Entrepreneurship and Innovation: MIT History and Observations

José J. Estabil
jje@mit.edu
Director, Program for Entrepreneurial Innovation

Massachusetts Institute of Technology

Skolkovo SkTECH RUSSIAN VENTURE COMPANY

DEVELOPING INNOVATIVE TECHNOLOGICAL ENTREPRENEURSHIP AT UNIVERSITIES

21–22 FEBRUARY 2012

Outline

- Motivation
- MIT
- *Engineering* innovation and entrepreneurship centers

- Acknowledgement
  - Edward B. Roberts
    - David Sarnoff Professor of Management of Technology
    - Founder and Chairman, Martin Trust Center for MIT Entrepreneurship
  - Charles L. Cooney
    - Robert T. Haslam Professor of Chemical Engineering
    - Founder and Faculty Director, Deshpande Center for Technological Innovation

About me

- 20 years of in translating technology into dominant designs
  - Introduced Spectroscopic Ellipsometry film measurement (KLA-Tencor)
  - Helped pioneer Copper wires (IBM)
- Co-inventor and President of Silicon Valley start-up
  - Non-contact prober (tau-Metrix)
- MIT
  - Member: Prof. Charles L. Cooney's Innovation group
    - Dr. Luis Perez-Breva, Research Scientist , Innovation Teams co-Instructor, serial entrepreneur
    - Leon Sandler, Deshpande Center, Executive Director
  - Tech Transfer: Materials Science and Software Patent Portfolio
- Advisor (TT Ventures, tau-Metrix, Arctic Sand, WeAdapt, Novus Folium…)
- 20+ publications; 8 USPTO patents

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About me: not googlable

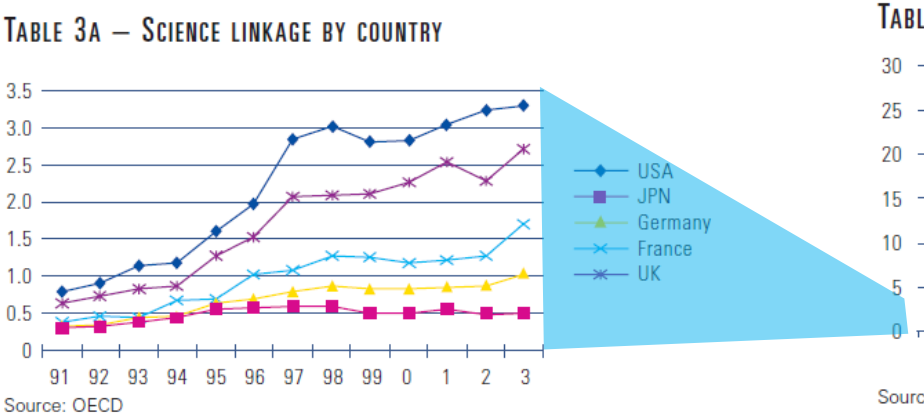
- Immigrant (Cuba)
- Married to college sweetheart (Janet) / Son in first grade (David)
- Lived & worked outside U.S. (Tokyo, Grenoble, Seoul)
- Won awards
  - R&D100 (2), Semiconductor International
  - Sales
  - Brown University volunteering
- Encyclopedic knowledge of American movies

Glossary

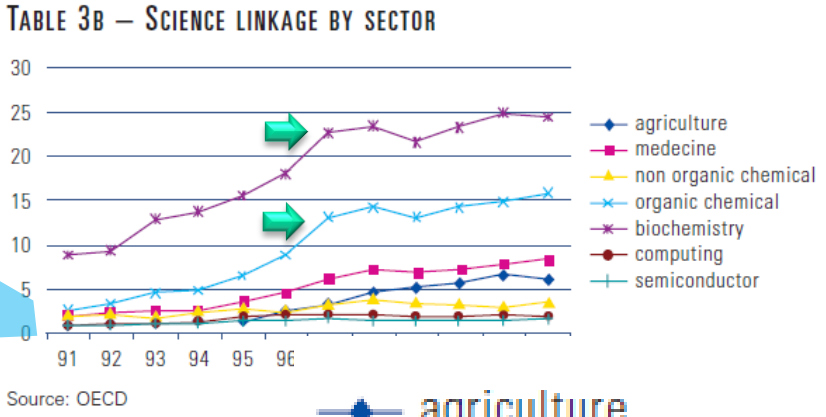
- Invention (http://www.copyright.gov/title17/92chap1.html)
  - Useful (USC§101), new (USC§102), and non-obvious (USC§103)
- Innovation = Invention + Commercialization (do-more-with-less)
  - Delivery of goods and services to market
- Entrepreneurship = creation of new ventures
- Entrepreneurial / Innovation Ecosystem = the complex of a community of people and institutions and their environment functioning as an entrepreneurial and innovation ecological unit
  - eg. Greater Boston / Silicon Valley

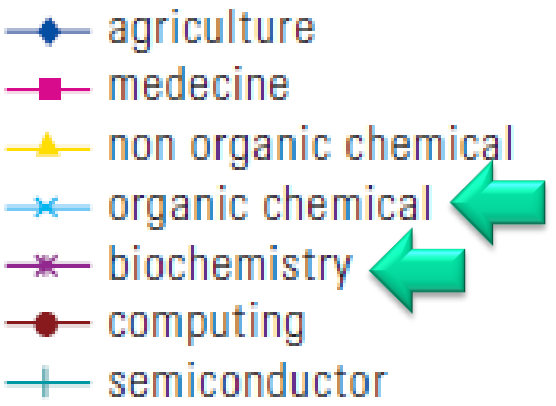
University research impact

Worldwide



US

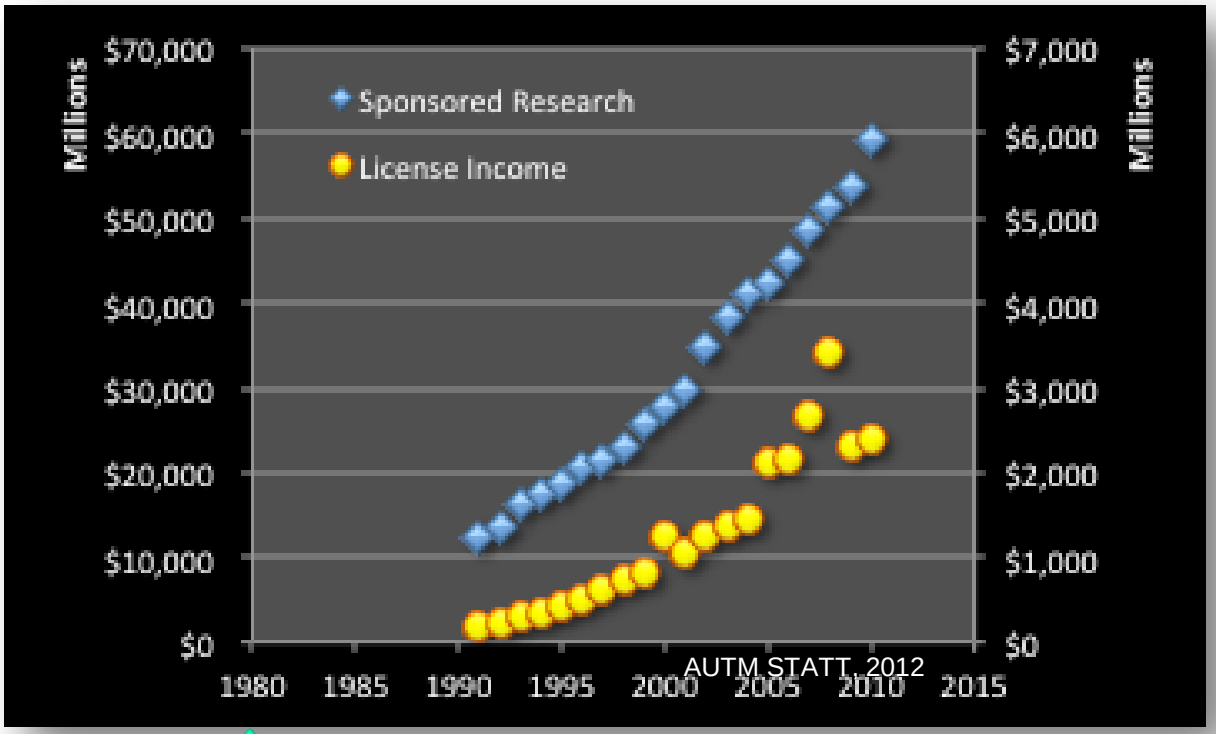




R. Nezu (Fujitsu Industries), et al., "Technology Transfer, Intellectual Property and Effective Univ

Bayh-Dole: University Tech Transfer

- Non-profits may retain IP and licensing income
- Must share income with inventors
- Prefer licensing to Startup/Spinouts with all else being equal



