

# Entrepreneurship: Technology Commercialization

CRPGE Workshop for New & Future Vice Presidents/Vice  
Chancellors for Research and Graduate Deans

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University of California, Berkeley

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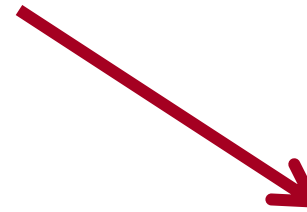
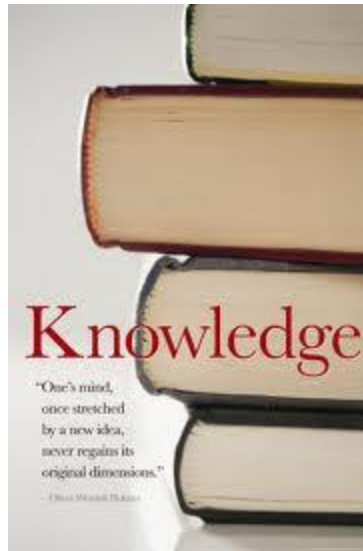


# Research and Innovation

*Dr. Geoffrey Nicholson  
inventor of the Post-It™:*

“Research is the transformation of money into knowledge.

Innovation is the transformation of knowledge into money.”

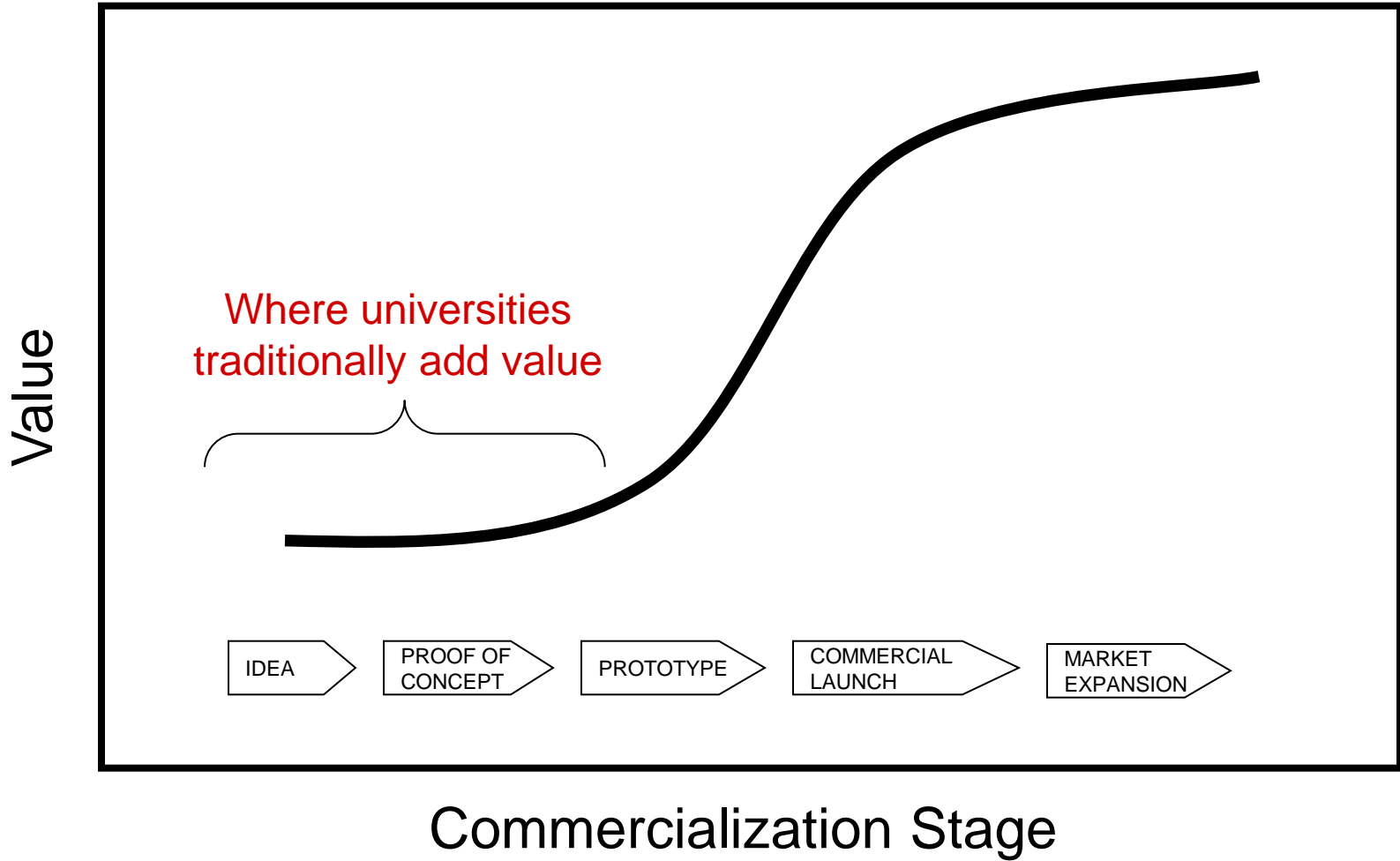


As innovators, universities are unique in their dedication to reinvesting innovation returns in knowledge creation.

