing global awareness of the role universities play in economic development.
- One aspect of this critical role is the increasing importance of promoting technology transfer from universities to the private sector.
- This commercialization of university technology is crucial for developing and maintaining comparative trade advantage.
- Legislation is essential in promoting this process of commercial innovation.
- Barriers to technology transfer are often those internal to universities, but they can be alleviated by diligent management of faculty relations.



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The University of Virginia has a technology licensing program managed by the University of Virginia Patent Foundation (UVPF). The Technology Transfer Office at the College of William and Mary also works with UVPF. At Virginia Tech and George Mason University, technology licensing is managed by Virginia Tech Intellectual Properties Inc. and George Mason Intellectual Properties Inc. respectively.

The Commonwealth of Virginia recognizes the importance of commercializing university research in technology, as evidenced by the long-time establishment of the Center for Innovative Technology. The Virginia Economic Development Partnership and the executive branch's

secretaries of commerce and trade and technology actively promote technology as a component of the new commonwealth's policy of embracing globalization.

Virginia universities play an important role in the economic development of the commonwealth and promote economic ties in this time of globalization. Transfer of technology is critical to this undertaking. Virginia universities are competing well with both national and international universities, but the challenge is to move forward and participate even more forcefully. ❧