Bayh-Dole

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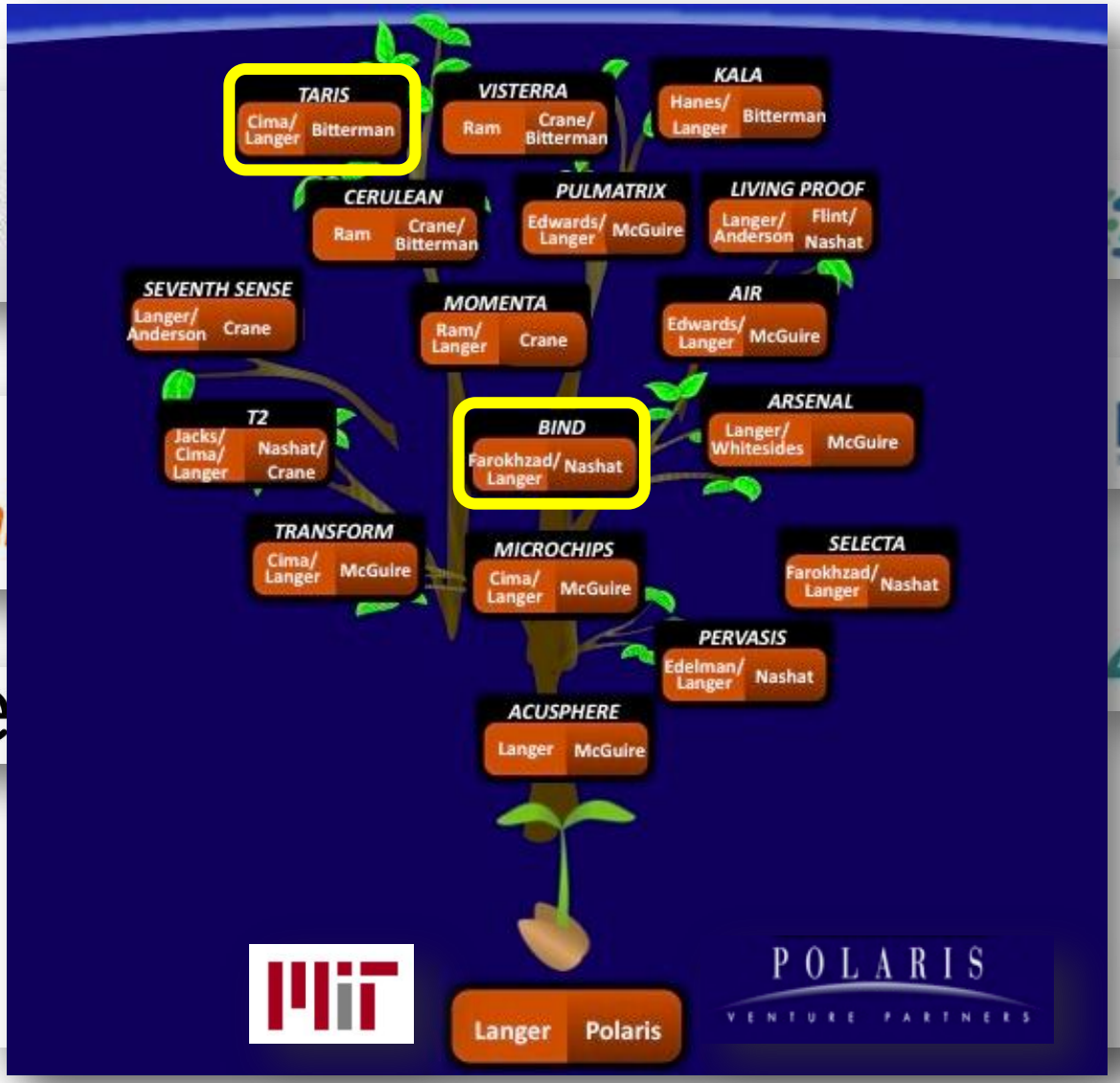
Startup economic impact

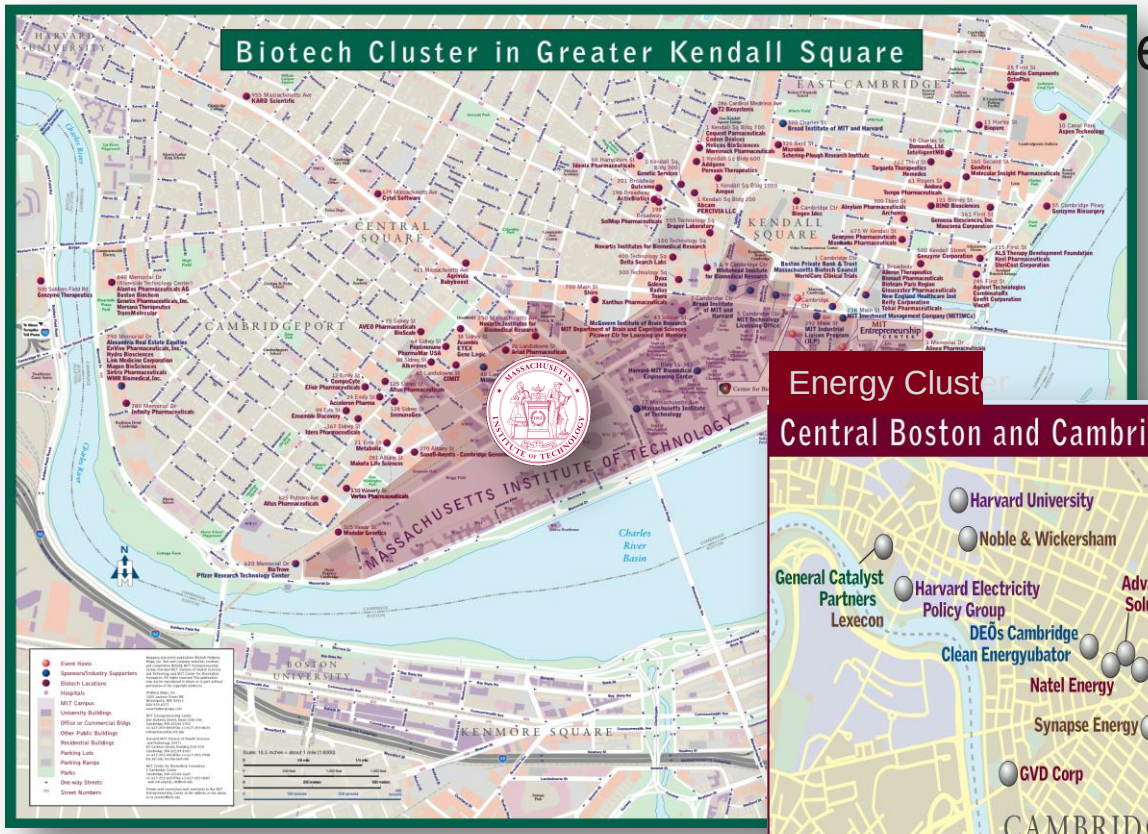


Observations

- University research can impact commerce
- Tech transfer mechanisms
  - Industrial licensing
  - Startup/Spinout
- Startups are an engine for job creation

- Unprecedented societal impact, opportunity, and economic activity

Observations



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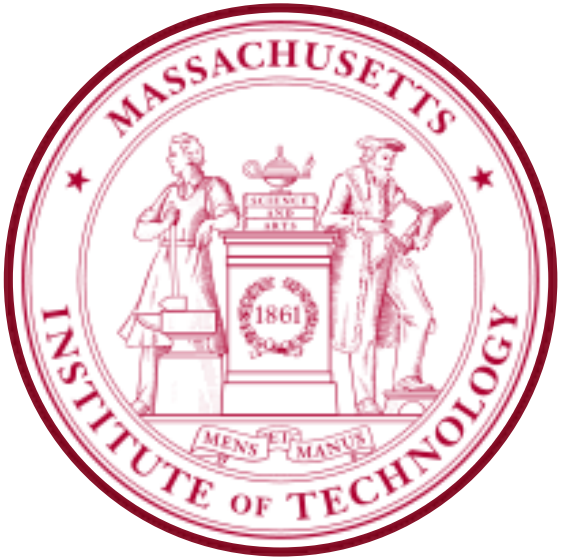
MIT