Source: VP for Technology Venture Development



# Technology Value Curve



# Benefits and Risks of Academic Technology Transfer

**Table 1.** Summary Table of the Benefits of Academic Technology Transfer

McDevitt, V.L. et al., (2014) *Technology & Innovation* 16:75-84.

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Revenue generation	<ul style="list-style-type: none"><li>• Unrestricted funds to institution from license income</li><li>• Direct personal financial benefit to inventors and authors</li></ul>
Increased opportunities for funding	<ul style="list-style-type: none"><li>• Eligibility for funding by compliance with federal regulations requiring a technology transfer program</li><li>• Increased opportunities for interinstitutional and interdisciplinary grants</li><li>• Outreach, licensing, and facilitation of new startups yield new funding partnerships</li><li>• Increased opportunities for funding sources requiring a commercial partner, for example, SBIR and STTR</li></ul>
Promotes a culture of entrepreneurship and innovation	<ul style="list-style-type: none"><li>• Facilitates establishment of international research relationships</li><li>• Successes increase university brand and prestige</li><li>• Enhances university fundraising efforts</li><li>• Opportunities to strengthen donor ties by engagement with startups</li><li>• Positively factors into high level recruitment efforts</li><li>• Positively affects retention of high-producing and high-potential faculty</li></ul>
Student success	<ul style="list-style-type: none"><li>• Provides opportunities to participate in real-world translational research</li><li>• Provides exposure to the process of obtaining intellectual property protection</li><li>• Strengthens prospects of finding jobs and being successful</li></ul>
Public benefit	<ul style="list-style-type: none"><li>• Fulfills the university's larger missions to address social, medical, environmental, or technical problems</li><li>• Improves the quality of life</li></ul>
Economic development	<ul style="list-style-type: none"><li>• Revenue from university licensing positively affects the US economy</li><li>• Brings money into the state or region</li><li>• Aids in the retention of local talent</li><li>• New university startups create high-wage jobs</li></ul>

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## Risks

- Inappropriate incentivizing of commercialization over academic work
- Faculty conflicts of financial interest or time commitment
- Institutional conflicts of interest
- Excessive administrative costs relative to potential benefit



# Licensing of Intellectual Property is Just One of Several Ways Universities Help the Transition of Knowledge into Practice

1. Movement of highly-skilled students into public or private employment
2. Publication of research results in the open research literature that is read by workers in all sectors
3. Personal interaction between the creators and users of new knowledge (e.g, via professional meetings, seminars, industrial liaison programs, etc.)
4. Corporate-sponsored research agreements with university researchers
5. Multi-firm arrangements such as university-industry cooperative research centers
6. Personal individual faculty and student consulting arrangements with private firms
7. Entrepreneurial activity of faculty and students occurring outside the university without involving university-owned intellectual property (IP)
8. **Licensing of IP to established firms or new start-up companies**



# Process for Evaluating and Commercializing Technologies

1. Evaluate the invention disclosure: understand and articulate what the invention is, what are its possible products, and what is its commercial opportunity. Decide to file patent or return technology to inventor.
2. Identify who can influence the commercialization of the new invention, test assumptions, gather feedback, and define critical commercialization milestones. License technology to an existing business or help create a start-up licensee company.
3. Assist licensee with the necessary resources to begin executing on the technology's business and development plan.



