

# Where Have All The IT Jobs Gone? There, There, and Right Here

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<http://www.acm.org/globalizationreport/>

# Terminology

- *Outsourcing*: Contracting out production/services to unaffiliated firms
- *Offshoring*: International relocation of production/services
- *Offshore outsourcing*: Outsourcing production/services to external international suppliers

**Focus of talk:** offshoring

# Foresight?

Riordan and Hoddeson, *Crystal Fire*, 1997:

At an annual dinner in the early 1900s, physicists working at the Cavendish Laboratory in Cambridge—who were involved in the very conception of the field of electronics—commonly gave one another the following toast: “To the electron; may it never be of any use to anybody.”

# No Place for Neutrality

John R. Walter, CEO, AT&T, 1997:

“It has been said that digital technology eats everything and tramples everyone who tries to oppose it. I believe that understates the case. You do not have to oppose digital technology to be trampled; innocent by-standers will be flattened too. There is no neutrality in the Digital Revolution. You must become a digital revolutionary or risk losing everything.”

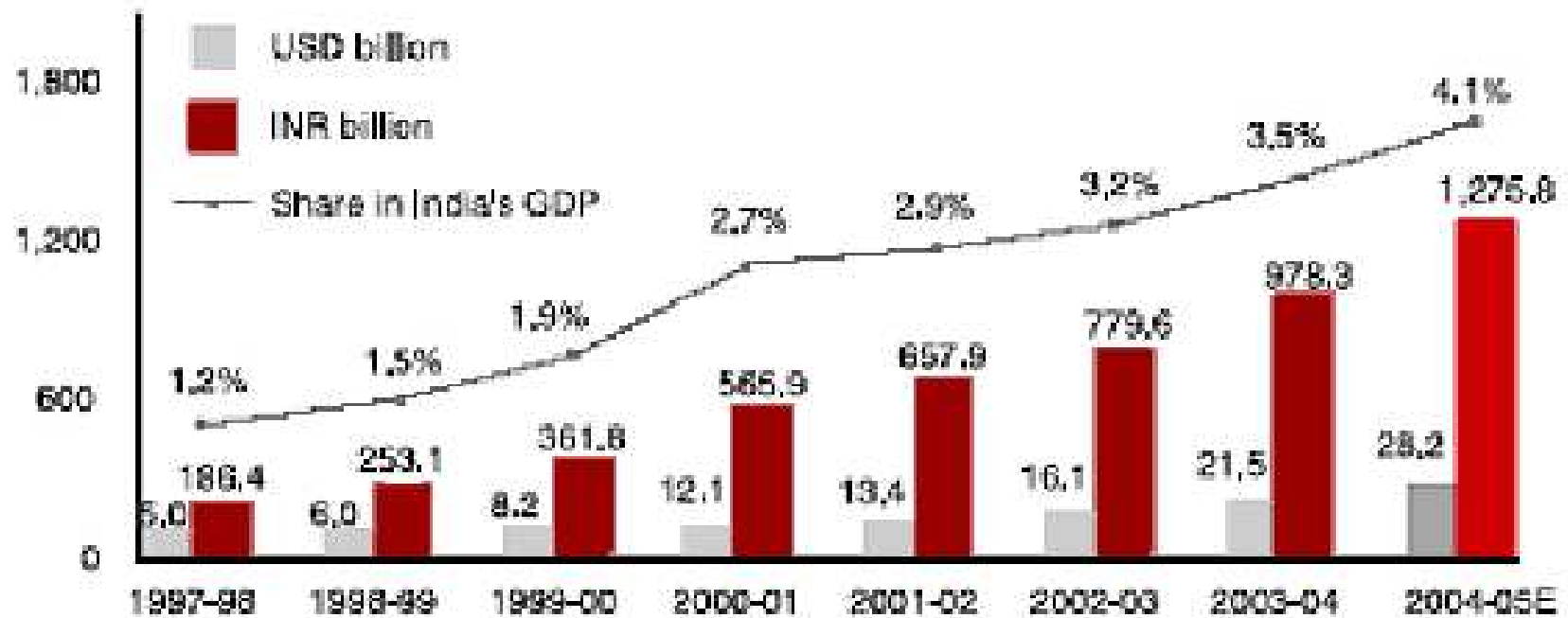
## 2003-4: The Offshoring Scare

**Thick Irony:** The revolutionaries got trampled and flattened!

- Exponential growth of IT industry in India
- Alarming reports by Forrester et al. – predicting millions of jobs to be offshored
- Shrill political response (“Benedict Arnold CEOs”)
- Echo of Ross Perot’s “Whoosh”, the sound of jobs moving south of the border with NAFTA.
- Scary websites: [www.yourjobisgoingtoindia.com](http://www.yourjobisgoingtoindia.com)
- January-May 2004: 2634 media reports on offshoring

