



Transfer and Commercialization of Technology and Innovation

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IC² INSTITUTE BUILDING

THE IC² INSTITUTE, FOUNDED BY BOARD MEMBER, ESTABLISHED THE VISION THAT SCIENCE AND TECHNOLOGY ARE RESOURCES FOR ECONOMIC DEVELOPMENT AND ENTERPRISE GROWTH. THE BUILDING WAS GIVEN TO SUPPORT THIS VISION AND TO ENHANCE EDUCATION AND RESEARCH ON THE ENTERPRISE SYSTEM.

GRANT BY THE FAY FOUNDATION
MAY 1998 & 2000



Presentation Topics

- Building commercialization into innovation programs
- Practicing effective technology transfer
- Pursuing a disciplined commercialization strategy





Building Commercialization into Innovation Programs



Building Knowledge-Based Economies

- Take advantage of Federal and State investments in science and technology
- Launch new businesses
- Link with educational programs
- Provide employment and expanded tax base
- Improve local competitiveness in ever changing economy



The Knowledge Economy Ecosystem

Contributors:

- Universities
- Researchers
- Students
- Private Sector



Idea Process

Technology

Company Funding and Ramp Up

- Funding Sources
- Incubators
- Management Talent
- City and State Gov'ts
- Local Ecosystem Support

Economic Impact:

- Jobs
- Tax Revenue
- Investment

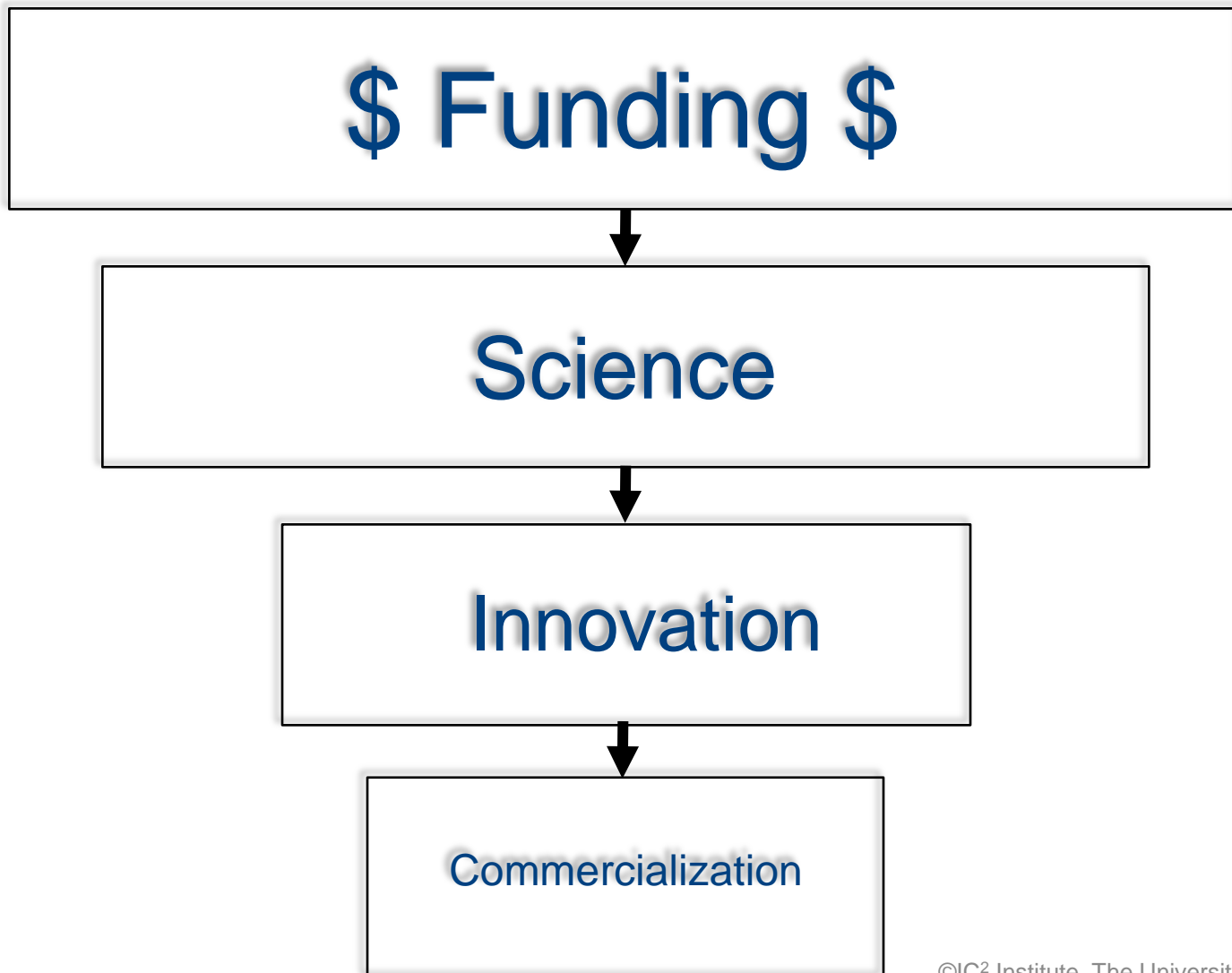
A Growing New Business Ecosystem:

Ecosystem:

- Going concern
- Graduation
- Acquisition
- (Fail)