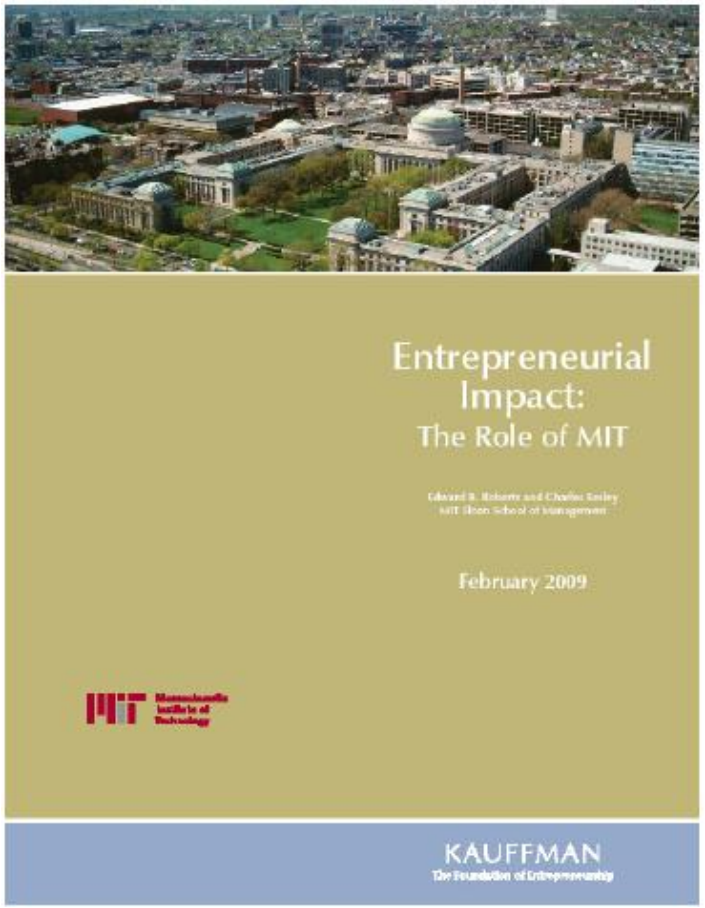


- Founded 1861
- Motto: *Mens et Manus*
- 5 Schools + 1 College (HST)
- 32 Academic departments
- 21,051
  - 1,017 Faculty (1,714 total teachers)
    - 76 Nobel Laureates (9 currently teaching)
    - 21 MacArthur Fellows currently teaching
  - 10,566 Students
    - 2,731 International Students
  - 8,771 Staff

Dramatic impact

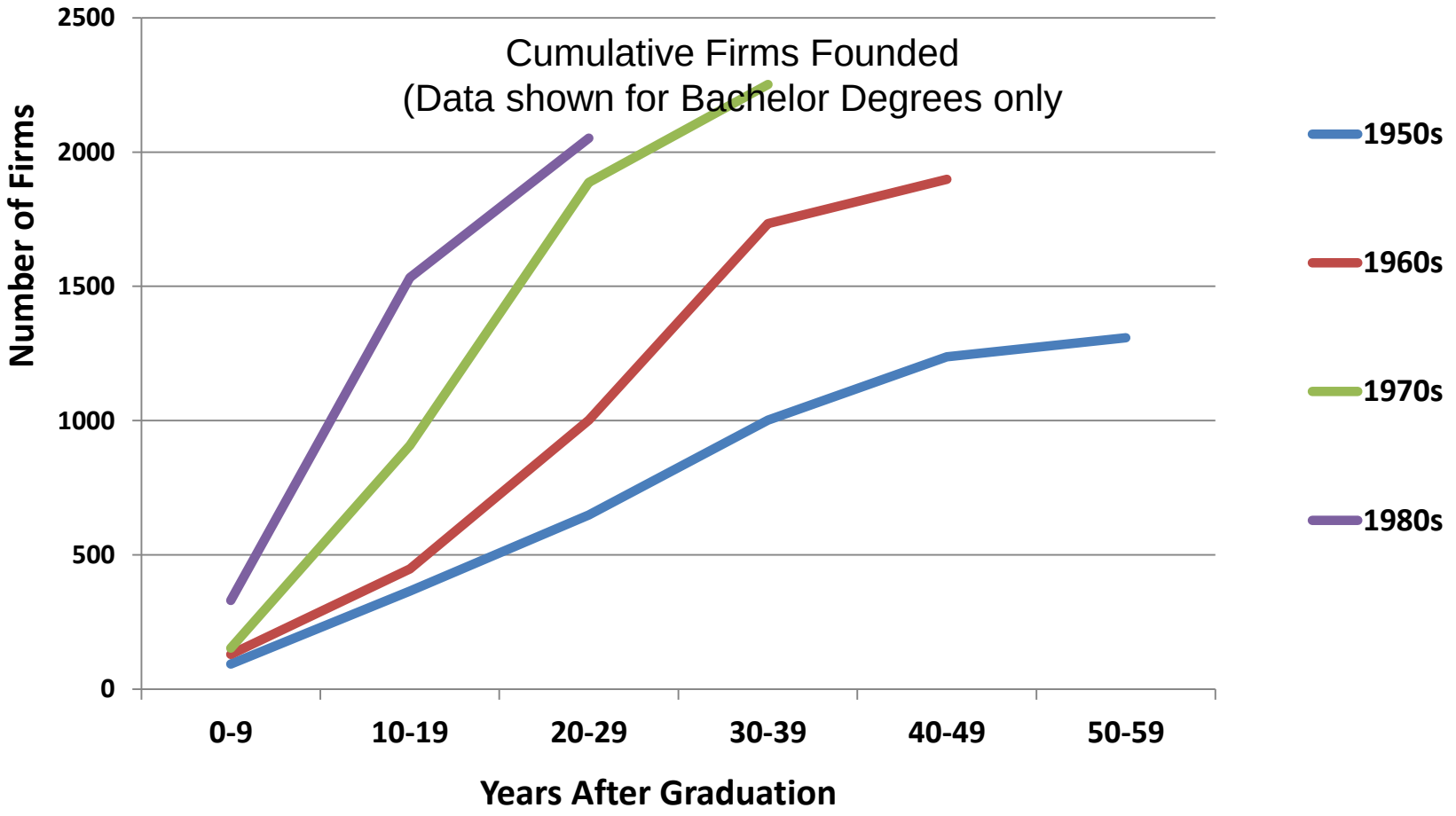
- 33,600 companies founded by living MIT alumni*
  - 76% active, employing 3.3M
- Annual revenues of $2 trillion*
  - GDP between Italy and India/Russia**

- MIT annual research: $650M
- 500+ disclosures/year
  - ~ Split between Physical & Life Sciences
  - ~ 200+ filed per year
- $70M-90M yearly license revenue



* Edward Roberts and Charles Eesley
** See appendix

Increasing Rate of NewCo formation



More entrepreneurs have emerged from each successive decade of graduates, and have started their companies sooner and at younger ages.

History before E&I centers (pre-1990)

- (1861): “Mens et Manus”culture, history, role models, and policies

- Alumni initiatives: Nationwide Young Alumni Entrepreneurship seminars (1969-1971), >3000 alumni
  - (1978) MIT ENTERPRISE FORUM

- Technology Licensing Office re-oriented (1985) MIT TLO

MIT Entrepreneurship Education (after 1990)

- MIT Entrepreneurship Center (1990); renamed Martin (1958) Trust Center for MIT Entrepreneurship formerly the MIT Entrepreneurship Center 2012)
  - Classes: from 1 to 30 subjects in 15 years
  - Clubs, $100K MIT ENTREPRENEURSHIP COMPETITION (1991)
  - Conferences
- Past decade: broadening and growth of MIT's institutions
  - (2000) MIT Venture Mentoring SERVICE
  - (2002) DESHPANDE CENTER FOR TECHNOLOGICAL INNOVATION
  - (2006) The Entrepreneurship and Innovation Track (E&I)
  - (2007) LEGATUM CENTER FOR DEVELOPMENT & ENTREPRENEURSHIP MASSACHUSETTS INSTITUTE OF TECHNOLOGY
- International engagements MIT Portugal; Masdar; SkTech/MIT Initiative; SMART Singapore-MIT Alliance for Research and Technology; SUTD Singapore University of Technology and Design Established in collaboration with MIT; Center for Clean Water and Clean Energy at MIT & KFUPM