**Outcome:** Prospective IT students voting with their feet

## Growth of Indian IT-ITES - FY 1998-2005E



Source: NASSCOM

**Figure 7. Newly Declared CS/CE Undergraduate Majors**

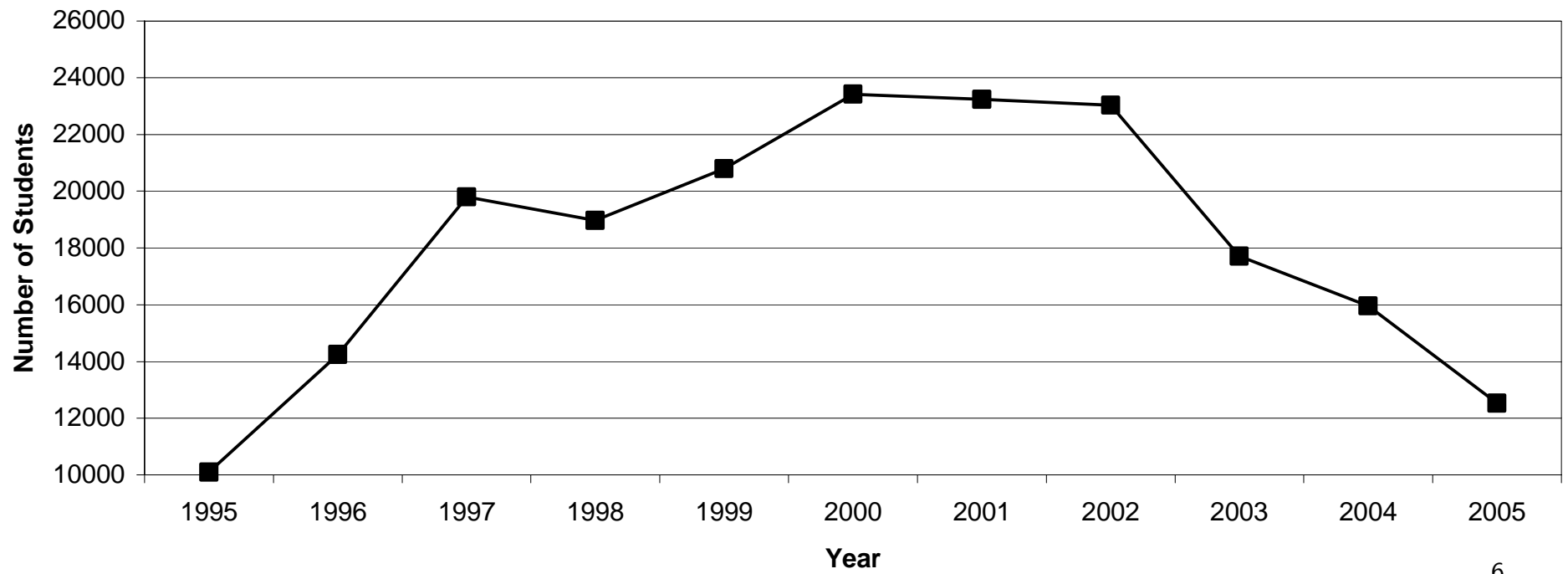
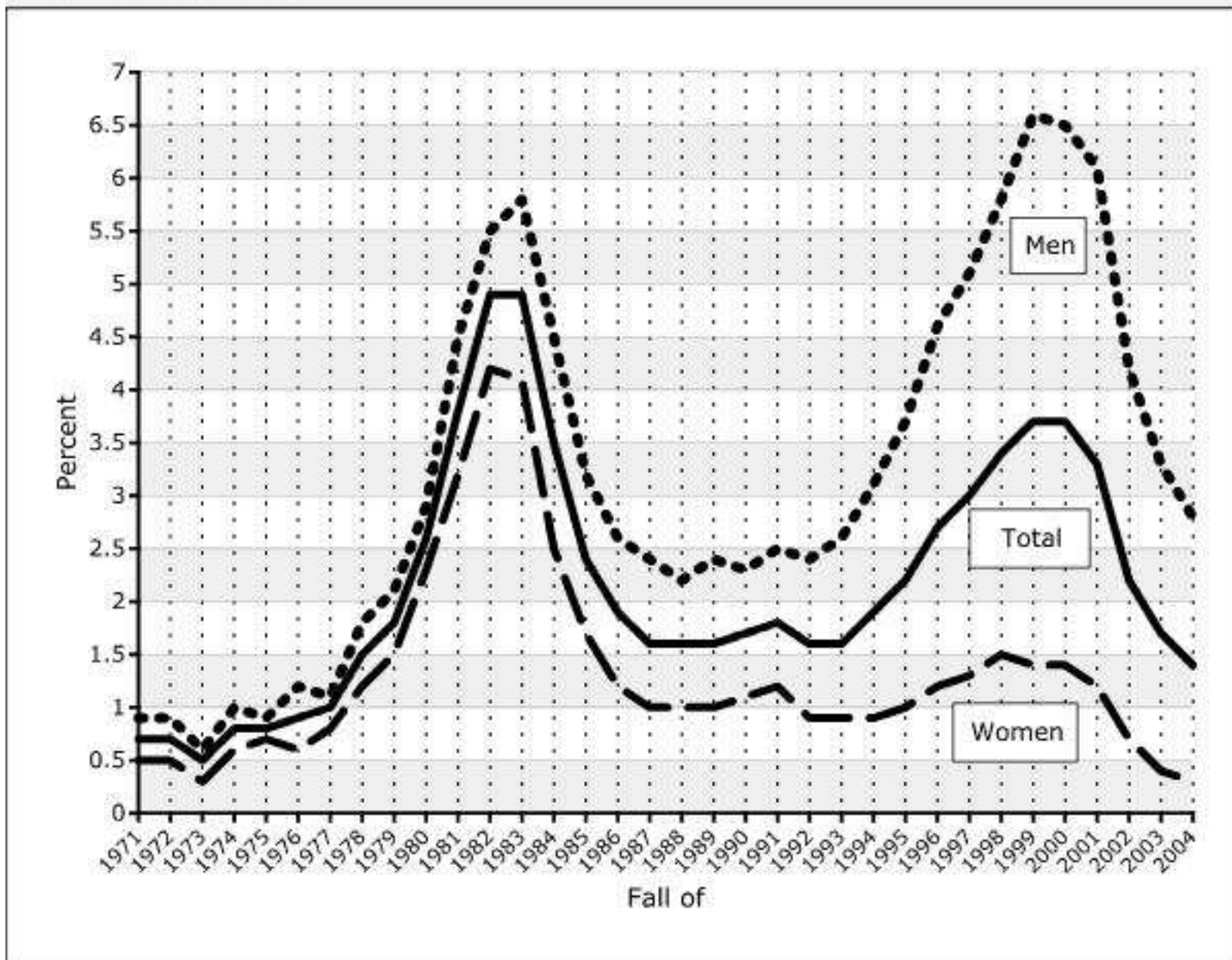