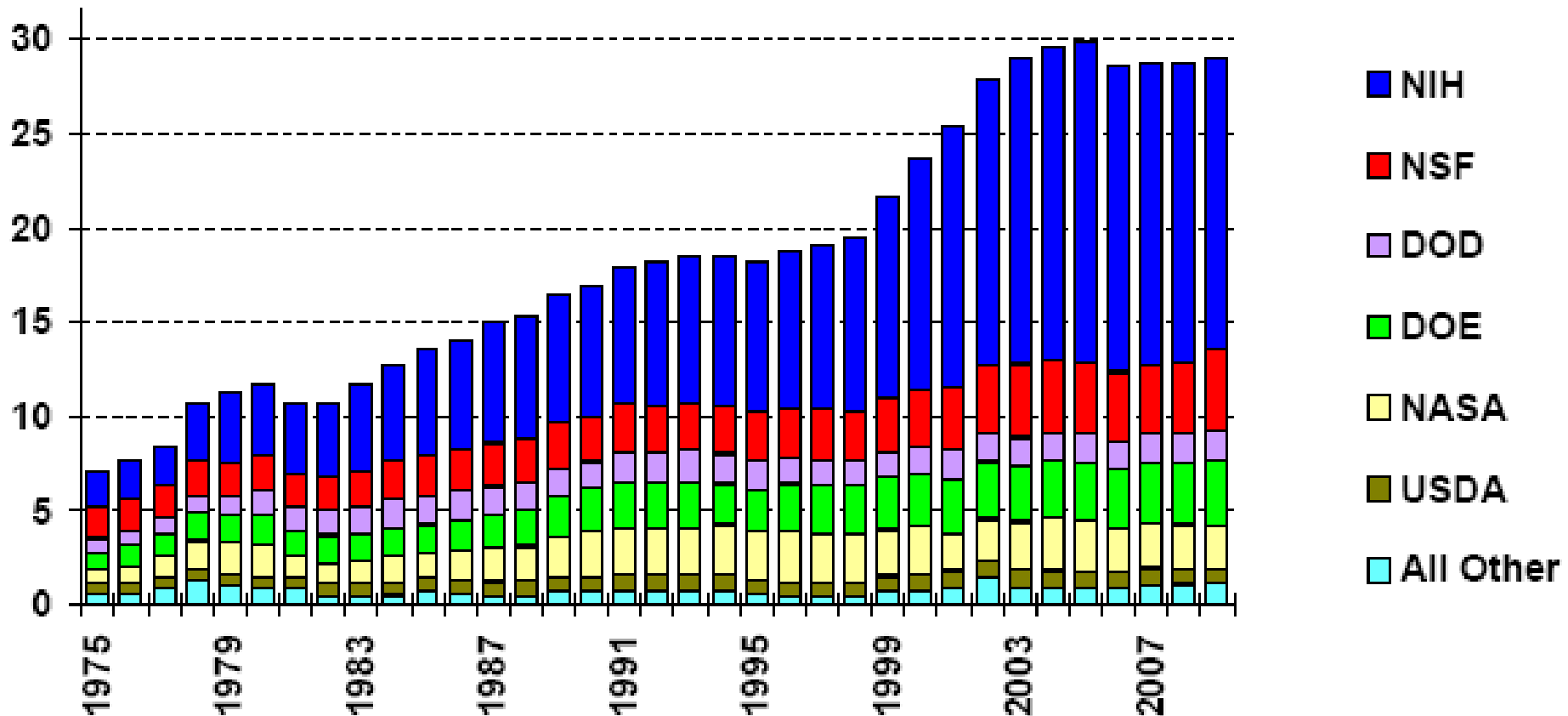


Traditional Commercialization Model





Trends in Basic R&D Funding in US



FY 1975-2009 in billions of constant FY 2008 USD



Traditional Model Works ... but Poorly

In 2009

- ~\$131 billion total R&D spending by US government
- ~\$54 billion in research funding (>\$40 billion in healthcare) to reporting entities
- ~\$2.3 billion in licensing income to reporting entities
 - >18,000 patents filed, >3,400 patents issued in US
 - ~600 new companies formed
- **~4% of annual reported research spending, and <2% of all R&D spending returned in realized commercialization.**
- **Slowing and refocusing of Venture Capital**



A Cue From Edison

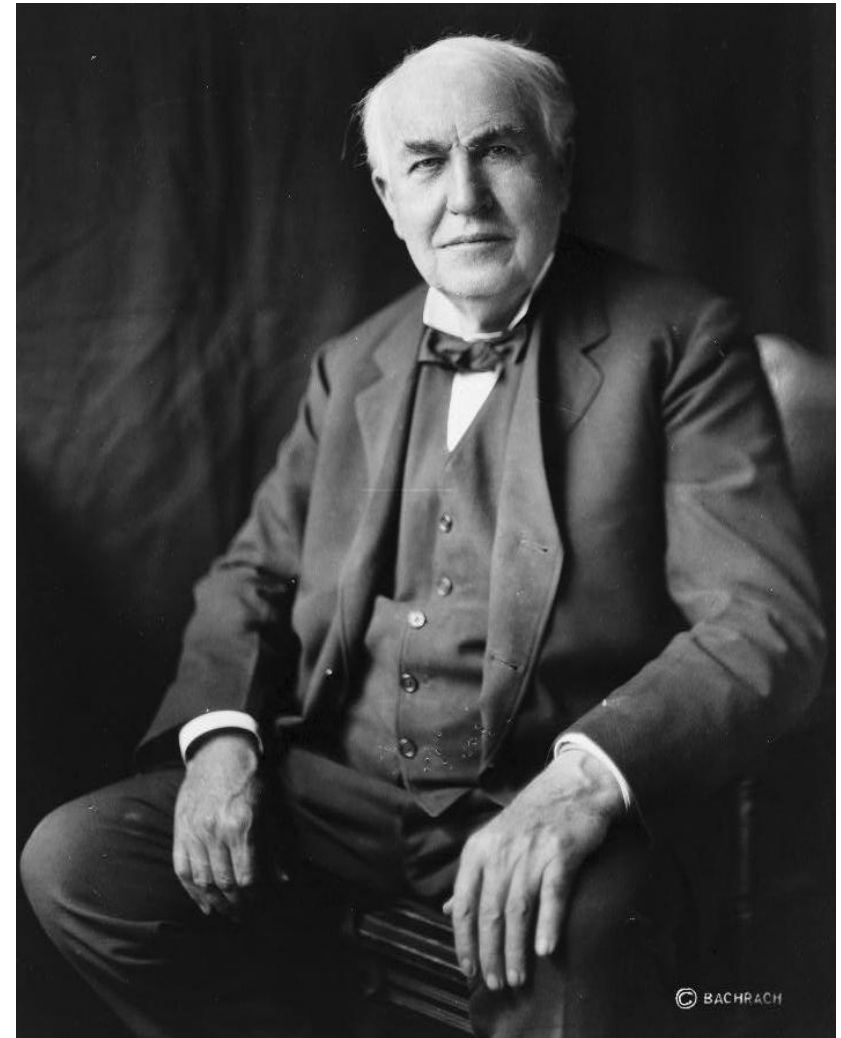
Market Need: The Light Bulb

Most know the end of the story

- Edison tried more than 6,000 different filaments to identify one that would burn for a few hours.

Most do not know

- Edison was not the first to invent the incandescent light bulb.
- Indeed, Joseph Swan actually obtained the first patent a year before Edison's patent date.



Source: *At Work with Thomas Edison*, Blaine McCormick, 2001.

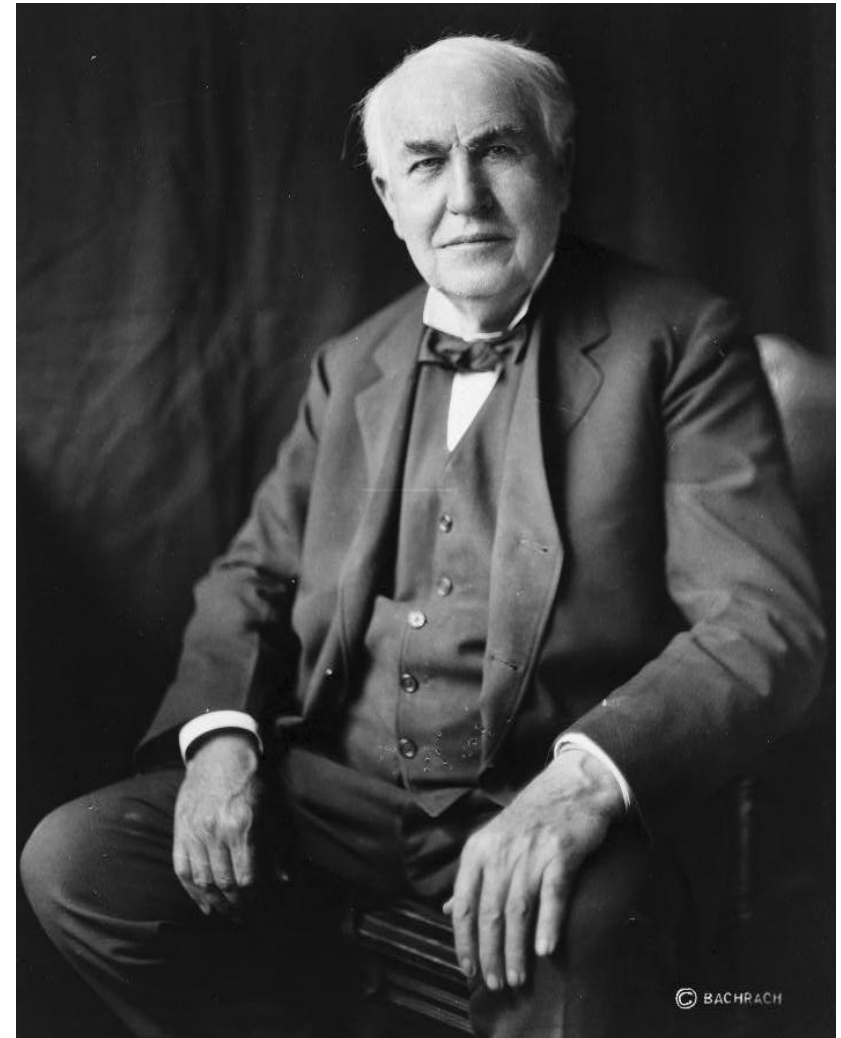


A Cue From Edison

The Rest of the Story ...