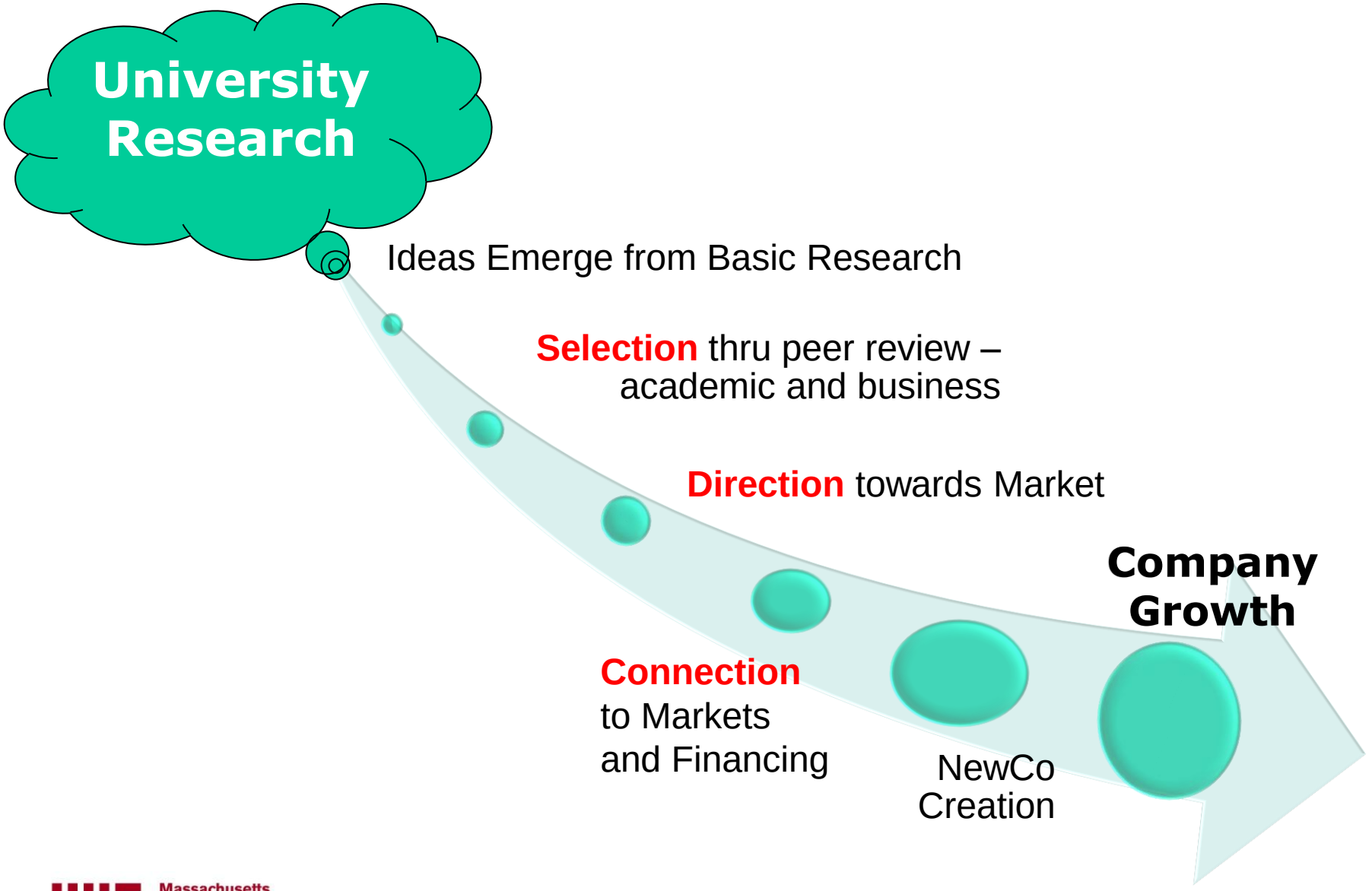
Outline

- University – industry – startup observations
- MIT
- *Engineering* innovation and entrepreneurship centers
  - Education
  - Innovation
  - Design of programs

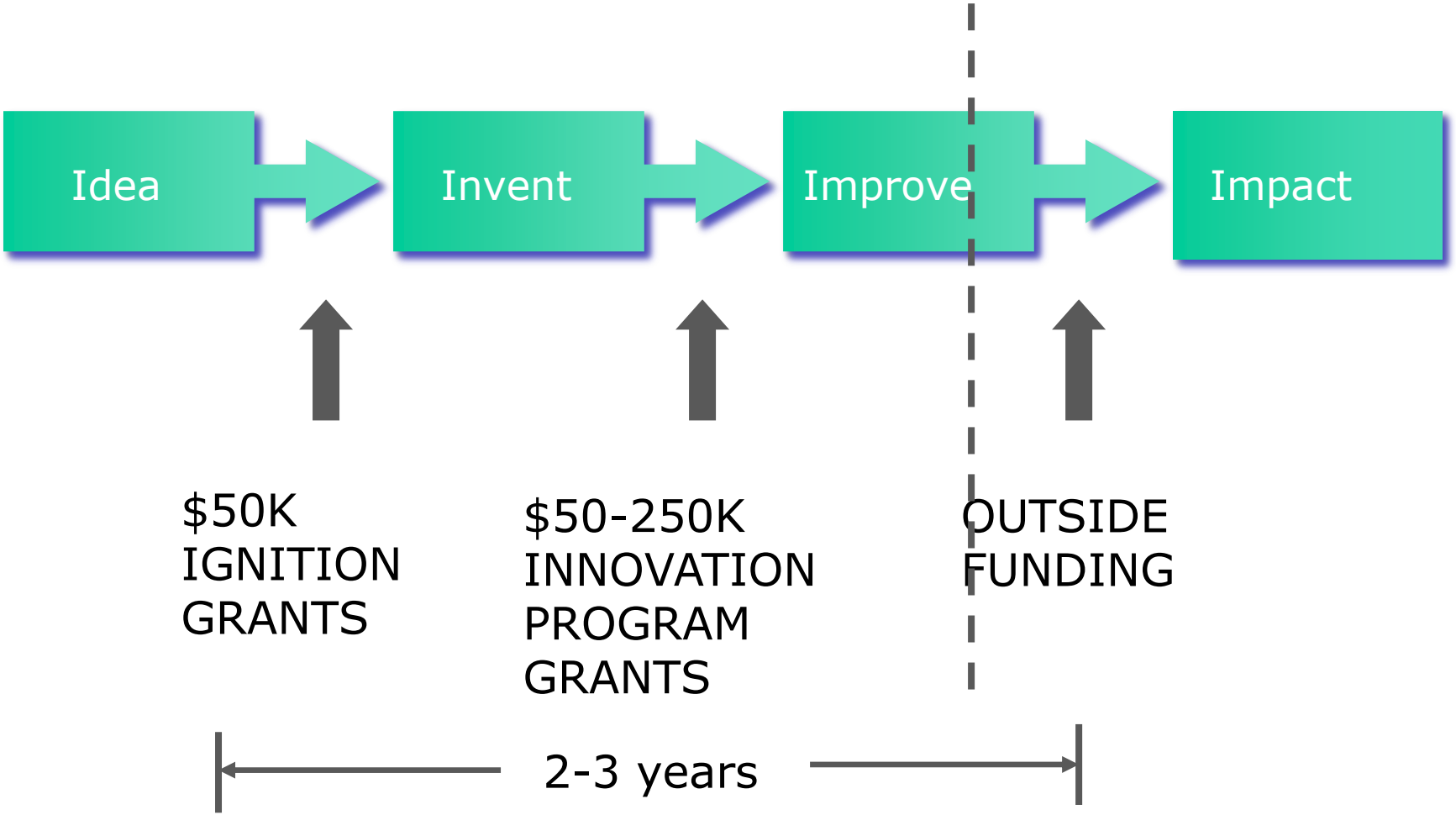
Education investment (since 1990)

- Dual track faculty: academicians and practioners, 1~2 → ~20
- Integrated class enrollments
  - MBA students with scientists and engineers
  - Cross list classes to accord engineering credit
- 1 → 30 classes
  - Broadly advertised, centrally located
- Emphasis on real-world mixed-team projects
  - Product, Firm, Startups
  - Real technologies exclude “known” business solutions
- Worked to house student clubs with EIRs to maximize interactions