Figure 1. Computer Science Listed as Probable Major Among Incoming Freshmen  
 Source: HERI at UCLA



# Association for Computing Machinery (ACM)

- Premier international society for computing
- Over 80,000 members, Over 150 journals and conferences

Sept. 2004: “In early 2004, ACM members began expressing concern about the future of computing as a viable field of study and work.

Given these concerns, ACM Council commissioned a Task Force to look at the facts behind the rapid globalization of IT and the migration of jobs resulting from outsourcing and offshoring.”

## Step 1: Assemble Task Force

*June - December, 2004:*

- Intended size: 15
- Actual size: 30

**Why?** Diversity!

- Academia, industry, computer scientists, economists, social scientists, international (Europe, India, Israel, Japan)
- **Special effort:** Risks experts, Europeans

# Early Decisions

- Co-chairs: Frank Mayadas+V. Editor: William Aspray
- Global perspective (this talk: US perspective)
- Focus on software (exclude hardware)
- Secondary research
  - Rich website
  - Rich bibliography (100 pages!)

# Process

## Four Meetings:

- Chicago, October 2004: Task force only – agree on report structure and committees
- Washington, DC, December 2004: DC experts
- Palo Alto, March 2005: Silicon Valley experts
- New York, May 2005: Task force only – committee presentations

# Report Structure

- Executive Summary
- Overview
- Big picture
- Economics and data
- Country perspective
- Firm perspective
- Research
- Risks
- Education
- Political issues

*Prescriptive chapters:* Education, Risks.

# Report Production

- June 2005: Committees submit chapters to editor
- September 2005: Editor submits chapters to reviewers
- October-November 2005: Chapters reviewed by co-chairs and finalized
- December 2005 - January 2006: Overview and Executive Summary
- February 23, 2006: Report released

**Difficult chapters:** Education, Risks (three versions!).

## Take-Home Points

- Offshoring is just a symptom, the issue is globalization (business restructuring and global expansion).
  - We (IT) enabled it. Now we have to live with it.
  - It's like winter; you cannot stop it, but you can dress warmly.
  - It is easy to measure offshoring, but it is difficult to measure and explain job losses; most published data are suspect.
    - Employment and wage data show complete recovery from the dot-com and telecomm crashes; no discernible effect of offshoring.
      - We do know that competition is globalizing and moving up the skill ladder; no reason for complacency.
      - Offshoring is good for the world, but there are winners and losers; no reason for complacency.

# Why Does Offshoring Occur?

D. Ricardo, 1817: Countries trade to exploit their comparative advantage (Krugman, 1994: “Ricardo’s Difficult Idea”).

*Technology determines the boundary between tradable and nontradable goods:*

- Containerization reduces shipping cost.
- Air shipping reduces shipping time.
- Communication technology enables “shipping” labor.

*Expansion of Global Economy:*

- 150 countries belong to the World Trade Organization
- China and India liberalizing their economies in the 1990s

Figure 1: Port of New Jersey



# We Enabled It

**Key Point:** *Information technology is now a truly global field, business, and industry.*

## Major Factors:

- *Technology:* low-cost, high-bandwidth telecommunications; standardization of software platforms and business software applications
- *Work processes:* digitization of work; and the modularization of work processes
- *Education:* standardization of computing curricula; availability of low-cost hardware and software; vendor-certification programs

# Is Offshoring Good or Bad?

**Question:** Is offshoring good or bad?

**Answer:** This is not a meaningful question!

- Trade contributes to economic growth and greater wealth.
- Some individuals gain and some lose.
- Some localities gain and some localities lose.

*Economists:* “Trade gains may be distributed differentially.”

**Question:** What about countries?

**Answer:** Conventional economic theory suggests that all countries gain, but some economists argue that globalization may lead to technology leaders' losing their current dominant position.