More surprisingly

- Edison was the 23rd person to file a patent for the light bulb.
- Edison's bulb was by far the most commercially successful.
- He was the only one who made the use of a light bulb practical for commercial use envisioning an electrical power industry and market deployment.
- Successful innovation required a commercial perspective – or we would all find ourselves “in the dark!”



Source: *At Work with Thomas Edison*, Blaine McCormick, 2001.



Commercialization Must be Engineered into Innovation

- Institutional technology innovation is just the raw material.
- Commercialization involves a strategy integrating simultaneous development of:
 - Science/technology enablement
 - Intellectual property protection
 - Market fit
 - Business reach and execution
- Commercialization = Innovation + Strategy + Funding + Execution
- Commercialization is executed according to an “market-driven” strategy with “timing-based” adaptability.



Practicing Effective Technology Transfer

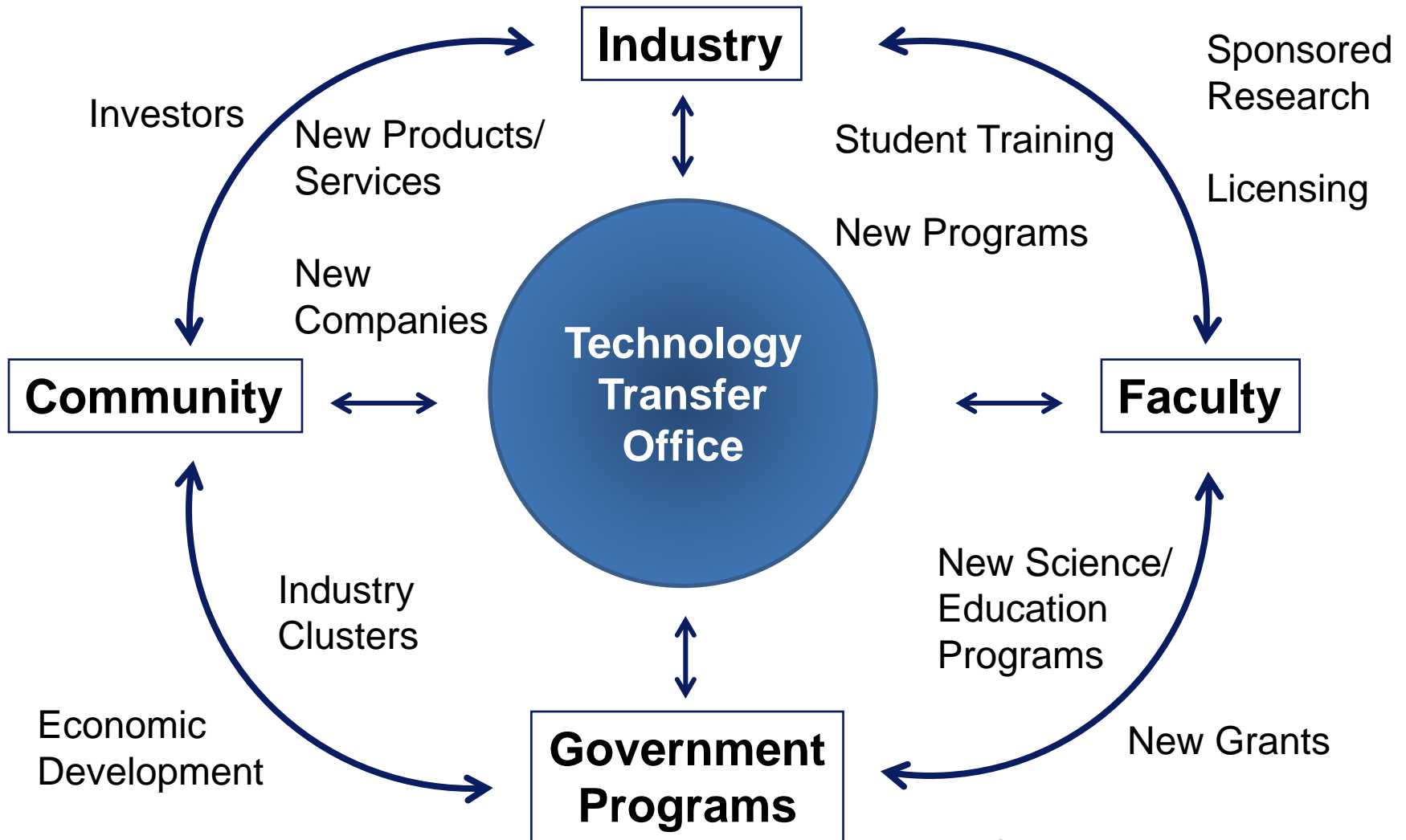


Role of Technology Transfer

- Turn science into assets
- Connect scientific assets to the market
- Generate revenue
 - Shorter term – fees and royalties
 - Longer term – equity
- Assist in faculty development
- Develop Industry relationships
- Contribute to local economic development



TTO Ecosystem





Incentives Required

- Innovator ownership of inventions
 - Private companies
 - Universities
- Institutional management
 - Inventions
 - Resulting IP
- Institution participation in innovation return
 - Royalties
 - Equity



Primary Concern for Value Return

- Manage Risk!!!

Hambrecht & Quist

Development Stage	Required Rate of Return (%)
Discovery	80.0
Preclinical	60.0
Phase I Clinical Trials	50.0
Phase II Clinical Trials	40.0
Phase III Clinical Trials	25.0
New Drug Application	22.5
Product Launch	17.5-15

Venture Capital Rates of Return

Stage of Development	Required Rate of Return
Start-up	50%
First stage	40%
Second stage	30%
Third stage	20%

Category

Discount Rate

Speculative ventures	30%
New products	20%
Expansion of existing business	15% (company cost of capital)
Cost improvement, known technology	10%



Idea or Asset

- When will a company pay for a new idea?
- Practically never!!! Ideas are viewed as gifts for development.
- Ideas are converted to assets through intellectual property (IP) protection



Structure IP to Insure Value

IP Regime	Origin of Rights	Prerequisites to Protection	Scope of Protection	Life	Test for Infringement
Trade Secret	Investment of time and money, guarded from others	Recognition of value and utility	Confidential Information	Life of confidentiality	Means of Derivation
Utility Patent	Granted by Fed. Govt. on application by inventor	New, useful, and non-obvious subject matter	Useful process, machine, article of manufacture, or composition of matter	17 years from date of grant or 20 years from date of application	Manufacture, use, sale, offer for sale in U.S., or import of claimed invention.
Copyright	Creation of original "works" of authorship, fixed in tangible form	Originality, registration and copyright notice required if publicly enforced	Works of authorship	Variable on the order of 100 years or longer; life of author plus 70 years.	Copying, Performing, Distributing
Trademark	Adoption & use in commerce	Used in commerce to identify and distinguish business, goods and services, Federal registration required for federal enforcement.	Words, names, symbols, and other devices.	Unlimited as long as property is used in commerce.	Likelihood of confusion, mistake or deception.



Invention Risk

- Actually find the inventions!!!
 - Outreach
 - Relationships
- Gather the full information from inventors
- Understand:
 - Potential encumbrances
 - Prior Art
 - Usefulness and development status
 - IP strategy



IP Investment Risk

- What is the cost difference?
 - Patenting a non-marketable technology, process or composition
 - Patenting a highly valuable technology, process or composition
- Each costs is the same – so choose wisely!!!



