Technology Entrepreneurship

The Marriage of Technology and Business

Class 4: Technology Strategy
IBM Green Data Center debrief
Les Neumann debrief
Risk / Reward
Research & Development

IBM Green Data Center debrief/synthesis

- What did we learn?
- Why is it important?
- How can we use it?
  - for the final project
  - in our future business/careers?

Les Neumann debrief/synthesis

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News of the week

Who fed it and who ate it this week?

- The Blackfire "Clamplight”
  - old product: new innovation
  - http://www.youtube.com/watch?v=lBj6ECA3q5k
- Firefox 4.0 to Arrive Late 2010
- 802.11n finalized after 7 years
- Net Neutrality
  - http://online.wsj.com/article/SB125329467451823485.html

Case Presentation

LOTUS

Case Presentation

Adobe

A Word on Entrepreneurship

- "Much of our American progress has been the product of the individual who had an idea; pursued it; fashioned it; tenaciously clung to it against all odds; and then produced it, sold it and profited from it."
  - Hubert Humphrey

The Technology Industry

- New firms perform more poorly in
  - Capital-intensive industries
  - Advertising-intensive industries
  - Concentrated industries (versus fragmented industries)
  - Industries composed of mostly large firms
- New firms do better
  - When industries are young
  - Before a dominant design emerges
- In the constantly changing world of technology, large firms do not have the ability to dominate all aspects of the technology leaving room for entrepreneurs

The Process

- Recognition of an opportunity
  - Making something good
  - Fixing something that is broken
- Deciding to proceed and assembling resources
- Launching a new venture
- Building success
- Harvesting the rewards

Critical Success Factors

- Common CSF Among Entrepreneurs
  - Ambition
    - To have an impact on the world
    - Empathy for users (make things people want)
  - Determination / Perseverance
  - Confidence
  - Adaptability
    - Ability to adjust plans and overcome rejection
    - Mental flexibility to understand what users want
    - Starting a start-up is a process of trial and error

The Risk/Reward Ratio

- The rules of the stock market also apply to entrepreneurship
- Most commonly, the riskier the investment, the greater the potential reward
- By absorbing great risk and responsibility for a venture, the entrepreneur is greatly effected by the project results
- Types of risk
  - see “Business Risks” article on web site

Finding Entrepreneurial Spirit

- Self-employed
  - Individual absorbs great risk and responsibility
  - Ultimately held self-accountable
- Employee –"champion" or "intrepreneur"
  - Individual absorbs great risk and responsibility
  - Ultimately held accountable by the company
- See Technology Strategy – Chapter 4

The Entrepreneurial Environment

- When doing new things:
  - Sense of uncertainty
  - Isolation
  - Sometimes, lack of progress

A Word on Finding Opportunity

- There are three principal means of acquiring knowledge: **observation**, **reflection**, and **experimentation**.
- Observation collects facts
- Reflection combines them
- Experimentation verifies the result of that combination
  - Diderot (French philosopher)

Why You?

- Use your **unique** experience to find opportunity
  - Unique Experience →
  - Knowledge →
  - Idea Generation
- Better able to utilize information—to combine it or interpret in ways that reveal the opportunities overlooked by others

How to Become Unique

- Having varied work experience
- Having lived in many different places
- Having a broad social network
- Others?

A Word on External Idea Generation

- "He who knows others is clever; he who knows himself has discernment*."
  - Lao-Tzu
    - Ancient Chinese philosopher
    - Translation: "Old Master"
    - Father of Taoism

* The power to see what is not evident to the average mind

from our book

Technology Strategy for Managers and Entrepreneurs

Chapter 4

Sources of Innovation

Sources of Opportunity

- Three major sources of opportunity for innovation
  - 1. Technological change
  - 2. Political and regulatory change
  - 3. Social and demographic change
- All sources of innovation can operate separately or in combination

1. Technological Change

- One of the most important triggers because technological change allows people to do things that could not be done before or only could be done in a less efficient manner
- Many technological changes do not make any innovations possible, while others generate a multitude of opportunities. The trick is telling them apart.
- Delays can occur because complementary technologies (other technologies used with the one you are looking at) need to be invented before an innovation can be developed.