# Job Loss

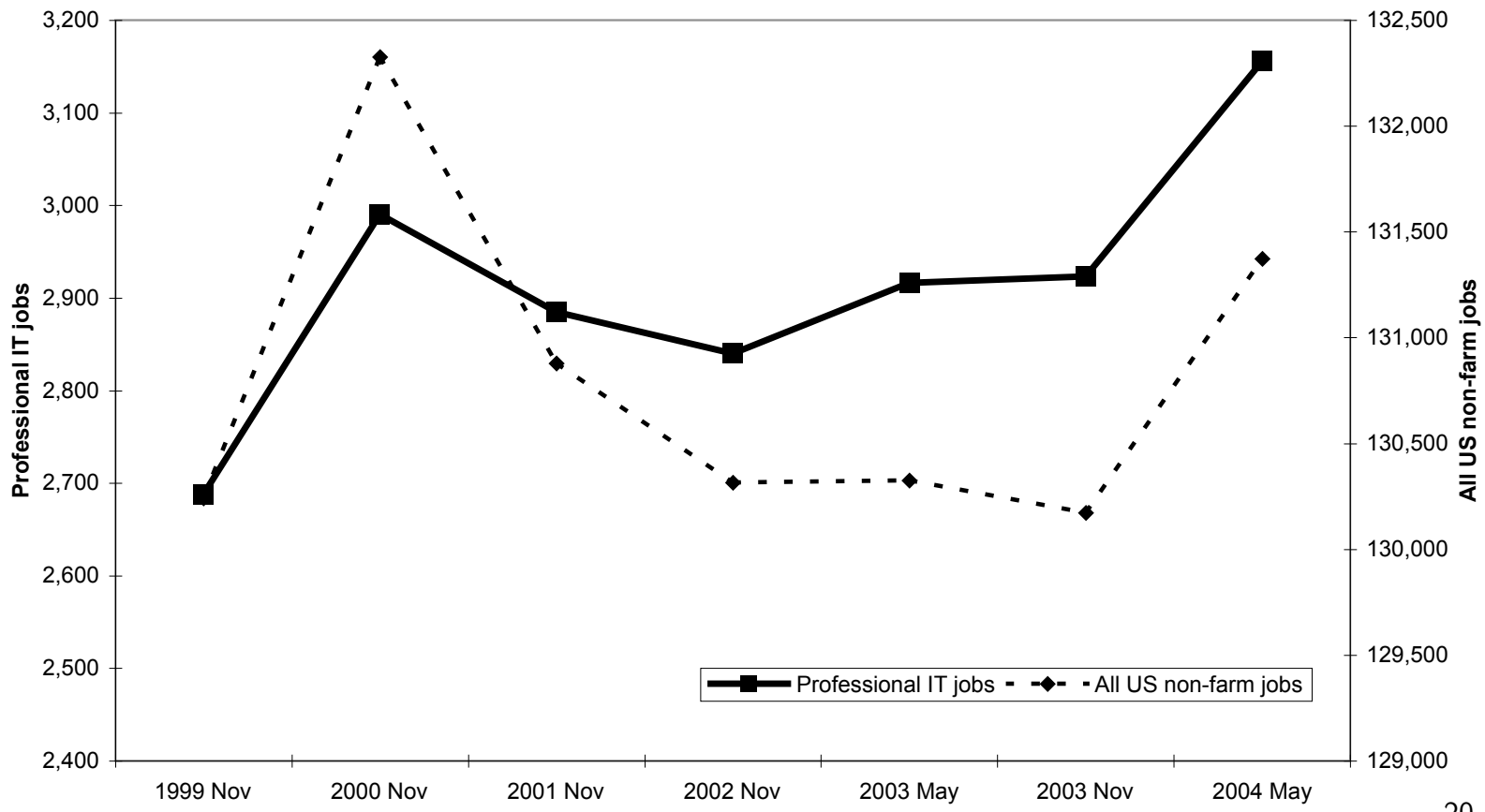
## Are Jobs Migrating?

- Some jobs clearly migrated, e.g., call centers.
- Measuring offshore outsourcing volume is possible, e.g., extensive NASSCOM data, but measuring offshore *insourcing* is not easy.
- Attributing job loss to offshoring is difficult. Jobs are lost due to many factors and new jobs are created.
- US Government data on offshoring are not useful; consultant reports are not reliable.

**Bottom Line:** We can only measure the present!

- US Bureau of Labor Statistics: more IT jobs in 2005 than at the height of the dot-com boom!

**Total Employment: US Total versus Professional IT**



Sources:  
 IT Jobs: John Sargent, Office of Technology Assesment, US Department of Commerce  
 All US Jobs: Bureau of Labor Statistics (Seasonally adjusted non-farm payroll figures)

# The Data Problem

*Most of what you hear in the media about offshoring is sheer speculation!*

- Government data is most reliable, but it usually answers old questions.
- Consulting companies have business interests.
- Analysis of “vulnerable” jobs is speculative.
- Projections are difficult, “especially about the future”.
- Proprietary models cannot be evaluated.

**Bottom line:** we have better hindsight than foresight.

# Global Competition Is Increasing

**Myth:** Only low-skill jobs are offshored.

**Reality:** Competition is moving up the skill ladder.

- Companies, including start-ups, are learning how to access and use higher skill levels in developing countries
- New research labs and increasing national research investment in India and China
- Increase in the total worldwide investment in research and a wider distribution of research activities around the world
- Global competition for talent; US dominance challenged

Business Week Online, May 1, 2006: America's dismal showing in a contest of college programmers highlights how China, India, and Eastern Europe are closing the tech talent gap

Ben Mickle, Matt Edwards, and Kshipra Bhawalkar looked as though they had just emerged from a minor auto wreck. The members of Duke University's computer programming team had solved only one problem in the world finals of the ACM International Collegiate Programming Contest in San Antonio on Apr. 12, 2006. The winning team, from Saratov State University in Russia, solved six puzzles over the course of the grueling five-hour contest. Afterward, Duke coach Owen Astrachan tried to cheer up his team by pointing out that they were among "the best of the best" student programmers in the world. Edwards, 20, still distraught, couldn't resist a self-deprecating dig: "We're the worst of the best of the best."