Evolution of an Idea



Deshpande Grant Program



Leverage on the Science Platform

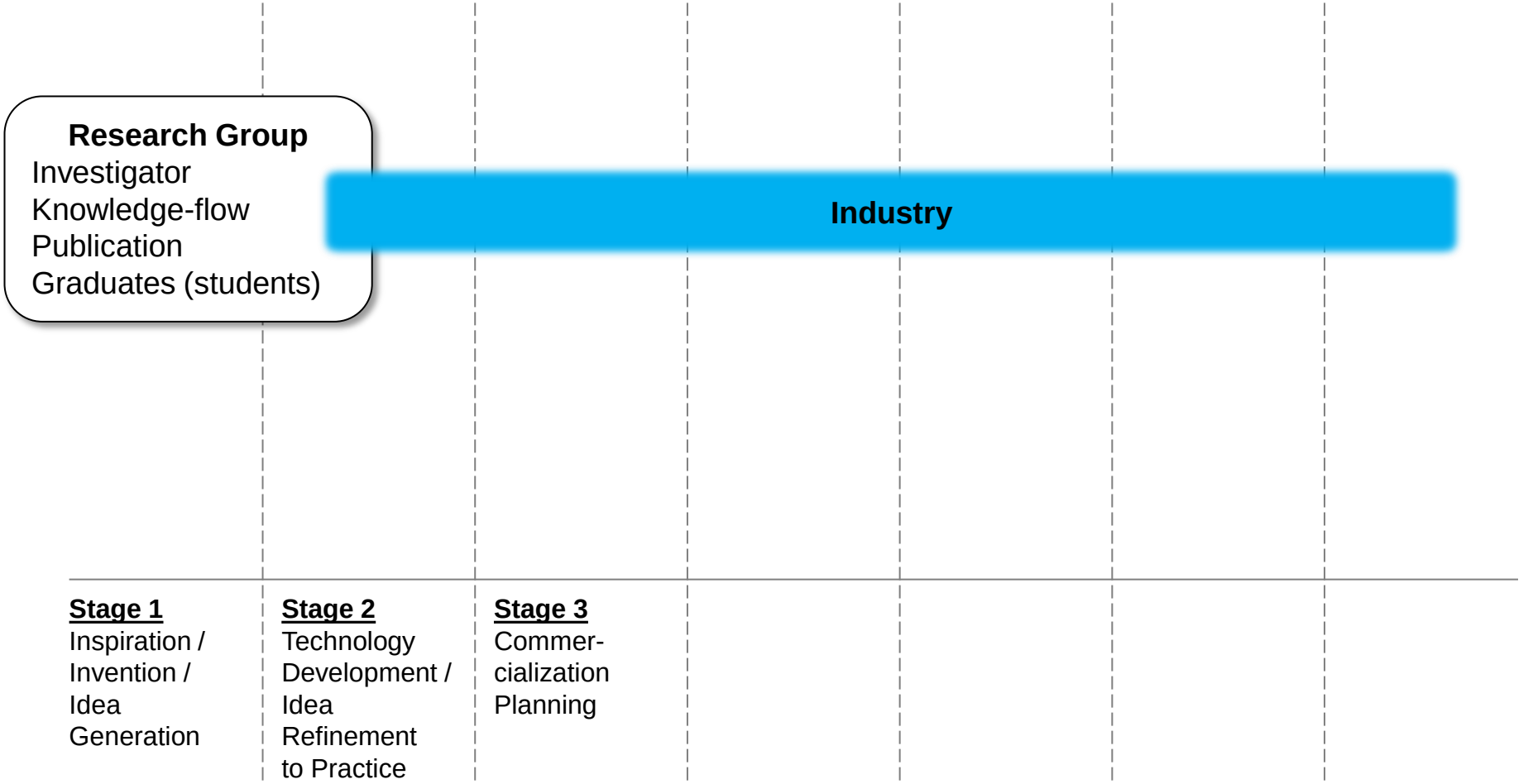
- Incredible leverage*:
  - Funded 85 projects with ~$10M in grants
  - 24 startups have attracted >$300m in venture financing
  - 60 projects have “failed”
    - Too early, didn’t work, no market
  - 2 ventures have been acquired ~$300
- We have involved:
  - 300+ faculty and their students
  - 200+ VCs and entrepreneurs
  - 400+ jobs have been created

***Networks are important**

Strong engagement of Entrepreneurs and VCs

1. Speaker/panelist invitations to classes, clubs, conferences and celebrations
2. Involvement of entrepreneurs, VCs, and senior officers as mentors, catalysts, and judges
3. Heavy linkages with local and global firms via our Entrepreneurship Lab (E-Lab) and Global E-Lab subjects
4. Network events each semester to “honor” company collaborators, with invitations to the major participants of the external entrepreneurial ecosystem
5. “Level playing field” VC access to potential MIT-based investments
6. Growing recognition over time of MIT’s critical role in creating and building the Greater Boston ecosystem

Traditional commercialization of University IP



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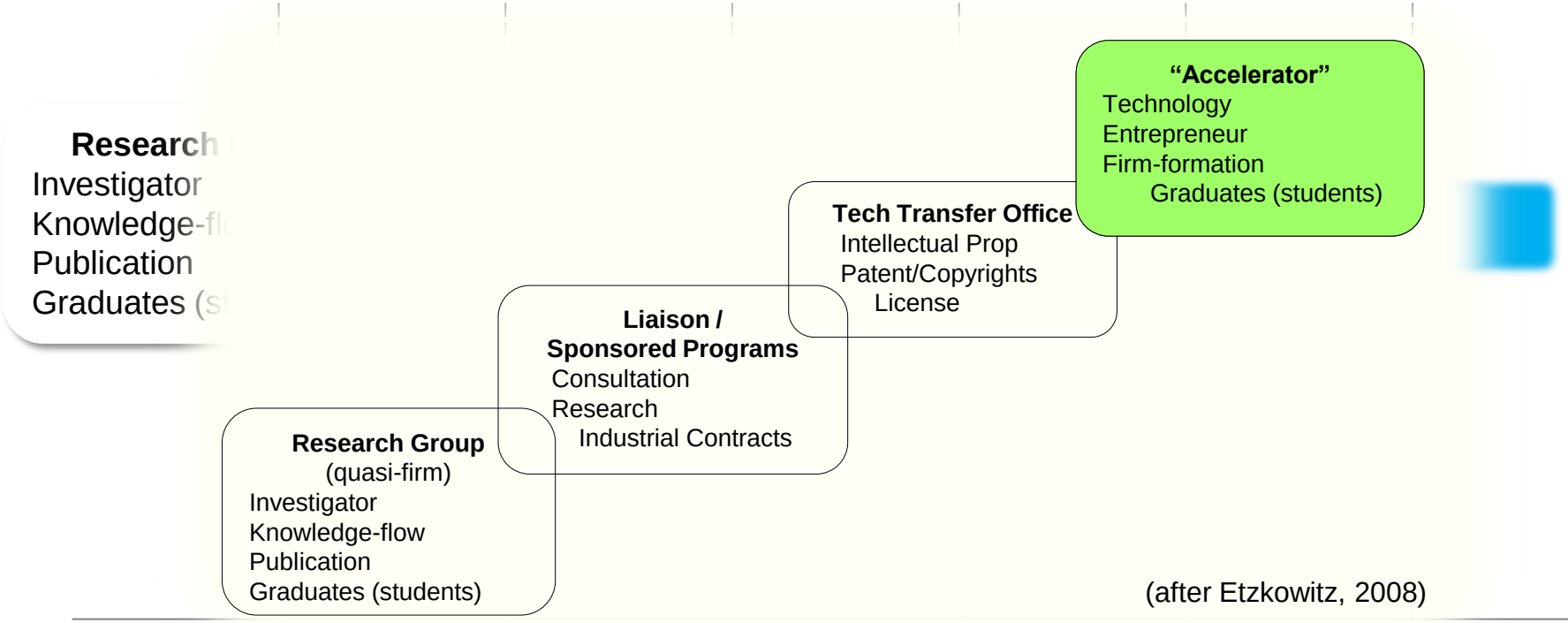
~~Traditional~~ commercialization of University IP