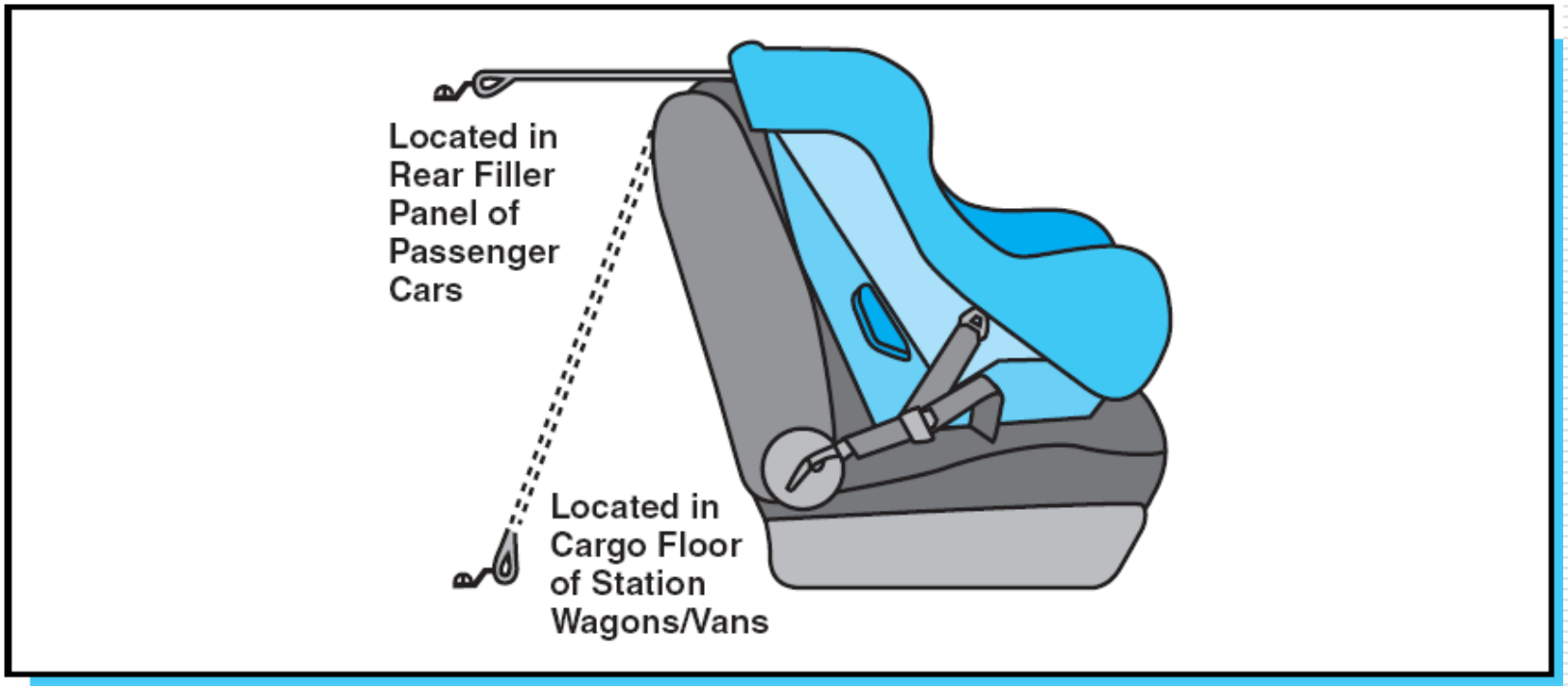
Important Attributes of Technological Change

- Influence opportunities for innovation
  - The magnitude of the change
  - The generality of the change
  - The commercial viability of the change
- Predicting the relationship between technological change and the opportunity for innovation is difficult because the relationship is not always one-to-one:
  - Leads to the creation of additional opportunities, and it is rarely immediate

2. Political and Regulatory

- Sometimes makes innovation possible by providing subsidies that pass off the cost of innovation.
- Prompts firms to create new products and processes to solve "problems" created by regulation.
- Spurs competition between firms.
- May provide access to resources that permit the development of new products and services