## “Through the Looking Glass” by Lewis Carroll

‘Well, in our country,’ said Alice, still panting a little, ‘you’d generally get to somewhere else – if you ran very fast for a long time, as we’ve been doing.’

‘A slow sort of country!’ said the Queen. ‘Now, here, you see, it takes all the running you can do, to keep in the same place.

If you want to get somewhere else, you must run at least twice as fast as that!’

# Risky Business

**Key Point:** Offshoring magnifies existing risks and creates new and often poorly understood or addressed threats to national security, individuals' privacy, and business property and processes.

- *Business risks:* intellectual-property theft, failures in longer supply chains, complexity arising from conflicting legal environments
- *National risks:* commercial off-the-shelf components in military and infrastructure systems, remote management of critical infrastructure, loss of technology base, tax-revenue loss.
- *Individual risks:* Increased exposure to loss of privacy or identity theft due to longer supply chains and privacy-laws differentials.

# National Risks

**Basic Dilemma:** How do we balance national security against economic dynamism?

*Examples:*

- February 2006: purchase of P&O by Dubai Ports World; P&O operated port facilities in New York, New Jersey, Baltimore, New Orleans, Miami and Philadelphia.
- May 2006: US State Department pulls China-made PCs from secure networks.
- October 2006: Questions about Venezuelan connections of an e-voting software company.

**Question:** Should utility companies be allowed to offshore power grid operations?

# Privacy Issues

**Conundrum:** When data fly around the world, which laws apply?

*Examples:*

- In 2003, a medical transcriber in Pakistan threatened to post patients' records online, unless UCSF paid the wages owed to her by the US subcontractor that had sent the work to her.
- In 2004, Indian workers at Heartland Information Services, an Ohio-based company that offshores medical records work to India, threatened to release confidential records unless they received a cash payoff from the company.

# Innovate or Die

**Key Point:** To stay competitive in a global IT environment and industry, countries must adopt policies that foster innovation. To this end, policies that improve a country's ability to attract, educate, and retain the best IT talent are critical. Educational policy and investment is at the core.

- strengthen technical training and education systems
- increase investment in research and development, and
- establish governmental policies that eliminate barriers to the free flow of talent.

Churchill, 1943: "The empires of the future will be empires of the mind."

**Challenge:** Reaping benefits from innovation! (Richard Florida: "The world is spiky".)

# The Educational Challenge

**Key Point:** Education is one of the primary means for both developed and developing countries to mount a response to offshoring so their workforces can compete globally for IT jobs.

## Huge Challenge:

- *China*: Traditional emphasis on rote learning; central planning
- *Europe*: Internal pre-occupation (Bologna Process)
- *India*: Poor quality outside top tier; doctorate level almost non-existent (less than 2% use Internet, 3-7% speak English)
- *US*: Fast-moving marketplace vs. slow-moving educational systems; lack of data about career outcome of education

# A Paradigm Shift in Education?

**Current Mentality:** *“If you build it, they will come”*

- We build CPUs.
- We build computers.
- We build systems.
- We educate “techies” .

**Key:** Only *personal services* are not offshorable.

**Conclusion:** We need to educate “personal” techies, who can align technology with business needs!

- Business skills, communication skills, interpersonal skills

## The Road Ahead?

**Key Point:** IT has driven itself global in a process whose outcome no one can predict.

- *Broadening:* Currently small number of large players (US and India biggest); will other major players emerge?
- *Deepening:* Will India get into packaged software?
- *Workforce:* Will students come back?

S. Berger, *How We Compete*, 2005: “Succeeding in a world of global competition is a matter of choices, not a matter of searching for the one best way—we discovered no misconception about globalization more dangerous than this illusion of certainty.”