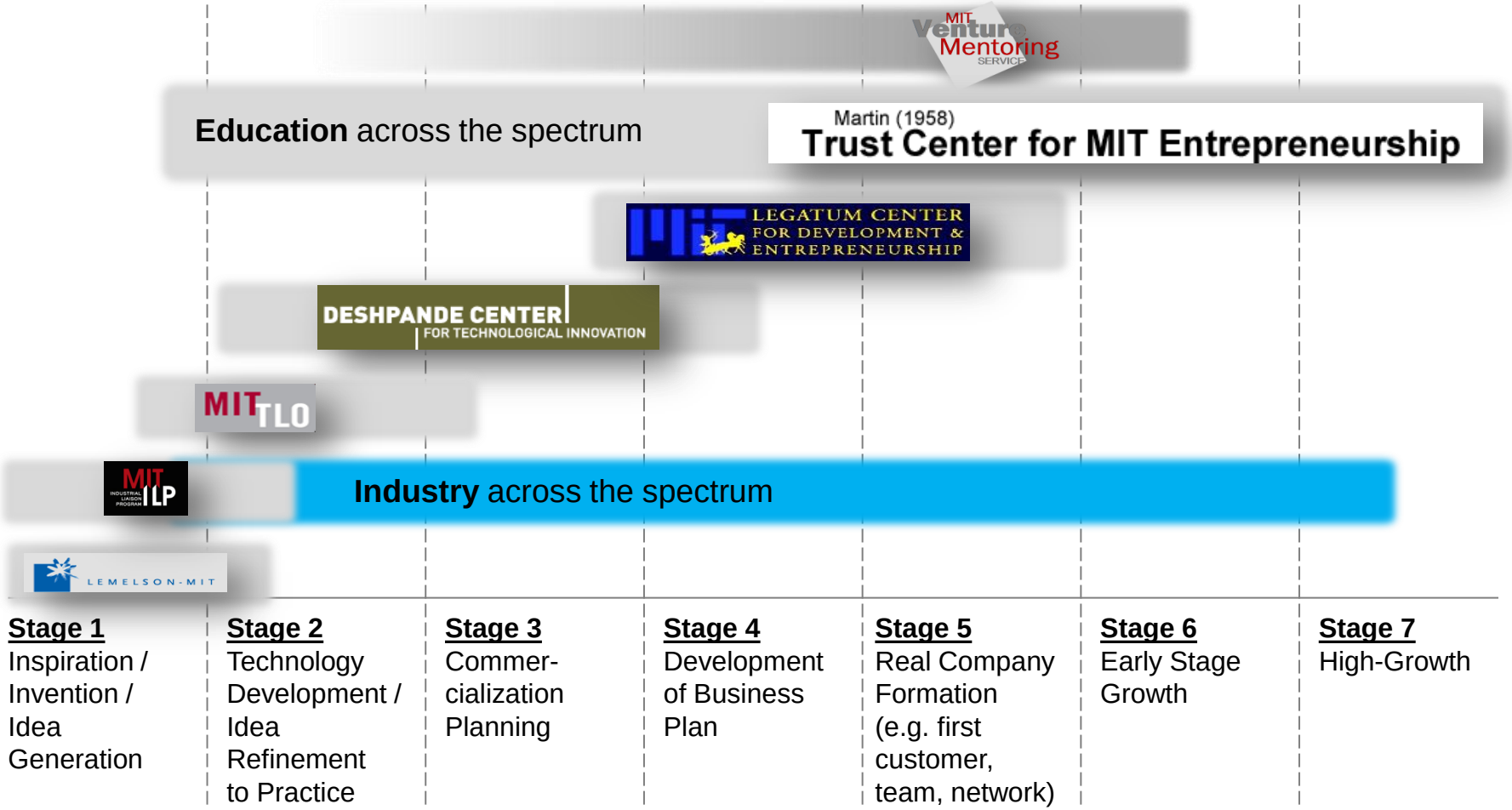


(after Etzkowitz, 2008)

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
Inspiration / Invention / Idea Generation	Technology Development / Idea Refinement to Practice	Commer-cialization Planning	Development of Business Plan	Real Company Formation (e.g. first customer, team, network)	Early Stage Growth	High-Growth

MIT's E&I Ecosystem

(Internal MIT Model)

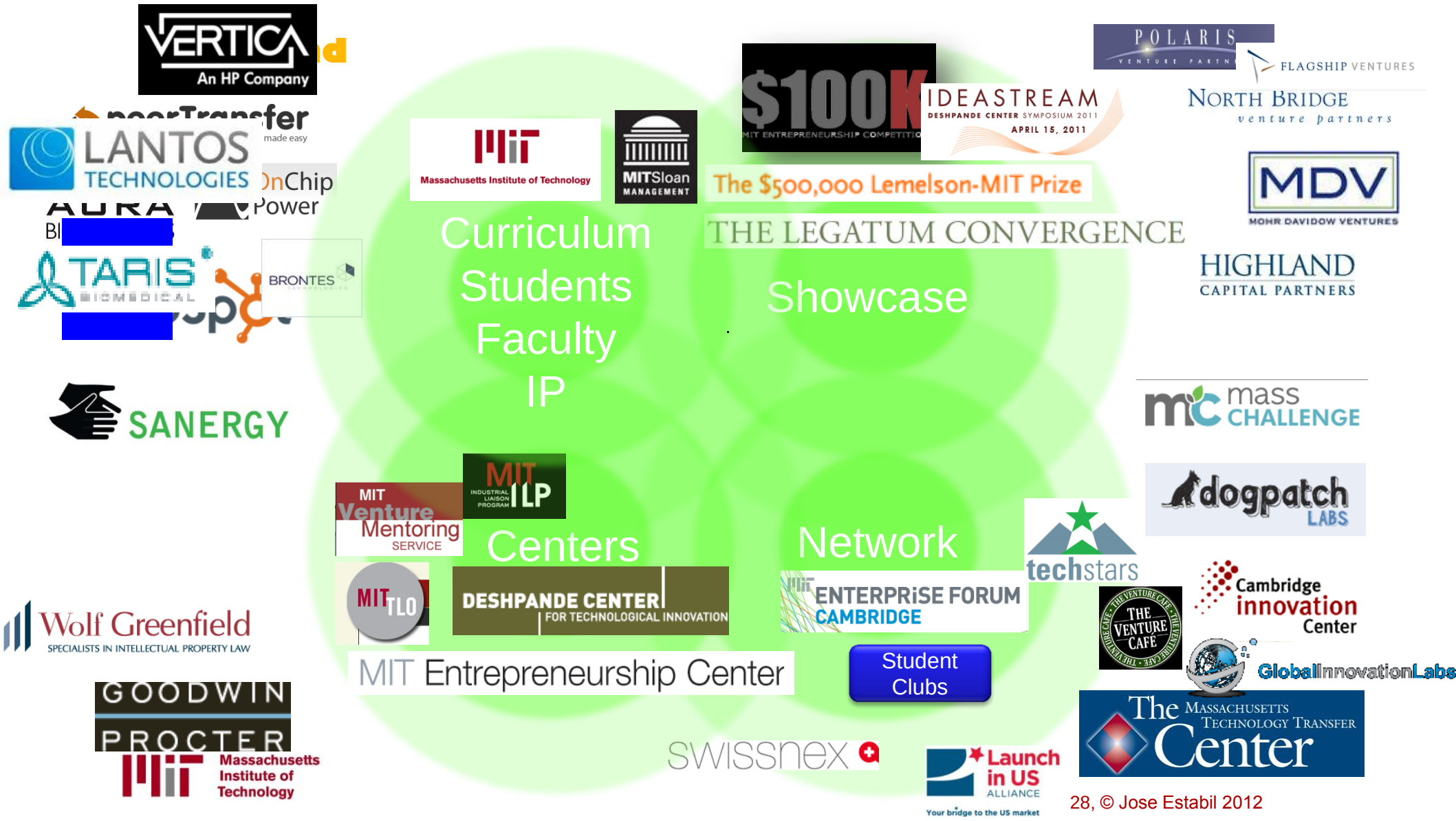


- **Basis for Commercialization:** 45 years of growing research & insight into the entrepreneurial process
- **Knowledge Base:** Outstanding scientific and engineering research … & pioneering of new fields
- **Underlying Foundation:** 150 years of MIT's "mens et manus" culture