IP Investment Risk: Technology Assessment

- Inventor support
- Institution support
- Technology ownership and IP status
- Market opportunity
 - Technology expert
 - Partner/Channel
 - User
 - Distributor
- Development status
 - Commercialization roadmap
 - Costs



Generating Revenue from IP Assets

- Costs of obtaining a patent: \$15-25,000
- Odds of obtaining a patent
 - Depends on management strategy
 - Self managed: 50-60%
 - Using a patent practitioner: >90%
 - The real question is what do the issued claims actually say? What are the estoppels? What competitors do they exclude?
- Odds of generating significant revenue from a patent
 - One in 10-50 patents is licensed/assigned
 - One in 100 new products makes significant profit



Impact of the Few

- UC System
 - 5 inventions account for ~48% of revenue; only 15 of 8,953 inventions generate >\$1 million
- Baylor Licensing Group
 - 3 of 160 revenue-generating licenses generate >\$1 million
- NCI/NIH
 - 8-10 of 600 active licenses generate >50% of revenue
- Columbia
 - 4.5% of all licenses generate >\$1 million



Critical Inventions Fuel TTO Revenues

- **New York University**
>\$650 million Remicade license alone
- **Columbia University**
\$135 million revenue/year; focus is chimeric antibodies and MPEG-2 video
- **University of California Sys.**
Top five inventions and 22 of 25 top technologies are biomedical
- **Northwestern University**
Growth from \$1.5 million 2004 to \$776 million in 2008 due to Lyrica royalties
- **Partners Healthcare**
\$284 million of \$355 million revenues due to Enbrel royalties
- **Wake Forest University**
Top is VAC wound healing device; 5 deals/year valued at \$1-2 million/year
- **City of Hope**
“Cabilly” patents \$110 million per year (\$500 million lawsuit)



How to Improve Your Odds?

Strategies of Leading TTO's

- Start with commercialization in mind
- Support of innovative science
- Assess all emerging inventions, stage-gated
- Select most promising inventions
- Invest in an IP asset strategy
- Encourage disciplined technology development
- Facilitate funding for development
- Conduct effective marketing campaigns
- Negotiate attractive deals



Success Metrics of a TTO

- Faculty relationships
 - Numbers of invention disclosures
 - Numbers and distribution of inventing faculty
- Asset development
 - Patent applications, conversions, issuances
- Strategic research support
 - Sponsored collaborative research with Industry
 - Commercialization grants
 - Strategic Industry interactions
- Business impact
 - Non-disclosure, Material transfer and License agreements
 - Startups and associated equity
 - Assertive licensing



University of Texas at Austin

OTC Statistics

	FY07	FY08	FY09	FY10	FY11
Disclosures filed	139	154	188	182	155
Patents filed (US + foreign)	243	274	302	344	270
Patents issued (US + foreign)	49	62	69	63	55
Startups created	3	10	9	13	4
IAs	4	7	5	10	8
Licenses+options	21	47	44	44	27
Licenses	20	43	32	32	18
Options	1	4	12	12	9
Licensing revenues (millions)	\$ 6.8	\$ 11.6	\$ 10.9	\$ 14.3	\$25.6

- 51,000+ students and 3,344 faculty
- \$642MM in annual research funding, including
 - \$60MM in industry-sponsored research
 - Chevron, ExxonMobil, Intel, Cisco, Samsung, Abbott, BASF, Boeing, Lockheed Martin, Merck, Pfizer, others



Improvement of Technology Transfer Functions



Impact of Training - Portugal

- EU funding programs started TTO programs in Portugal in mid-2000's
- When funding stopped (late 2000's), TTO's supported themselves doing whatever they could to survive (EU and national projects, contract research, services, etc.)
- No real TTO activities practiced in Portugal on a large scale (a few good TTO offices)
- No real institutional support to TTO's (money did not follow words)
- Training and development was urgently needed



University Technology Enterprise Network (UTEN)

- Ongoing partnership between the IC² Institute and Fundação para a Ciência e a Tecnologia
- 2007-2011
- Objectives:
 - Promote the development of globally competitive and sustainable commercialization infrastructure
 - Develop networking among Portuguese TTO's and science and technology entrepreneurs
 - Provide training through real-life commercialization experiences



UTEN Learnings

What not to do:

- Adopt too broad of a scope
 - Focus on TTO's first, build foundation, then provide entrepreneurial training and startup internationalization
- Promote too large of events
 - Promote learning by doing to see deep penetration of concepts to practice
- Discuss too diffuse of topics
 - Provide focused highly specific training from practitioners not “world leaders”



UTEN Learnings

What to do:

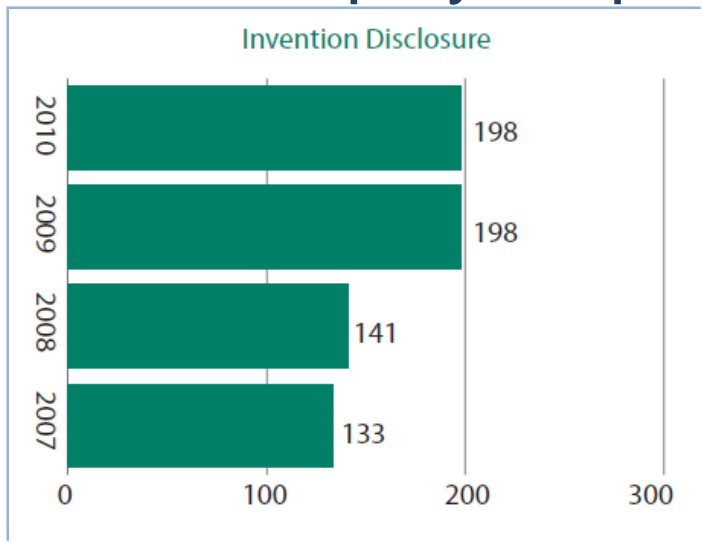
- **Provide focused workshops**
 - Narrow topic (not “commercialization,” but “valuation”)
 - Concentration on quality (<20 participants/ in roundtable events)
- **Establish international internships**
 - Teach practice in functioning environment
- **Transition to entrepreneurs and startups**
 - Build TTO foundation first, then focus on entrepreneurship training and company internationalization
- **Focus resources on activities and education**
 - De-emphasize overarching, expensive management
- **Support program from the top**
 - Evangelize university leadership
 - Provide necessary staff
- **Demonstrate real-life results**



TTO Institution Impact

“The greatness of small things”

- Most TTO’s started <5 years ago
- Annual budgets of <225,000 euros
- Employ <5 people



A table titled "Patent Applications (Priority Filings)" showing the number of filings for each year from 2007 to 2010. The table is organized with years as columns and categories as rows. The data points are: Provisional Filings (4, 23, 66, 80), Portuguese (71, 88, 76, 78), PCT (29, 30, 74, 43), EPO (12, 13, 12, 4), and USPTO (11, 17, 5, 11).