## Media Reaction

Don Marquis, 1878-1937 “Publishing a volume of verse is like dropping a rose petal down the Grand Canyon and waiting for the echo.”

### Responses:

- “Study plays down export of computer jobs”, NY Times, Feb. 23
- “Report offers tips to protect your job from offshoring”, Computerworld, February 24
- “Tech jobs still plentiful in U.S. Optimistic report calls offshoring’s effects overstated”, San Francisco Chronicle, February 24
- “Offshoring booms jobs in US”, Financial Express, February 27
- “Offshoring isn’t all bad. It spurs new job creation, study finds”, InformationWeek, March 6

## Individual Dislocation

From ...@yahoo.com Thu Feb 23 18:19:23 2006

Subject: ny times and Jobs

HI

So I did C++ for Pitney Bowes, and got downsized.  
Then I did web development, ASP and ASP.NET  
and got downsized again.

I been on many, many interviews, but too much competition  
For 2.5 years I have been digging ditches next to illegal aliens  
(very nice people but also too much competition )

I'm almost 50 years old, things are not looking good.

Pres Bush says just go to a community college and get retrained,  
he has not said what to train in!

Thanks for listening.

## Cui Bono? Who Benefit?

Demir Barlas, [www.line56.com](http://www.line56.com): “If a US company becomes more profitable after offshoring, its managerial class and/or owners benefit. If you are one of the fired workers, you do not see the benefit.”

### *Who benefit?*

- The employees who now work for a more competitive company.
- The consumers who get to buy cheaper products.
- The investors who hold the company's shares in their pension fund.
- The new employees who got hired after the company expanded.
- Workers in developing countries (India+China=0.4×world)

# It Is Not A Zero-Sum Game!

**Global Economy:** complex web of feedback relations

**Catherine Mann,** Institute for International Economics, 2003:

Globalization of IT hardware production lowered prices by 10-30%, promoting IT investment and productivity growth, adding 0.3% to GDP growth in the US during 1995-2002.

## **Facts:**

- The main factor in job elimination is increased productivity. In 1810, 84% of the workforce worked in agriculture, today's share is about 1.5%.
- 2M+ job changes occur in the US monthly!
- The US economy generated 35M net new jobs over the past decade.

## A Balanced View

A.S. Blinder, Former V.Ch., Board of Governors of the Federal Reserve, 2006

“The normal gains from trade means that the world as a whole cannot lose from increases in productivity, and the US and other industrial countries have not only weathered but also benefited from comparable changes in the past. But in order to do so again, the governments and societies of the developed world must face up to the massive, complex, and multifaceted challenges that offshoring will bring. National data systems, trade policies, educational systems, social welfare programs, and politics all must adapt to new realities.”

## Example: Trade Adjustment Assistance

**TAA:** The Trade Adjustment Assistance program is a federal program established under the Trade Act of 1974. TAA provides aid to workers who lose their jobs or whose hours of work and wages are reduced as a result of increased imports. In 2005, the US spent over \$1.1B for Trade Adjustment Assistance

**A “Small” problem:** TAA was aimed at manufacturing workers, not service workers, excluding software workers (changed in April 2006).

**Larger Problems:** What about a social safety net? growing inequity?

## 2005 NRC Report: “Rising above The Gathering Storm”

### Four major recommendations:

- Increasing the US talent pool by vastly improving K-12 math and science education,
- Strengthening the commitment to long-term basic research,
- Developing, recruiting, and retaining the top students, scientists and engineers from the US and abroad,
- Ensuring that the US is the premier place in the world for innovation.

# American Competitiveness Initiative

**ACI:** <http://www.whitehouse.gov/stateoftheunion/2006/aci/>

- Research:

- Commitment to double NSF, DoE SC, and NIST budgets over 10 years
- Make permanent the R&D tax credit

- Education:

- 70,000 new teachers, alternative teacher certification, bolster AP, improve participation in math and science

- Workforce/Immigration:

- Expand worker-training programs
- Flexible H1-B caps, reform visa issues

# Managing Change

“Constant revolutionizing of production, uninterrupted disturbance of all social conditions, everlasting uncertainty and agitation distinguish this epoch from all earlier ones. All fixed, fast-frozen relations and opinions are swept away, all new formed ones become antiquated before they can ossify. All that is solid melts into air, all that is holy is profaned, and man is at last compelled to face, with sober senses, his real conditions of life and his relations with his kind.”

