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Universities in change

Worldwide, universities are in the midsts of change in response to any new forces. To name a few:

1. **Need to contribute to the economic welfare of a region and/or country**
2. **To respond to academic competitive forces**
3. **Drive for prestige**
4. **To respond to increasing enrollments**
5. **Respond to globalization of education**

Sir Eric Ashby, “Adapting Universities to a Technological Society”, Jossey-Bass Publishers 1974

Speaking of Universities , “They are living through one of the classical dilemmas of systems in evolution; they must adapt themselves to the consequences of success or they will be discarded by society: they must do so without shattering their integrity or they will fail in their duty to society”.

Commercialization and the University

“ One of the most important things a university president has to know today, is what is for sale and what is not.”

This statement was attributed to Derek Bok, former President of Harvard University. Whether this is a correct attribution or not, the statement is very appropriate today.

In short we must decide what is important to change and

what is important to preserve

“

Summary of Opportunities For Technology Commercialization from Universities

The opportunity for the efficient conversion of innovation into goods and services to stimulate economic development and growth, create jobs, and improve the standard of living.

The opportunity to demonstrate that investment of public funds into research support at universities produces tangible benefits for society.

The opportunity for the university to acquire income from license royalties or the sale of equity from licenses to start-up companies, to support teaching and research activities.

The opportunity for employees of universities (such as university professors) to supplement income through a share of royalty income from the licensing of their inventions, paid consulting work for licensees, or compensation for serving on Advisory Boards of licensees.

The opportunity for licensees to fund research projects in the laboratory of the inventor, when such research funding meets the criteria of the university.

The opportunity for licensees to provide gifts and donations (with related tax benefits) to the university.

The opportunity for licensees to hire students (normally but not always student inventors of the licensed invention) when they graduate.

Source: Forthcoming paper by Jon Sandelin

Summary of Perils in Commercialization of Research from Universities

The peril that patenting and licensing by universities will inhibit rather than promote the progress of science and production of innovation.

The peril of a loss of public trust in the university and/or its employees.

The peril of unfulfilled commitments to research sponsors, to students, or to the university.

The peril of bias when reporting research results, or not reporting research findings that would be adverse to the interests of an industry patron.

The peril of exploiting the work of students to benefit personal interests of their supervising professor.

The peril of adverse and embarrassing reports in the media that adversely affect the reputation of the university.

The peril that new discoveries made by university employees are not reported to the university as invention disclosures, but are instead diverted to a company in which the employee has a financial interest.

Source: Forthcoming paper by Jon Sandelin

Connecting University Research

"If university research is to raise a particular region's productivity growth via technology,it must connect with local industry performance…..The destination of graduates from local institutions will substantially affect any calculation of payoff from state and regional investments in research.

R&D spillovers associated with the new technology will become a source of long-run economic benefit only if the local industry R&D network draws from the technology,if commercialization occurs locally,and if the region's industries capture the technology through diffusion and investment."

Michael S.Fogarty and Amit K.Sinha,"Why Older Regions Can't Generalize from Route 128 and Silicon Valley",Industrializing Knowledge,Edited by Lewis Branscomb,Fumio Kodama,and Richard Florida,MIT Press 1999,page 474.

Importance of proximity and affinity-the co-evolution of ideas

AUTM Survey 1991-2002

The Annual AUTM Survey, beginning in 1991, has documented the growth in a number of areas for U.S. and Canadian universities and teaching hospitals. Some results from the most recent survey year (2002) [2] are the following:

- **Total royalty income of $1,267 Million, which translates into about $60 Billion in licensed product sales and over 400,000 jobs**
  - **15,573 invention disclosures**
  - **7,741 patent filings**
  - **4,673 new licenses, with some 10% to start-up companies**

Year	Patents Filed	Licenses Granted	Royalty Income(Million USD)
1991	1643	1278	186
1992	1951	1741	248
1993	2433	2227	323
1994	2429	2484	360
1995	2872	2616	424
1996	3261	2741	514
1997	4267	3328	611
1998	4808	3668	725
1999	5545	3914	862
2000	6375	4362	1260
2001	6812	4058	1071
2002	7741	4673	1267

Stanford University's Role in Silicon Valley

- **Early History**
- **The Vision of Dean and,later,Provost Fred Terman-A University-Industry Community**
- **The Stanford Industrial Park**
- **Visionary Companies: Varian Associates and H-P**
- **Educational Programs for Industry,eg the Honors Co-op Program and Continuing Education Programs**
- **Industrial Affiliates Programs**
- **Cooperative Research Programs**
- **Industry Speakers at Seminars and Student Clubs**
- **Spin outs from faculty and students**
- **Office of Technology Licensing**

The Office of Technology Licensing(OTL) at Stanford

The Stanford Office of Technology Licensing started in 1970

There were five prior university commercialization activities:

1. **Wisconsin Alumni Research Foundation – 1925**
2. **Iowa State University Foundation – 1935**
3. **Massachusetts Institute of Technology – 1940**
4. **Kansas State University Research Foundation – 1942**
5. **University of Minnesota Foundation – 1957**

The four foundations are organizations that are separate from the universities. In the US, there are now over 200 technology commercialization activities associated with universities, very few are organized as separate foundations.

Stanford Data

1969-1980 $ 4 million

1981-1990 $ 40 million

1991-2003 $ 550 million

The majority of the $550 million can be traced to invention disclosures in the 1970s

For Stanford in fiscal year 2003, 442 licenses generated $45.4 million. Only seven inventions generated over $1 Million each, accounting for 71% of total income. All but seven inventions were disclosed before 1985.