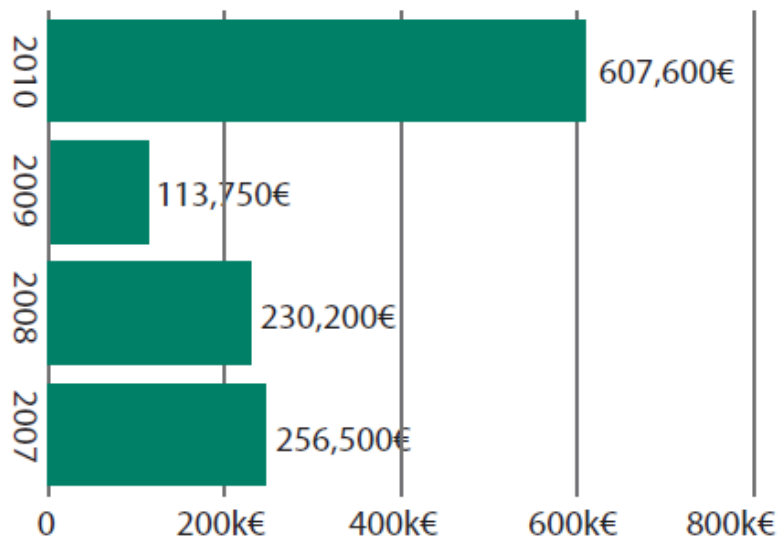
	2007	2008	2009	2010
Provisional Filings	4	23	66	80
Portuguese	71	88	76	78
PCT	29	30	74	43
EPO	12	13	12	4
USPTO	11	17	5	11



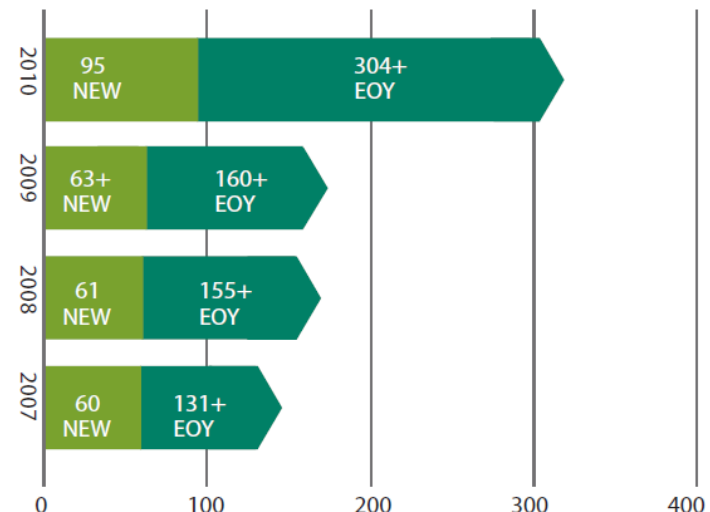
TTO Economic Impact

- Patents granted – 19.6% increase/year
- Executed licenses/agreements – 26% increase/year

License Income



New Academic Spin Offs (ASOs) and Total ASOs at End of Year





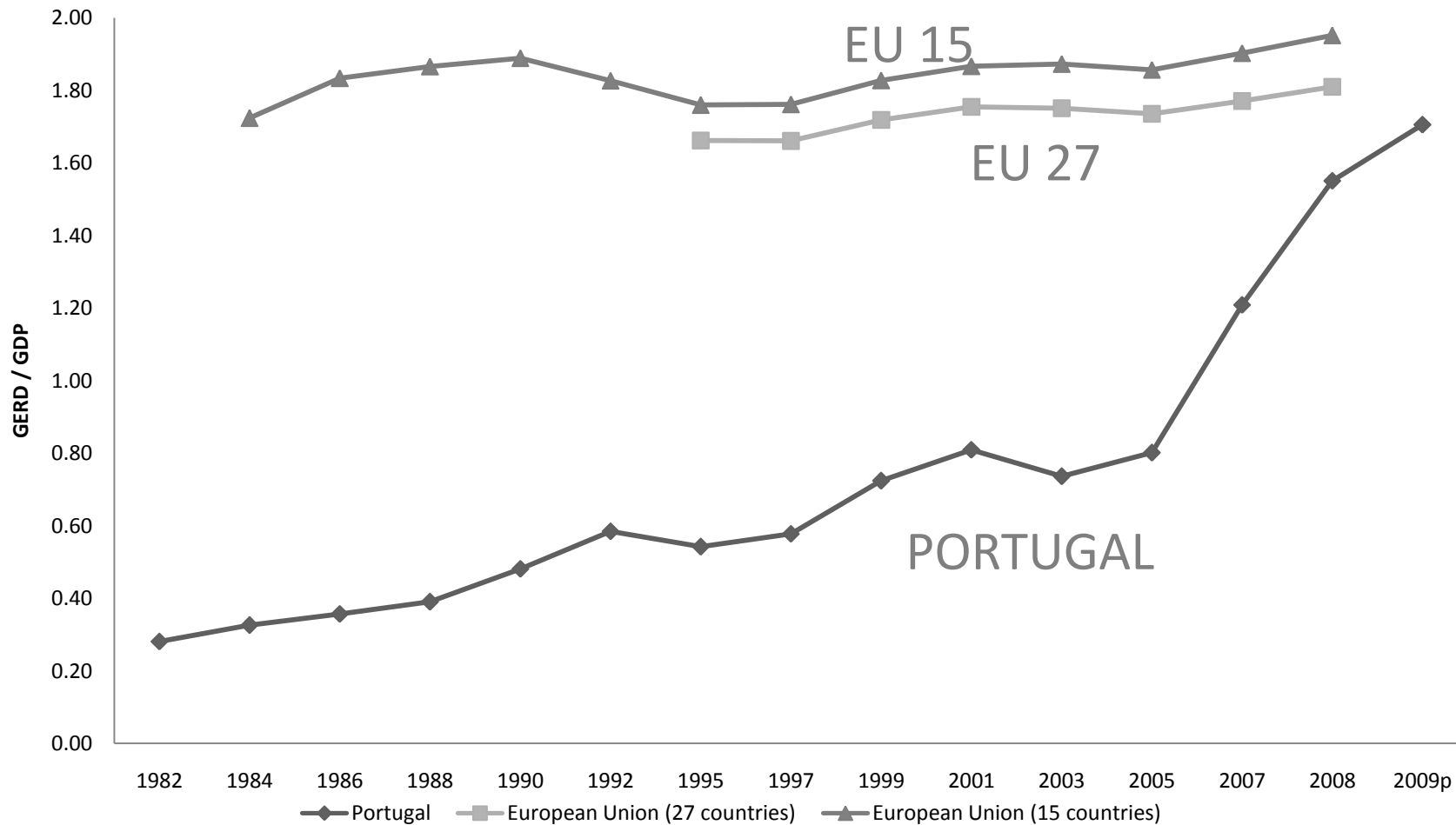
Economic Impact - Startups

Analysis from 44% responding startups :

- Profitability
 - >90% startups were selling product
 - Average revenue of 226,000 euros/2011
 - 127% annual growth rate in revenue
 - 37% of startups export products
- Employment
 - Average 8 employees/startup
 - ~38% annual growth rate in hiring
- Capital
 - Capital increased 6-fold 18 months after creation
 - Local and international VC funding events