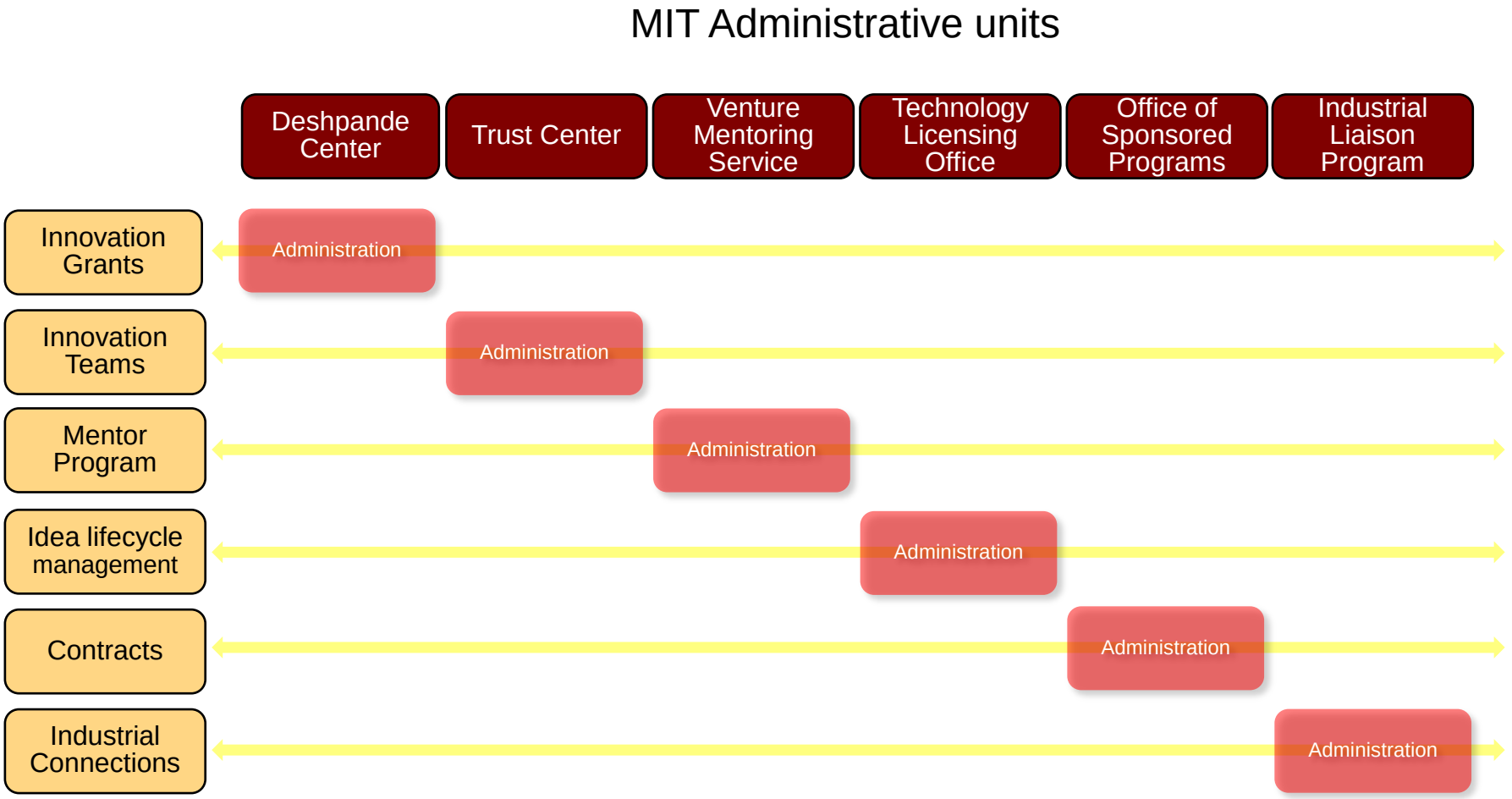
E&I Ecosystem observations

- Each center has a different focus … activities meant to have some overlap
  - Satisfy student or faculty need
  - Low threshold for participation; High threshold to sustained activity
- Dynamic collaboration of MIT and funder
  - Affiliation with MIT
    - MIT alumni
    - non-MIT innovators and business leaders
  - MIT provides naming opportunity in exchange for funding
  - *Some* incubation by MIT
- Enablement
  - American philanthropic model
  - US tax policy