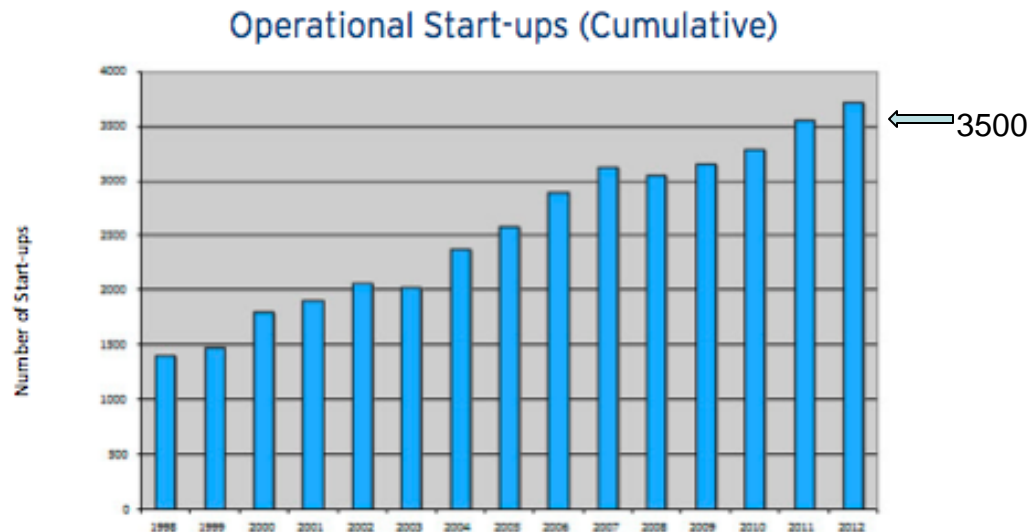
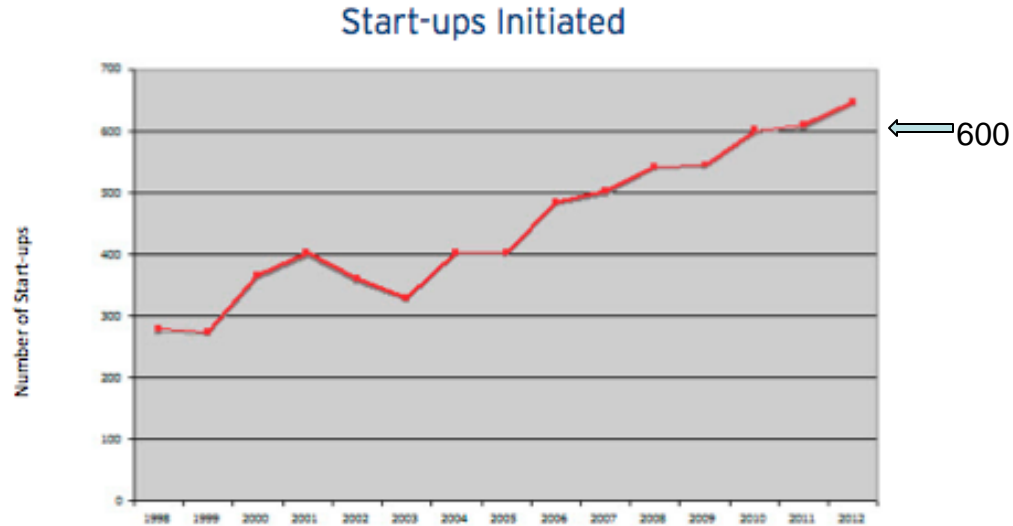
# License to an Existing Company or Start Your Own?

## In a study of all NCI-funded university researchers:

- 70% of those who filed patents pursued commercialization through licensing via their TTO, while 30% chose entrepreneurship
- >25% of researchers with patents had started a new firm
- Social capital (shared inventorship, service on a board, or shared authorship with corporate researchers) enhanced the propensity to commercialize research, particularly for researchers using the TTO licensing route
- Entrepreneurship is much more common than licensing among researchers who perceive their TTO as *unhelpful*-- and vice versa



# University Start-Up Companies Are Increasingly Common



Valdivia, W.D. (2013) *University start-ups: Critical for improving technology transfer*.  
The Brookings Institution, Washington, D.C. [Data from 2013 AUTM Survey]





# Spinoff Development

## Spinoff Value Generation



PROTOTYPE

COMMERCIAL  
LAUNCH

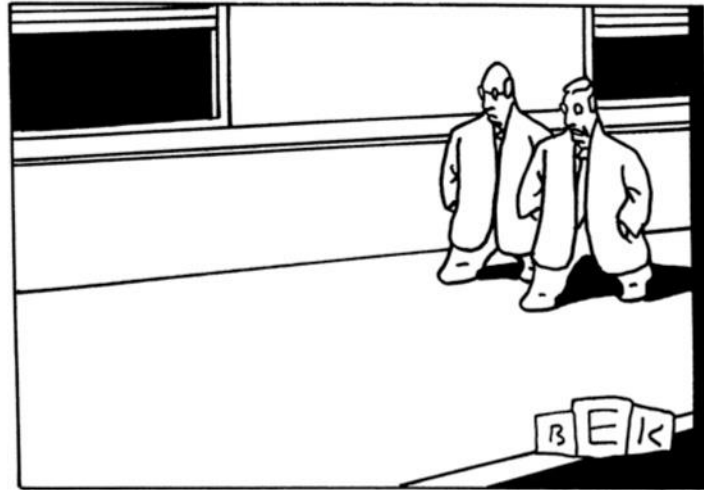
MARKET  
EXPANSION

## Commercialization Stage



# Strengths of Faculty Members as Entrepreneurs

- **Persistent**
- **Sceptical and evidence-driven decision-makers**



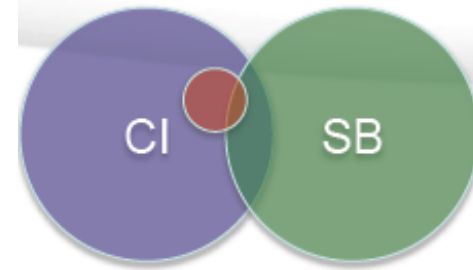
*“If it made sense, that would be a very powerful idea”*