Economic Impact – GERD as % of GDP

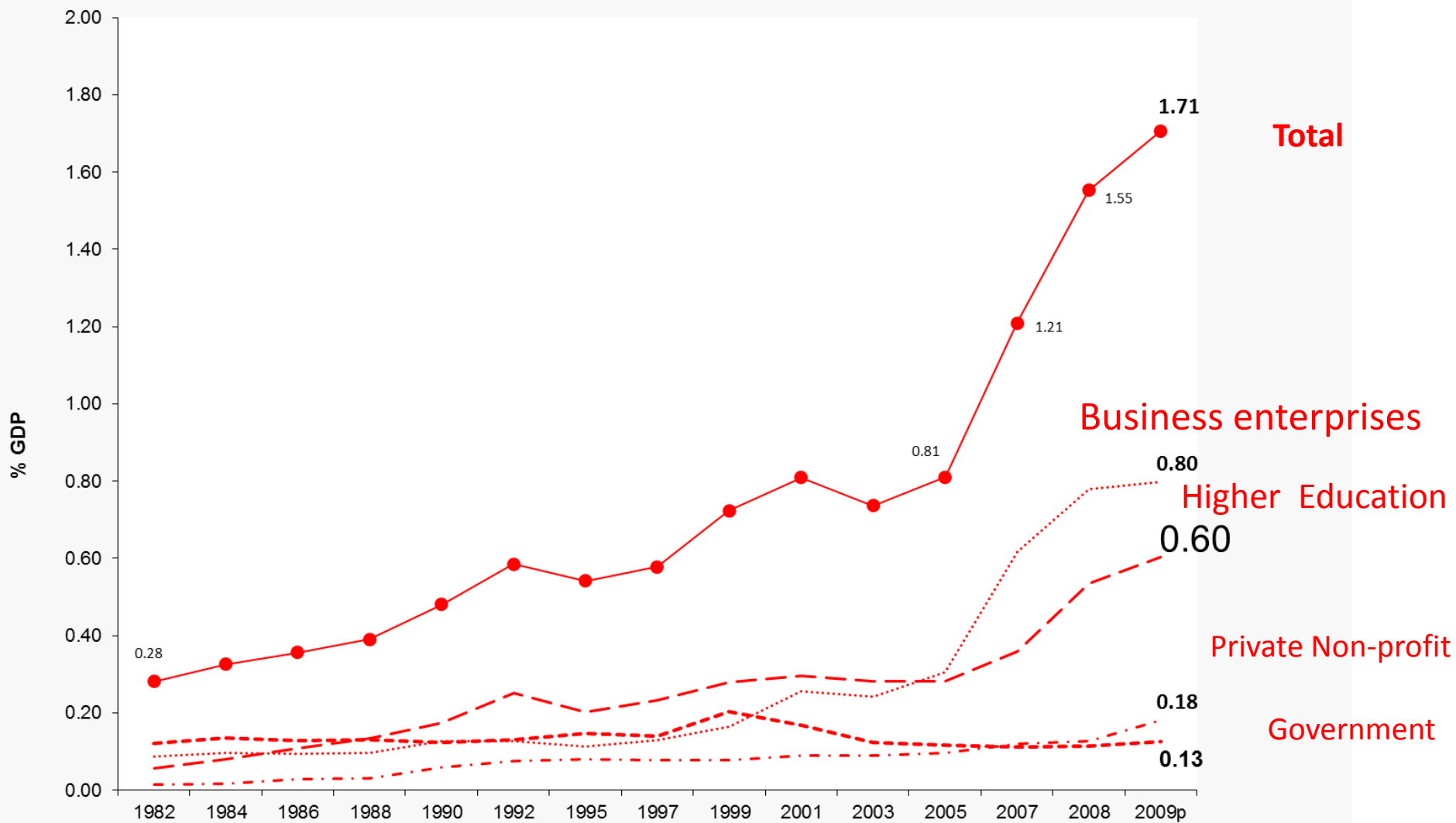


GERD: Gross Expenditure in R&D

Note: p – provisional data; Source: GPEARI / MCTES / OCDE 2010



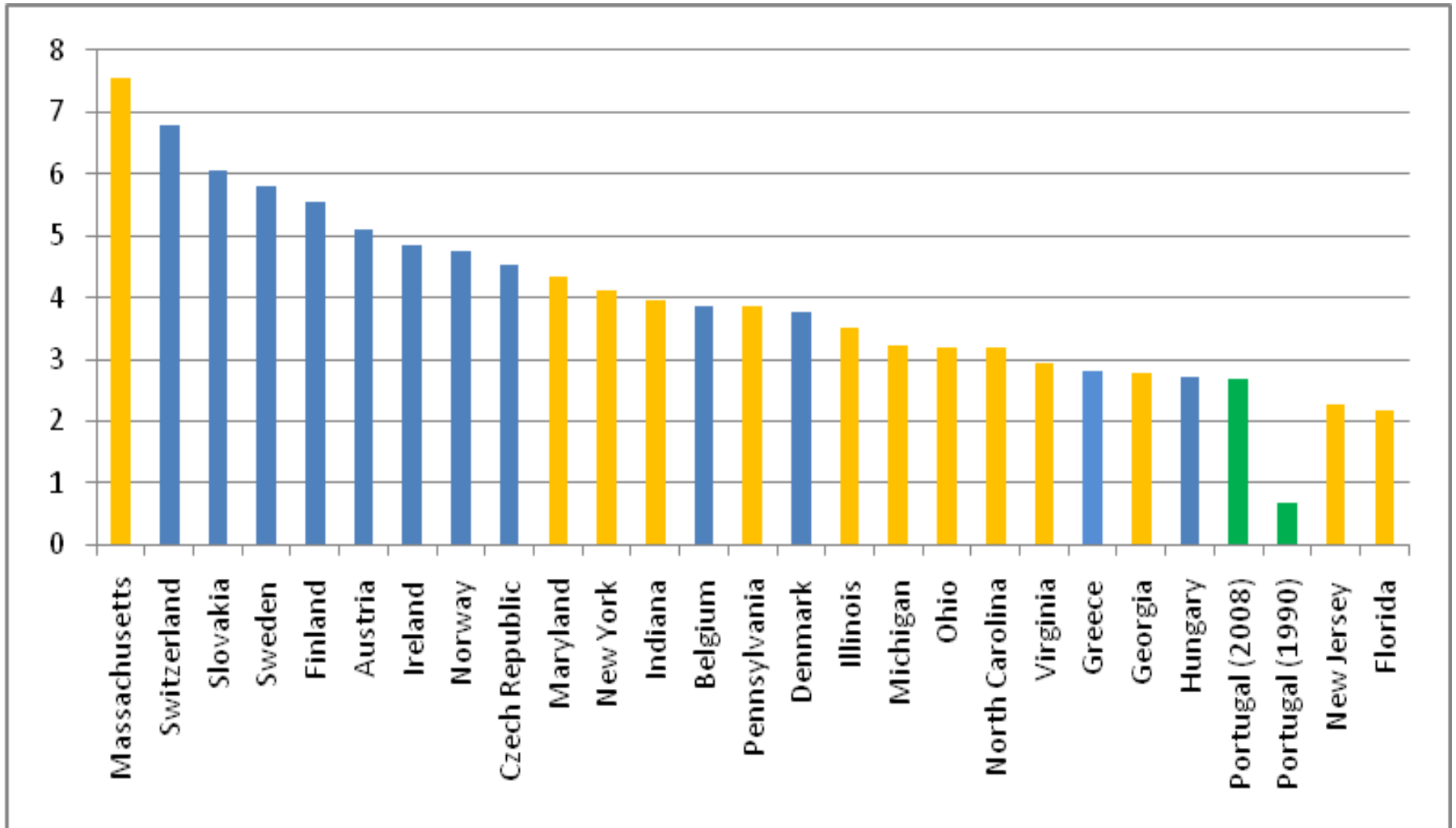
Sector Impact: GERD as % of GDP



Notas: p – provisional data; Source: GPEARI / MCTES.



Educational Impact





Pursuing a Disciplined Commercialization Strategy



Commercialization Vehicles

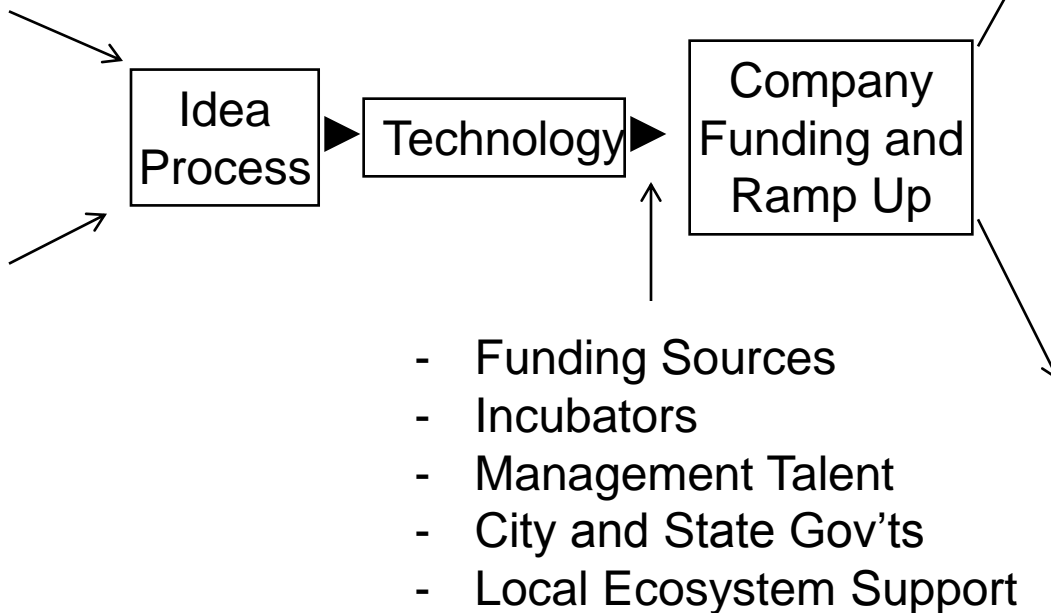
- Licensing
 - Reaching Industry with innovation
 - Industry seeking innovation
- Technology bundling
 - Realize through partnerships
 - Provide a full, robust market solutions
 - Demonstrate proof of concept for specified applications
- New ventures
 - Leadership
 - Funding
 - Return