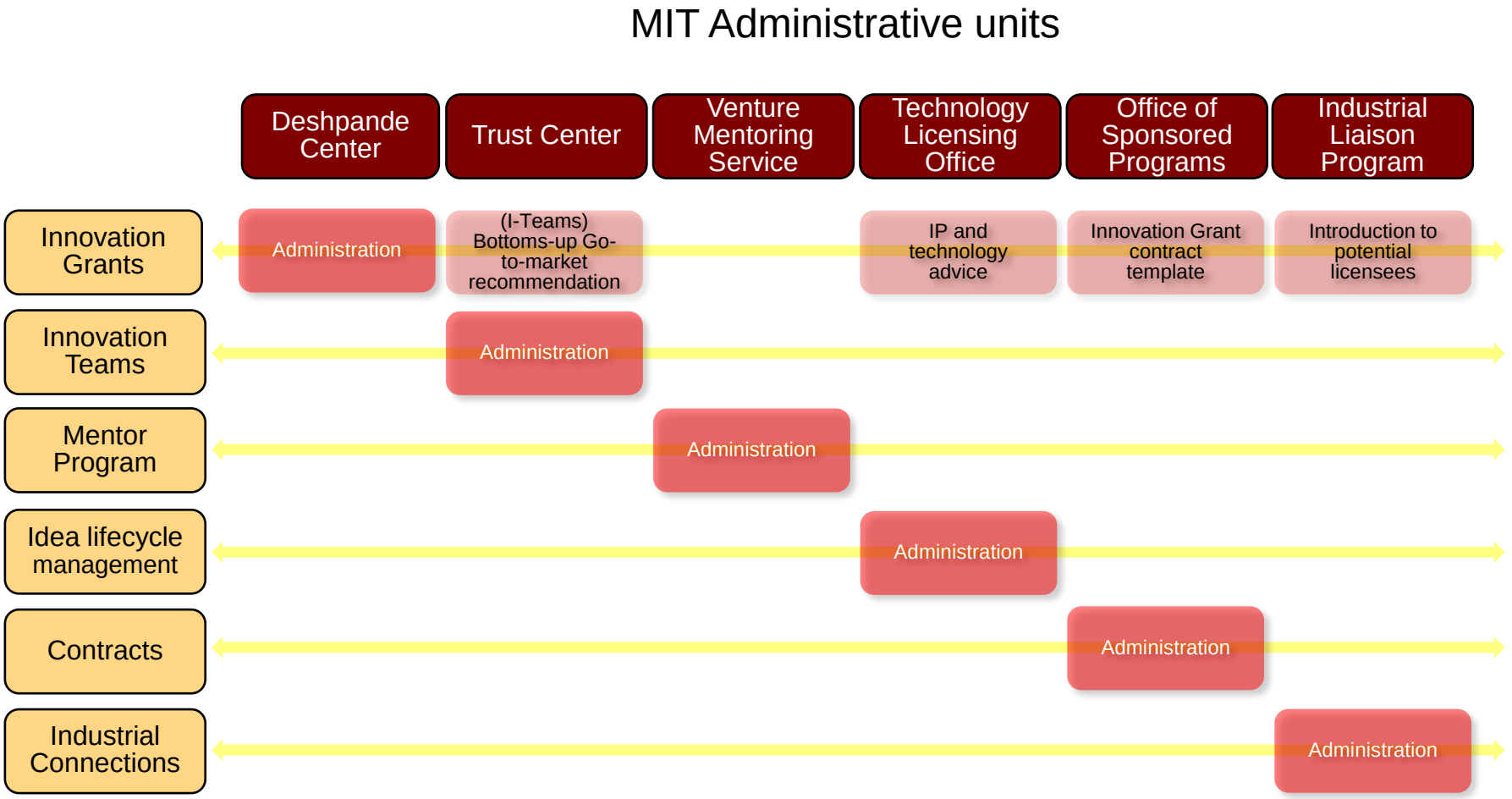
MIT's E&I Ecosystem



Engineering E&I centers

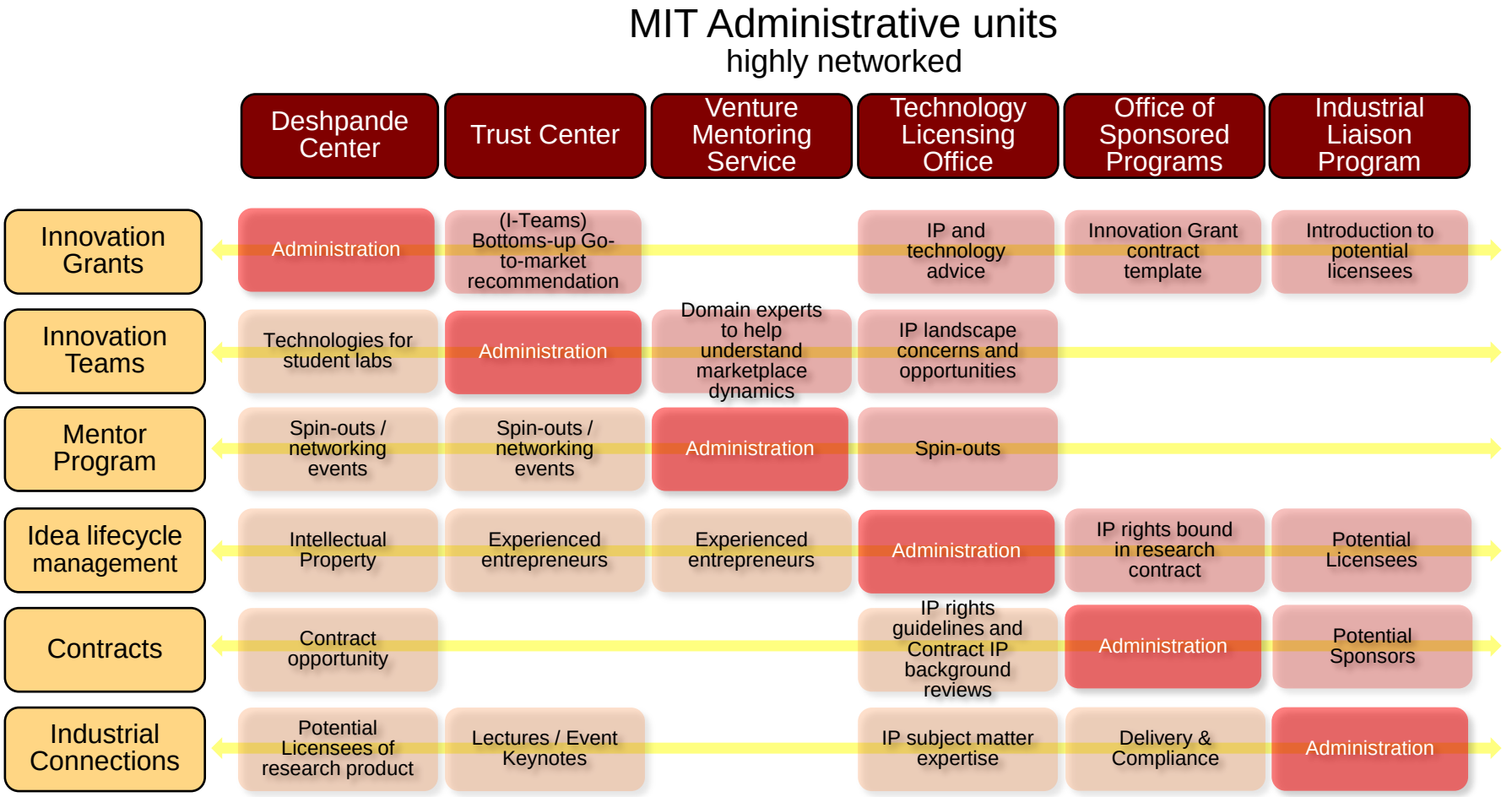


Designing E&I centers' programs

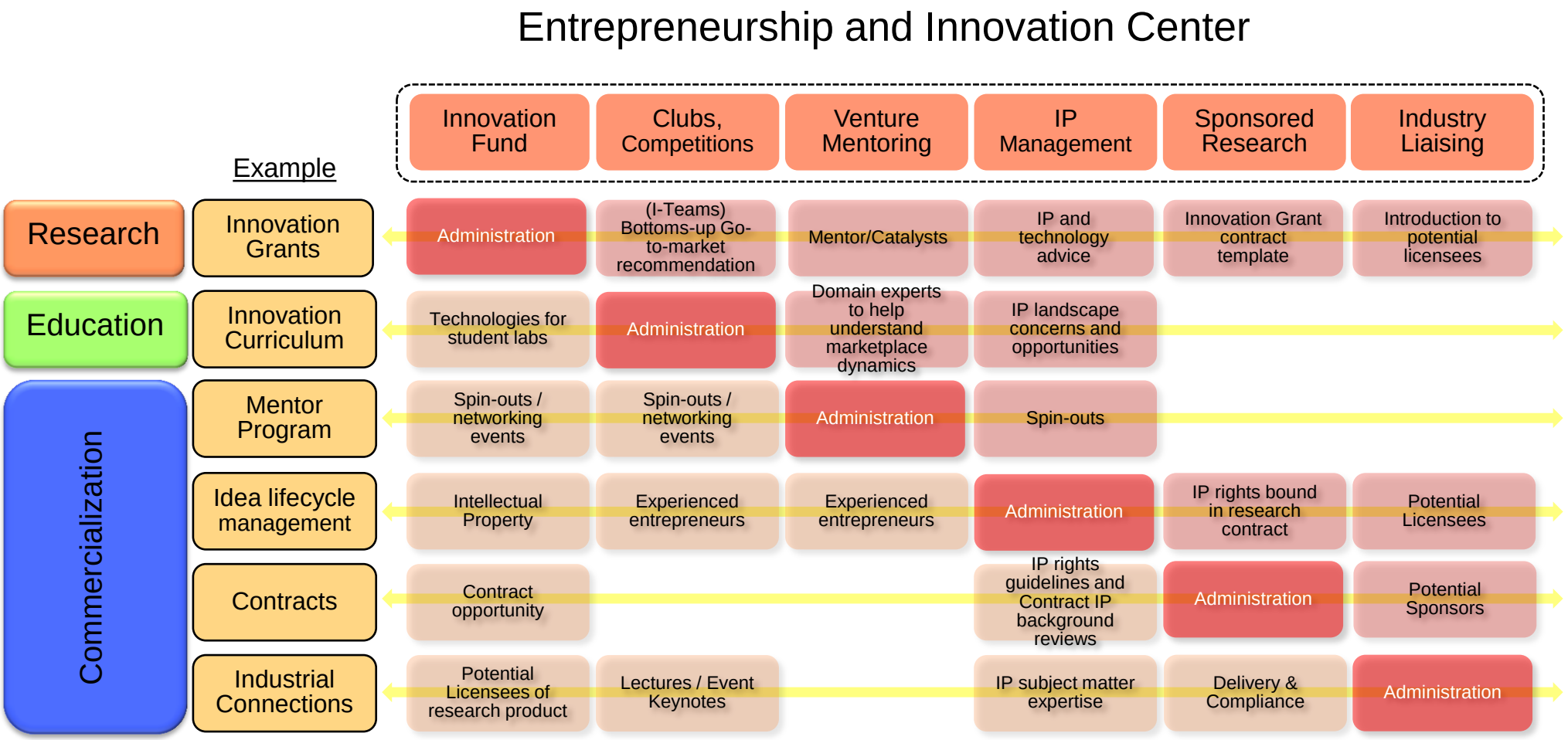


Designing E&I centers' programs

Off-axis elements matter on both sides of diagonal



Engineering an E&I center



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Future powerhouses

- Thomas Friedman, author of *The World is Flat*, New York Times columnist
  - "The best of these ecosystems will be cities and towns that combine a university, an educated populace, a dynamic business community…These will be the job factories of the future."(1)

(1) T. Friedman, "So Much Fun. So Irrelevant." NYT, January 3, 2012.

Thank You

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GDP

Rank	Country	GDP (millions of US$)
	World	**62,911,253**[4]
	European Union	16,242,256[4]
1	United States	14,526,550
2	China, People's Republic of	5,878,257[n2]
3	Japan	5,458,797
4	Germany	3,286,451
5	France	2,562,742
6	United Kingdom	2,250,209
7	Brazil	2,090,314
8	Italy	2,055,114
9	India	1,631,970
10	Canada	1,577,040
11	Russia	1,479,825
12	Spain	1,409,946

Rank	Country	GDP (millions of US$)	Year
	World	**63,123,888**	**2010**
	European Union	16,222,855	2010
1	United States	14,586,736	2010
2	China, People's Republic of	5,926,612[n2]	2010
3	Japan	5,458,837	2010
4	Germany	3,280,530	2010
5	France	2,560,002[n4]	2010
	United Kingdom	2,248,831	2010
7	Brazil	2,087,890	2010
8	Italy	2,051,412	2010
9	India	1,721,111	2010

Rank	Country	GDP (millions of US$)	Year
	World	**63,170,000**	**2010**
	European Union	17,720,000	2011 est.
1	United States	15,060,000	2011 est.
2	China	6,989,000	2011 est.
3	Japan	5,855,000	2011 est.
4	Germany	3,629,000	2011 est.
5	France	2,808,000	2011 est.
6	Brazil	2,518,000	2011 est.
7	United Kingdom	2,481,000	2011 est.
8	Italy	2,246,000	2011 est.
9	Russia	1,885,000	2011 est.
10	India	1,843,000	2011 est.

DRAMATIC IMPACT: Estimated Employment and Sales for All Active MIT Alumni Companies*

Jobs	Percent of Companies	Median Employees	Median Sales ($Millions)	Estimated Total Employees	Estimated Total Sales ($Millions)
More than 10,000	0.3%	15,000	1,523	1,339,361	1,389,075
1,000-10,000	1.8%	1,927	308	1,043,932	235,532
Less than 1,000	97.9%	39	<1	900,001	226,671
Total	100.0%	155	<1	3,283,294	1,851,278

- Selectivity is very high: Only ~2% (~540) of MIT-alumni companies provide most of the economic impact (>1000 jobs each). Societal benefits provided by all !

*Underlying data from 2003 MIT survey of all living alumni, updated to 2006; ~25,800 active companies. All data are in "*Entrepreneurial Impact: The Role of MIT*" (2009) and its 2011 "Updated Report".