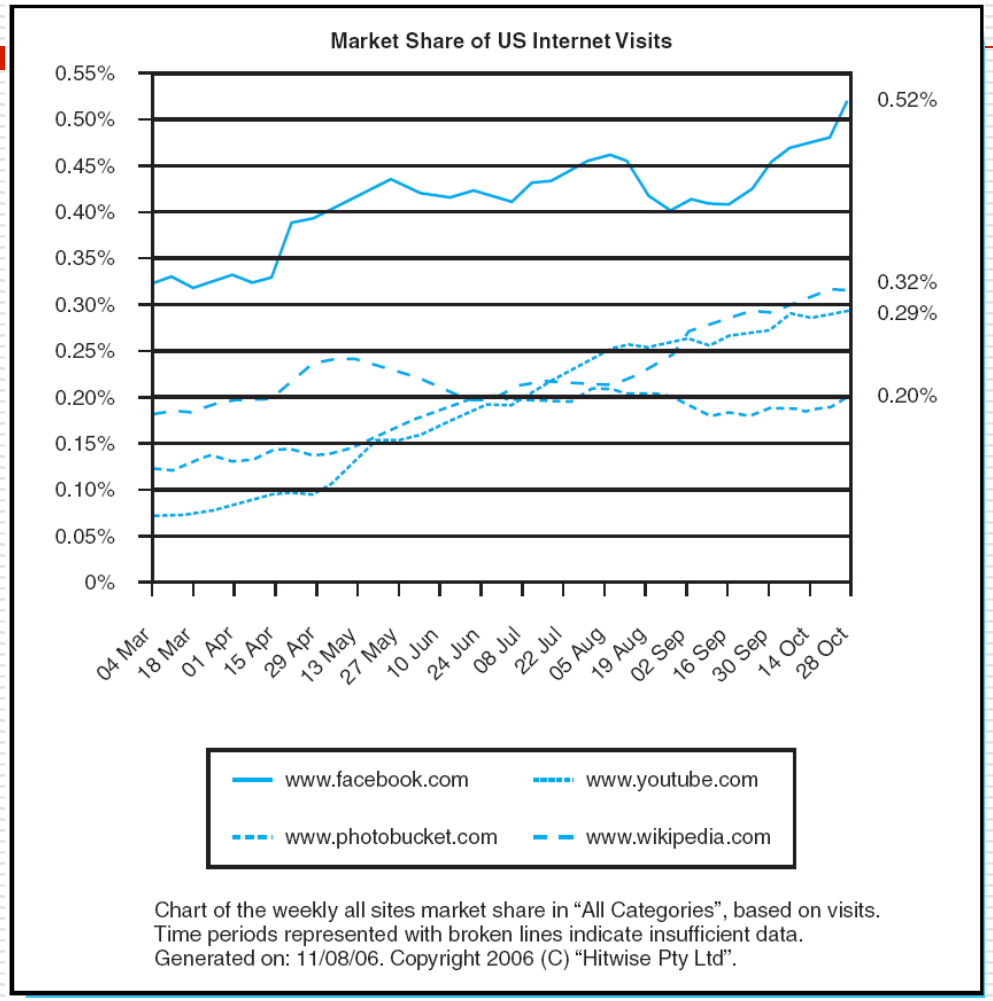
Political And Regulatory Change



3. Social and Demographic

- Create opportunities by altering people's preferences, and by creating demand for products that had not existed before.
  - Social trends
  - Demographic trends
  - Shift in perception