The Knowledge Economy Ecosystem

Contributors:

- Universities
- Researchers
- Students



Economic Impact:

- Jobs
- Tax Revenue
- Investment

A Growing New Business Ecosystem:

Ecosystem:

- Going concern
- Graduation
- Acquisition

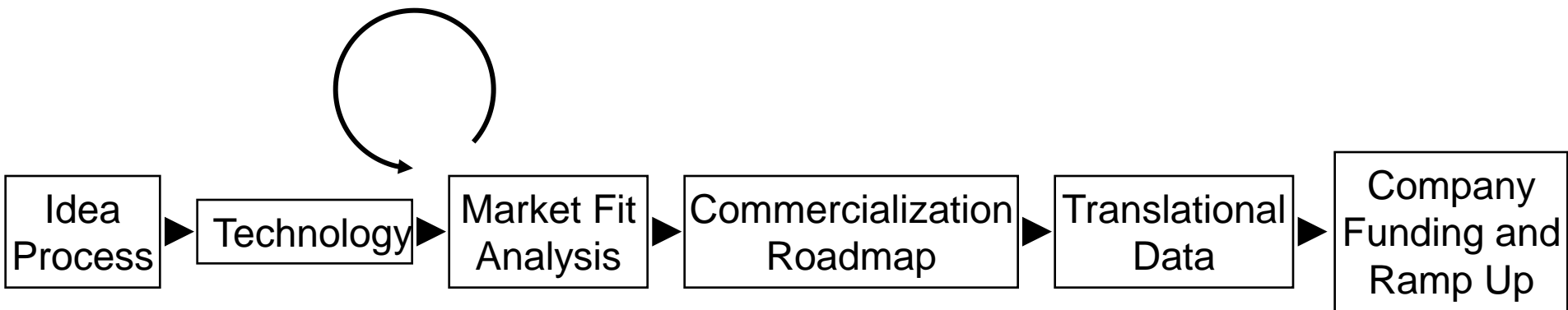


The Idea Pipeline



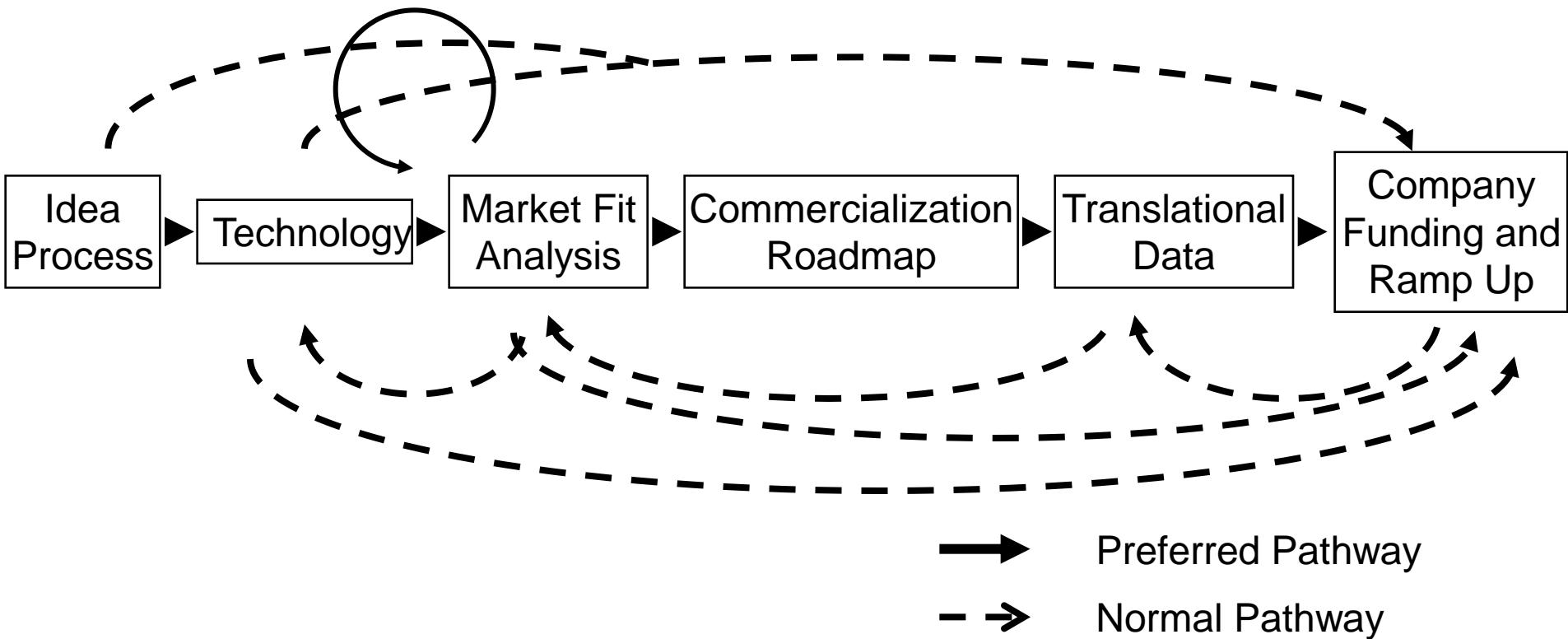


The Expanded View of Idea Development





The “Ready, Fire! Aim” Strategy





Practice Disciplined Commercialization

- Connect scientific innovation to defined need or market-defined vision
- Shape a technical solution to meet the deficiency and fit into the value chain
- Develop market-driven prototype using a defined commercialization roadmap
 - Reduced cost
 - Shorter time to financial return
- Pursue appropriate IP protection strategy
- Determine best commercialization vehicle
- Do not allow enthusiasm to outrun disciplined strategy



Improving Commercialization Efficiency of Startups



Technology Business Accelerator (TechBA)

- Program of the Ministry of Economy of Mexico and The United States –Mexico Foundation for Science (FUMEC)
- Advices and Mentors Small Mexican Technological Businesses to generate their growth in Mexico and internationally
- Opens global markets of high value to Mexican small businesses with strong innovation potential in Mexico
- Offices in Arizona, Austin, Michigan, Seattle, Silicon Valley, Madrid, Montreal and Vancouver



Austin TechBA

The Austin Process:



TECHNOLOGIES SCREENED (through judging panels or validators)	TECHNOLOGY MARKET RESEARCH REPORTS (IC ² Quicklook Assessment Methodology)	TECHNOLOGIES ACCEPTED FOR BUSINESS DEVELOPMENT IN THE US	TECHNOLOGIES WITH US BUSINESS DEVELOPMENT RESULTS (e.g. customer agreement, joint ventures, strategic investments and equity investments)	NUMBER OF PEOPLE TRAINED
961	107	152	80	293