Long term process

The experience of Stanford University reinforces the theory that the most important parameter defining significant royalty income is the length of time the licensing office has been in existence.

Thus, it takes a combination of invention disclosures with commercial potential and time (sometimes 10 to 15 years or more after initial invention disclosure) before high-volume licensed products sales produce large royalty incomes.

Royalty Sharing

Under the provisions of the Bayh/Dole Law, a percentage of royalty income must be shared with the inventor(s). Each university can set it's own royalty sharing arrangements. At Stanford, after 15% is set aside for the operations of the licensing office and for certain programs, the balance is shared 1/3 with inventor(s), 1/3 with the inventor(s) department, and 1/3 with the inventor(s) school. There is no upper limit on the total amount shared with Stanford inventor(s), and a few have received millions of dollars from the licensing of their inventions. Some universities have the percentage given to inventor(s) change as the total amount reaches certain levels, or may set a threshold amount after which no further payments are made to the inventor(s).

Conflict of Interest Concerns

Derek Bok, former President of Harvard University, in his book Universities in the Marketplace expresses his concerns on page 77 as follows: "Universities have paid a price for industry support through excessive secrecy, periodic exposes of financial conflict, and corporate efforts to manipulate or suppress research results" and "In the face of pressure from corporate sponsors to influence the results of high-stakes clinical research, institutional safeguards have proved inadequate in a disturbing number of cases. Most universities have not done all they should to protect the integrity of their research. Many have not even shown that they are seriously concerned about doing so."

Maintaining the Balance

Maintaining the proper balance between excellent academic research and industry collaboration is absolutely essential.

Stanford is an demonstration that it is possible.

The key decisions are at the time of appointments and promotion.

Maintaining Academic Excellence

Academic appointments and promotions based entirely on academic contributions in teaching and research, not on amount of industry collaboration. The first goal of the university must be to build excellence in research and research trained graduates.

Stanford University: 1950 vs. Today(2004)

Undergraduate students	4,800	6,700
Graduate students	2,800	7,800
Faculty Members	370	1,760
Tuition	$600	$28,500
Endowment	$44M	$10B

Stanford University: 1950 vs. Today(2004)

National Medal of Science	0	28
Nobel Prize Winners	0	25
Annual Budget	$100M	$2.3B
Sponsored Research	$11M	$885M

Early Regionalism Attitudes

- **The Founder of Stanford: Leland Stanford**
- **The first President: David Starr Jordan**
- **Trustee: Herbert Hoover**
- **Wallace Sterling and Frederick Terman**

“Stanford never entirely forgot its founder’s aspiration for an institution which would contribute to the development of the Western region.”

Source: Robert Kargon and Stuart Leslie, “Imagined Geographies: Princeton, Stanford and the Boundaries of Useful Knowledge in Postwar America,” *Minerva* 32, no. 2 (summer 1994): 132.

Indeed, in his 1891 inaugural convocation address, Leland Stanford reminded the school’s student body that “life is, above all, practical; that you are here to fit yourselves for a useful career.”

Source: George H. Nash, *Herbert Hoover and Stanford University* (Stanford, Calif.: Hoover Institution Press, 1988), p. 6.

Influence of Herbert Hoover

Rather than a classically trained academician from the East, Hoover sought a practical man from the West. In October, Hoover wrote to the chairman of the board of trustees that **Stanford was "essentially a Western institution, with ideals entirely different from those which obtain on the Atlantic seaboard." The next president should be "a Western man," he argued. "The old-line President who was able to preside at Sunday School Conventions and make choicely classical orations on public occasions is not the type of man Stanford needs. . . . "**

Source: Nash, *Herbert Hoover and Stanford University*, p. 50.

Terman's Vision

In 1975, Terman spoke to a delegation visiting from China. His speech, "Stanford Engineering and Local Industry," detailed the various elements in the formula for Silicon Valley's success. "Many of the leaders and founders of the early companies were interested in building up the area," he explained. "As a result, they worked hard to create a community spirit such that individual companies, even companies that were competitors in the marketplace, would work together for the good of the area"

Evolution of Silicon Valley

Silicon Valley has gone through several phases of development. Each time the region had to adjust and change. We might roughly breakout these phases as follows

1890-1940 Radio vacuum tube and food machinery

eg. Federal Telegraph Corporation, Food Machinery Company

1940-1960 Vacuum tube applications to instruments and defense

eg. Hewlett Packard, Varian Associates

1960- 1980 Semiconductors

eg. Fairchild, Intel, National Semiconductor, AMD

1980-1990 PCs and Workstations

eg. Apple, Sun Microsystems, Silicon Graphics

1990- 2000 Network Computing

eg. 3Com, Cisco , Netscape, Yagoo!, eBay, Google

2000- Mobile Computing, Biotech, Nanotech

eg. Salesforce .com, Nanosysis, Nanostellar

Silicon Valley as Habitat for Innovation and Entrepreneurship

SPRIE

The Valley is a gathering place for researchers, entrepreneurs, venture capitalists, and highly skilled workers who turn new ideas into the innovative products and services that fuel the economy of the region.

This “habitat” allows the region to adapt to waves of innovation and adjust to economic cycles.

12 Features of an Advanced High Tech Entrepreneurial Habitat

- **Knowledge Intensity**
- **Universities and research institutes that interact with industry**
- **Favorable government policies**
- **Results-oriented meritocracy**
- **Flexible and Mobile work force**
- **Climate that rewards risk-taking and tolerates failure**
- **Knowledgeable Venture Capital**
- **Open business environment**
- **Collaboration: business, government, and non-profits-local networks**
- **Specialized business service infrastructure: lawyers, accountants, etc.**
- **High quality of life**
- **Global Linkages**