- **Self-confident and independent but able to work collaboratively**
- **Willing to work long hours to achieve goals**

# Weaknesses of Faculty Members as Entrepreneurs

- Little familiarity with the commercialization process
- Little knowledge of basic business and legal concepts important to start-up businesses
- Often unaware of how little they know about business

Cool Idea  $\neq$  Successful Business



- Cannot or will not commit sufficient time to a commercialization effort
- Often unwilling to share the risks associated with start-up businesses

# University Technology Commercialization in 2012

Licenses executed	6,372
Licenses and options yielding income	18,295
Total licensing income	\$2.625 billion

**TABLE 2: PROBABILITY OF BLOCKBUSTER PATENT AS A FUNCTION OF RESEARCH FUNDS**

Rank According to Research Funds	Probability of NOI $\geq$ 10m	
	As a function of total research funds (TRF)	As a function of federal research funds (FRF)
4	58.6%	72.9%
10	30.4%	24.8%
20	23.8%	22.6%
30	15.3%	14.9%
40	11.7%	11.8%
50	9.8%	11.0%
100	5.3%	5.8%
155	4.0%	4.2%

Estimated using PROBIT mode: Regression of success/failure of blockbuster patent (NOI>\$10m) over TRF (intercept -1.766565, slope 0.0013321) and over FRF (intercept -1.744929, slope 0.00185); all estimated coefficients are statistically significant at  $p < .05$ . Data Source: AUTM, 2013



# A Small Number of Inventions Produce Most of the Licensing Revenue

## U of U Technologies (n= 5590 since 1965)

Associated with revenue-generating licenses	824	14.7%
Associated with revenue > \$100,000	254	4.5%
Associated with revenue > \$1,000,000	70	1.25%

## U of U Licenses (n= 916 since 1985)

Earned revenue of any kind	551	60%
Earned revenue > \$100,000	69	7.5%
Earned revenue > \$1,000,000	13	1.4%

For the 13 highest-yield licenses, the average time from signing to first revenue was 9.9 years

*U of U Technology & Venture Commercialization, 2013*

“In the past 40 years, Stanford’s Office of Technology Licensing has received more than 8000 invention disclosures. Half of these have resulted in patents and one-half of those have been licensed. However, less than 1% of Stanford disclosures have generated \$1 million or more in cumulative royalties.”

“The great majority of inventions generate modest revenue and many generate none; a handful of universities and a small fraction of all inventions are responsible for a large fraction of the revenues received.”

*Managing University Intellectual Property in the Public Interest, 2011, pp. 22-23*



# Technology Transfer 2012 League Table

University	Rank 2012	Number of times on top 20 over the last decade	Rank adjusted by number of TTO employees	Rank adjusted by university research expenses
New York University	1	10	2	2
Columbia University	2	6	6	5
Massachusetts Institute of Technology	3	10	8	15
Princeton University	4	2	1	1
Northwestern University	5	7	4	6
Univ. of California System	6	10	38	46
University of Washington	7	10	23	17
Stanford University	8	9	15	13
Mount Sinai School of Medicine	9	7	5	4
University of Texas System	10	4	34	34
University of Massachusetts All Campuses	11	10	13	16
University of Minnesota-Twin Cities	12	9	21	24
University of Wisconsin-Madison	13	10	40	30
University of Rochester	14	10	11	10
University of Utah	15	8	26	11
University of Florida	16	10	25	23
University of Colorado System	17	5	19	28
California Institute of Technology	18	5	12	19
Emory University	19	6	20	25
Duke University	20	4	30	32
University of Illinois at Urbana-Champaign	21	1	37	38
University of Pennsylvania	23	1	41	43
University of Michigan-Ann Arbor	26	6	46	65
Harvard University	29	5	69	55
State University of New York System	31	3	56	64
Iowa State University	34	1	35	31
University of Nebraska - Lincoln	38	1	53	36
University of Georgia	44	4	33	40
University of Iowa	45	6	57	48
Washington University in St Louis	53	1	66	77
Michigan State University	60	3	85	81
University of South Florida	81	1	108	109
Florida State University	86	2	97	85
Wayne State University	105	2	110	118
Wake Forest University	110	9	124	120
Eastern Virginia Medical School	129	1	126	116
University of Texas Southwestern Med Center	150	1		