TechBA Austin Impact

- 194 companies have participated in TechBA Austin (2005-2011)
- 56 Mexican companies have been incorporated in the United States
- 2 companies have received capital/equity investments in US
- 28 issued and pending patents to companies today.
- International sales of ~\$6MM and total sales ~\$88MM
- Number of jobs created and sustained: 2074



India Innovation and Growth Program

- Nationwide program aimed at assisting early-stage entrepreneurs bring products and services to the Indian and world markets
- Program is supported by Lockheed Martin Aeronautics and India's Department of Science and Technology
- Primary players are the IC² Institute and the Federation of Indian Chambers of Commerce and Industry (FICCI)
- Program
 - Training: Commercialization Workshops
 - Technology intake: >900 different technologies and ventures/year
 - Stage-gate process similar to TechBA
 - Business development efforts surrounding top technologies



Program Outcomes and Impact

Program from 2007-2011

- >2,000 technology applications received
- 180 technology commercialization assessments performed
- 150 business agreements in India and throughout the world completed
- In 2011, 30 companies were admitted to business development program and an expected ~100 business agreements will be completed by year end.
- In 2010, Datamonitor reported that this program resulted in >\$75MM in sales for participating companies during 2007-2009



The IC² Institute of the University of Texas at Austin

**Connecting Economic Opportunity to
the World**

Through Research, Education and Action



The IC² Institute of the University of Texas at Austin

**To Develop
Human Capital**

**To Grow
Thriving
Civil Societies**

Four Grand Purposes:

**To Catalyze
Global
Economic
Networks**

**To Accelerate
Wealth
Creation**



Thank You for Your Attention!!

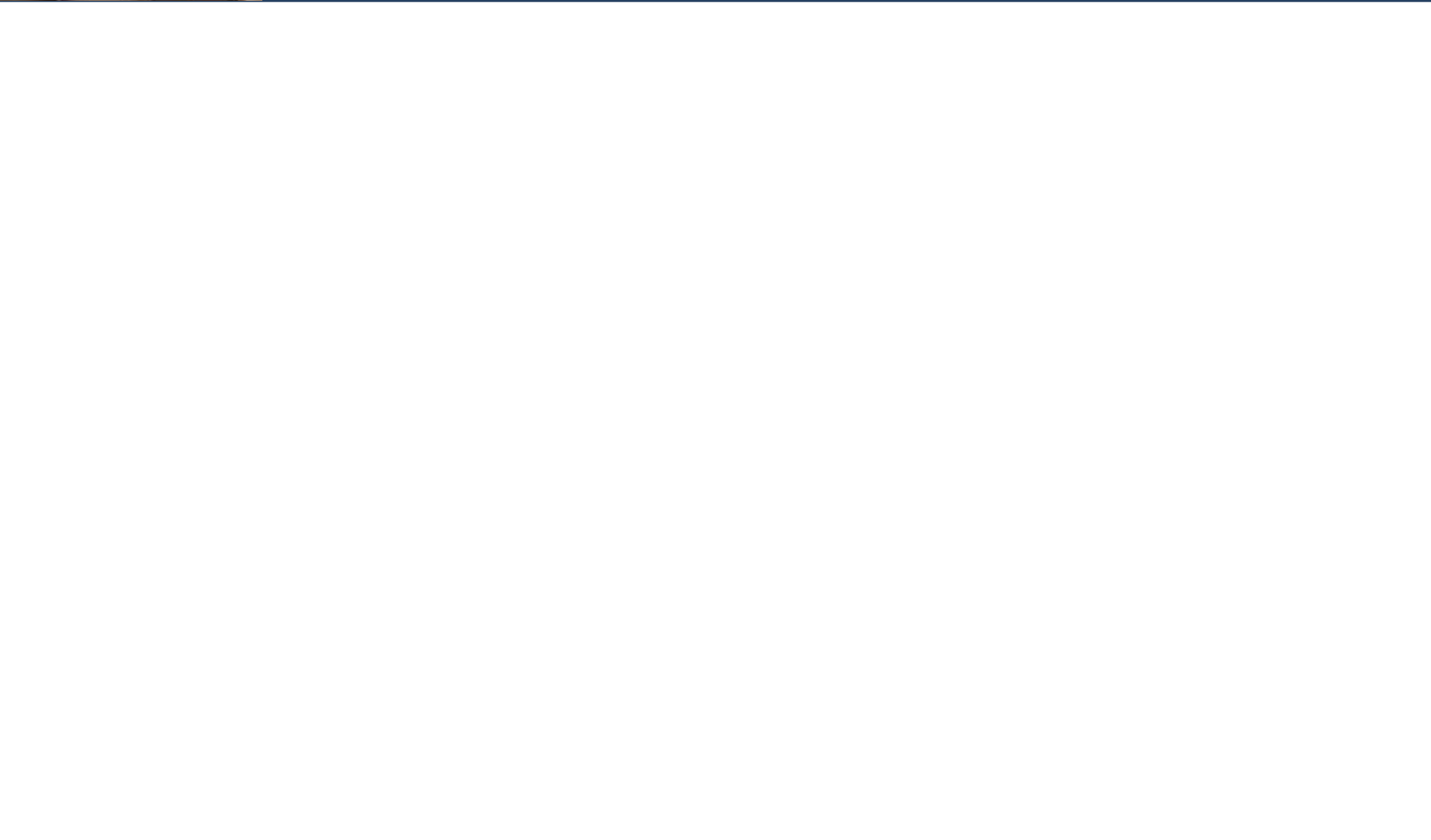
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IC² Institute Overview

- **Founded** in 1977 by Dr. George Kozmetsky:
 - Co-Founder and former Ex VP Teledyne, Inc.
 - Dean of the Business School at the University of Texas (1966-1982)
 - National Medal of Technology Award in 1993
- **Goal:** Research and training on best practices related to business acceleration, incubation, technology commercialization, and formation of capital networks
- **Focus:** “Think and Do” Tank (Policy-and-training institute) – research and learning always accompanied by mentorship and “hands-on” activities



Commercialization Activities at the IC² Institute

- Austin Technology Incubator (1989-now)
- Technology Business Accelerator (TechBA)
- Master of Science in Technology Commercialization
- Global Center for Innovation and Entrepreneurship in the PIT in Monterrey, Mexico
- International Global Fellows Program
- IC² Visiting Scholars/Researchers
- International Commercialization Internship
- Global Commercialization
- Bureau of Business Research



Program Impacts

Examples – 1

- **Austin Technology Incubator** (since 1989)
 - >10,000 local jobs created; 1,000's of students trained
 - ~\$3 billion in economic impact; \$10-15 million/year in company revenue;
 - 4+ IPO's
 - >\$0.75 billion in investor capital raised by 200 companies
- **Technology Business Accelerator** (TechBA; since 2005)
 - ~300 individuals trained in Mexico and >45 companies
 - >80 business deals providing >\$35 million in economic value
- **Global Commercialization** (since 2004)
 - >3,600 individuals trained in 10 international programs
 - >300 business deals providing >\$175 million in economic value



Program Impacts

Examples – 2

- **Master of Science in Technology Commercialization** (since 1996)
 - >600 graduates from 25 different nations
 - Two international programs
- **CGIE in Monterrey, Mexico**
 - Maestría en Comercialización de la Ciencia y la Tecnología
 - >100 graduates since 2008
 - Active collaborator in Monterrey Incubator Certification
- **Fellows Programs**
 - 18 Endowed Fellows
 - >160 Global Fellows from 16 nations
 - >200 Visiting Fellows from 17 nations



What Are Key Things to Change

- Cannot readily move VC operations
- Cannot rapidly change the quality of science
- Cannot change geography, weather or environment
- What can we do?
 - Align local Angel investment syndicates
 - Grow a focused scientific expertise
 - Provide incubation environment
 - In-source as well as develop technologies
 - Train entrepreneurial skills
 - Provide entrepreneurial experience
 - Recruit experience for part-time management



Technology Assessment Process