Social and Demographic Change



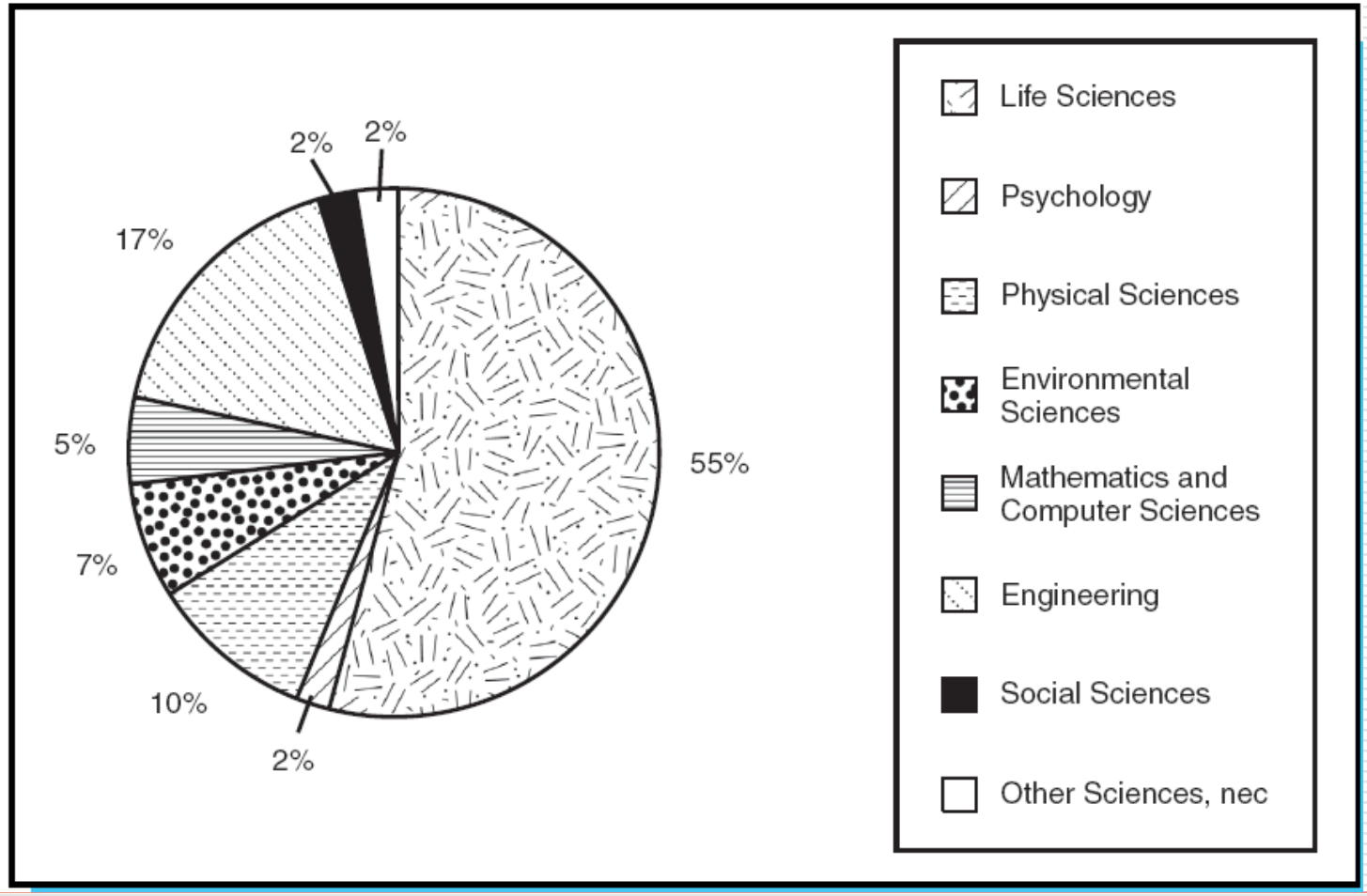
Combination

- Opportunities for innovation are often the result of many different types of changes.
  - Can be hard to see, but
  - Can be very valuable when recognized.

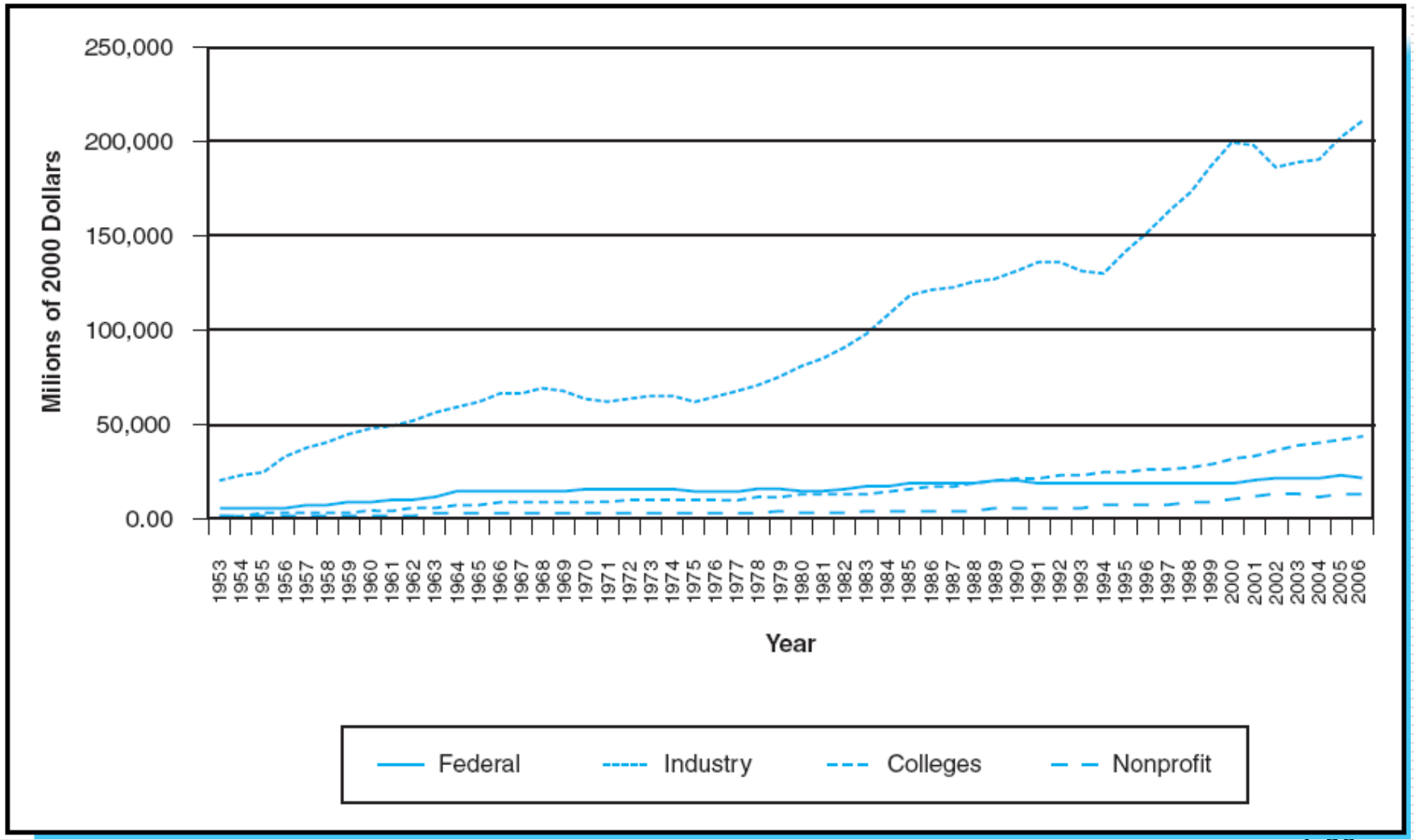
Locus of Innovation

- Business undertakes most of the research and development conducted in the United States
- The government plays an important role in the technology innovation process by conducting research, paying for research done by others, and by serving as a lead customer
- Individuals conduct much less of the technological innovation than they once did
- Universities help firms innovate by training students, by conducting research, and by licensing technology developed by their faculty, staff and students

Share of Federal Funding of Different Technical Fields



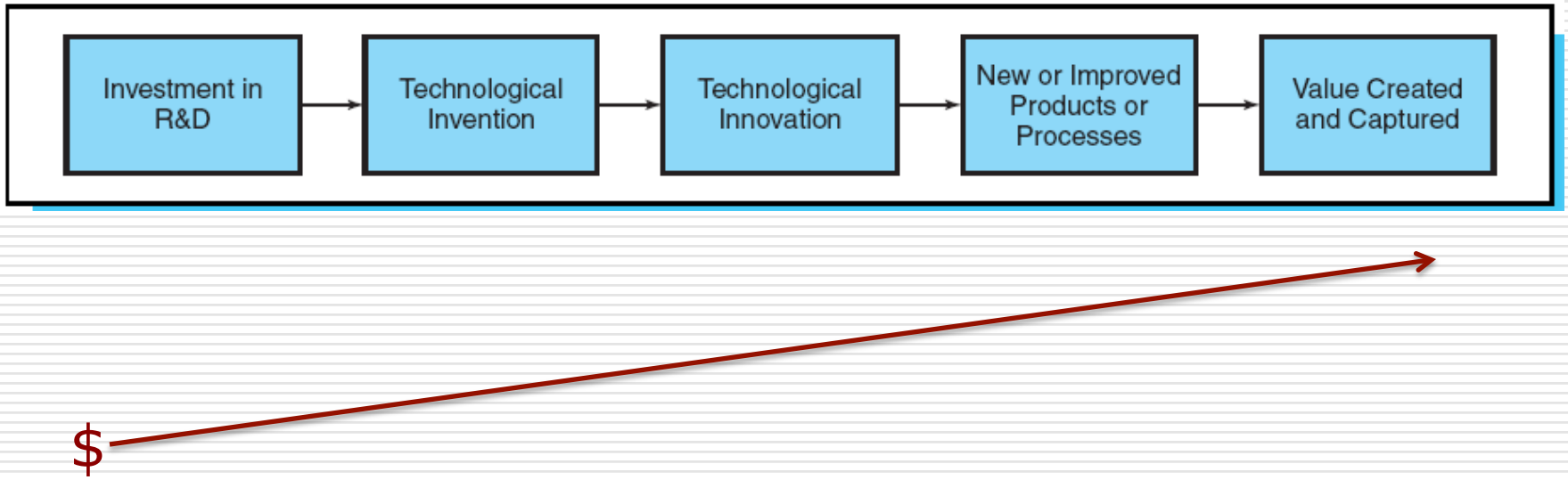
The Rise of Academic Research



Research and Development

- Companies can, and do, create innovations through deliberate investment in research and development efforts designed to create new products and services, and new processes for providing them.

Model Underlying Investment In R&D



Types of R&D

- Basic Research
  - the effort to understand the technical or scientific principles in a field
- Applied Research
  - the effort to understand technical or scientific principles with a specific commercial goal in mind
- Development
  - the effort to use technical knowledge to produce something of commercial use
  - "Commercialization"

Why Firms Conduct R&D

- To create new technologies that provide the basis for new products and services
- To develop products to replace those threatened by substitutes
- To differentiate products from those of competitors
- To create strong intellectual property positions
  - Are these valuable in and of themselves?
- To absorb externally generated ideas

Top 20 R&D-Spending Corporations In 2003

Company (country)	R&D (millions) 2003	R&D as Percent of Sales 2003
Microsoft (United States)	7,779	21.1
Ford Motor (United States)	7,500	4.6
Pfizer (United States)	7,131	15.8
DaimlerChrysler (Germany)	6,689	4.1
Toyota Motor (Japan)	6,210	3.9
Siemens (Germany)	6,084	6.8
General Motors (United States)	5,700	3.1
Matsushita Electric Industrial (Japan)	5,272	7.7
International Business Machines (United States)	5,068	5.7
GlaxoSmithKline (United Kingdom)	4,910	13.0
Johnson & Johnson (United States)	4,684	11.2
Sony (Japan)	4,683	6.9
Nokia (Finland)	4,514	12.8
Intel (United States)	4,360	14.5
Volkswagen (Germany)	4,233	4.0
Honda Motor (Japan)	4,086	5.5
Motorola (United States)	3,771	13.9
Novartis (Switzerland)	3,756	15.1
Roche Holding (Switzerland)	3,694	15.3
Hewlett-Packard (United States)	3,652	5.0

Source: Adapted from information in Science and Engineering Indicators 2006, http://www.nsf.gov/statistics/seind06/c4/tt04–06.htm.

Costs of R&D

- Investments in basic research are uncertain and usually unknowable.
- Financial returns almost never occur in the short term.
- Most all of the financial returns from R&D projects are generated by a handful of projects, many years after the investments are first made
  - i.e., Most R&D efforts will fail, while the few successes find the rest.
  - What does this tell us about entrepreneurship?
- Lock companies into strategies that are difficult to change

The Costs and Benefits of R&D

Benefits	Costs
Creates products and services that meet customer needs	Is difficult to appropriate the returns to
Replaces products and services threatened by substitutes	Is highly uncertain and does not yield high average financial returns
Develops the absorptive capacity to recognize the value of externally developed technology	Locks companies into particular strategies
Creates a strong intellectual property position	
Differentiates products from those of competitors	