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Marx and Engels, The Communist Manifesto, 1848

## Reasons for Optimism

**Let's remember:** The US enjoys an incredible advantage in scientific innovation, labor mobility, capital markets, higher education, job creation, investment liquidity, and large consumer market.

**Calvin Coolidge:** The business of America is business!

**Bottom Line:** We have the most competitive economy in the world. Let's go out and compete!

**David Brooks:** "The American way is to help people compete, not shield them from competition!"

## The Current Distribution of IT Research

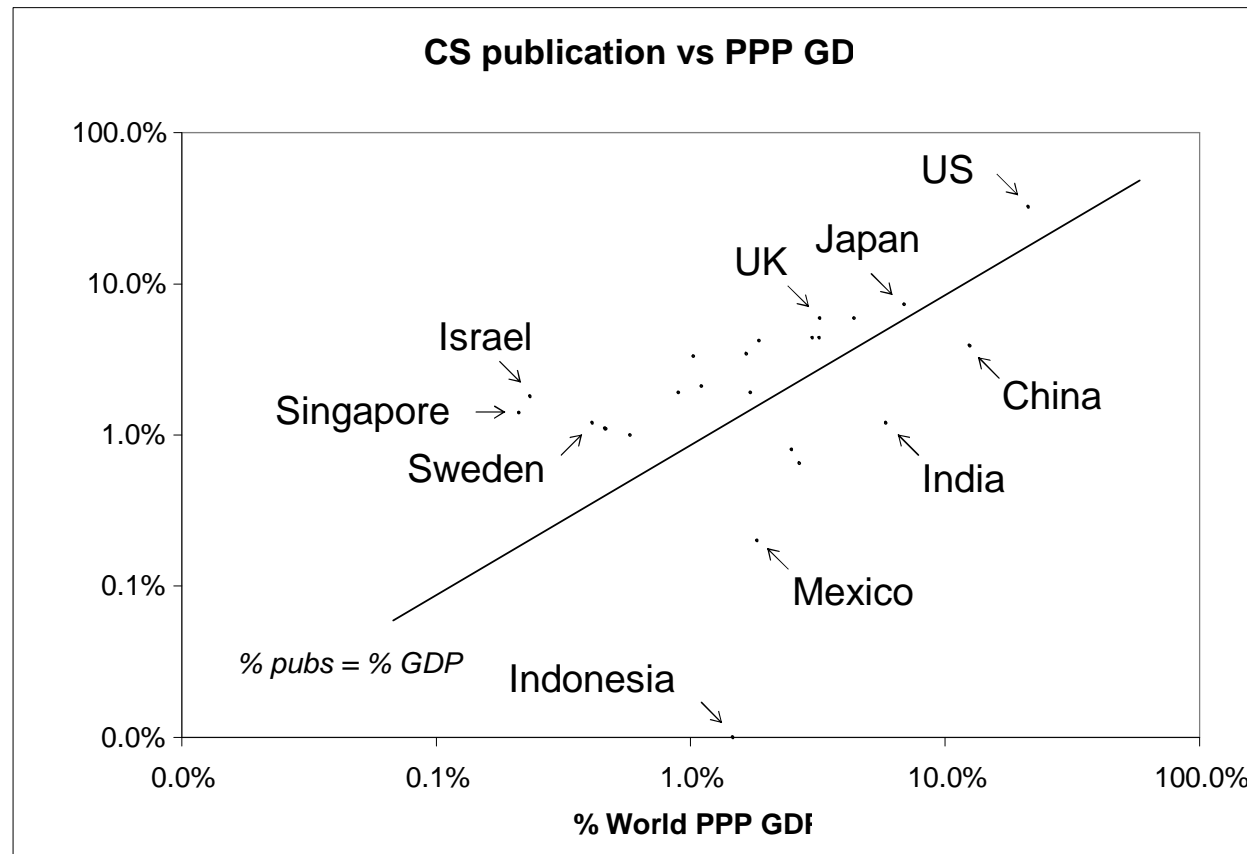


Figure 2: IT Is Still A Good Career I

**Projected Science & Engineering Job Creation  
(new jobs, 2004-2014)**

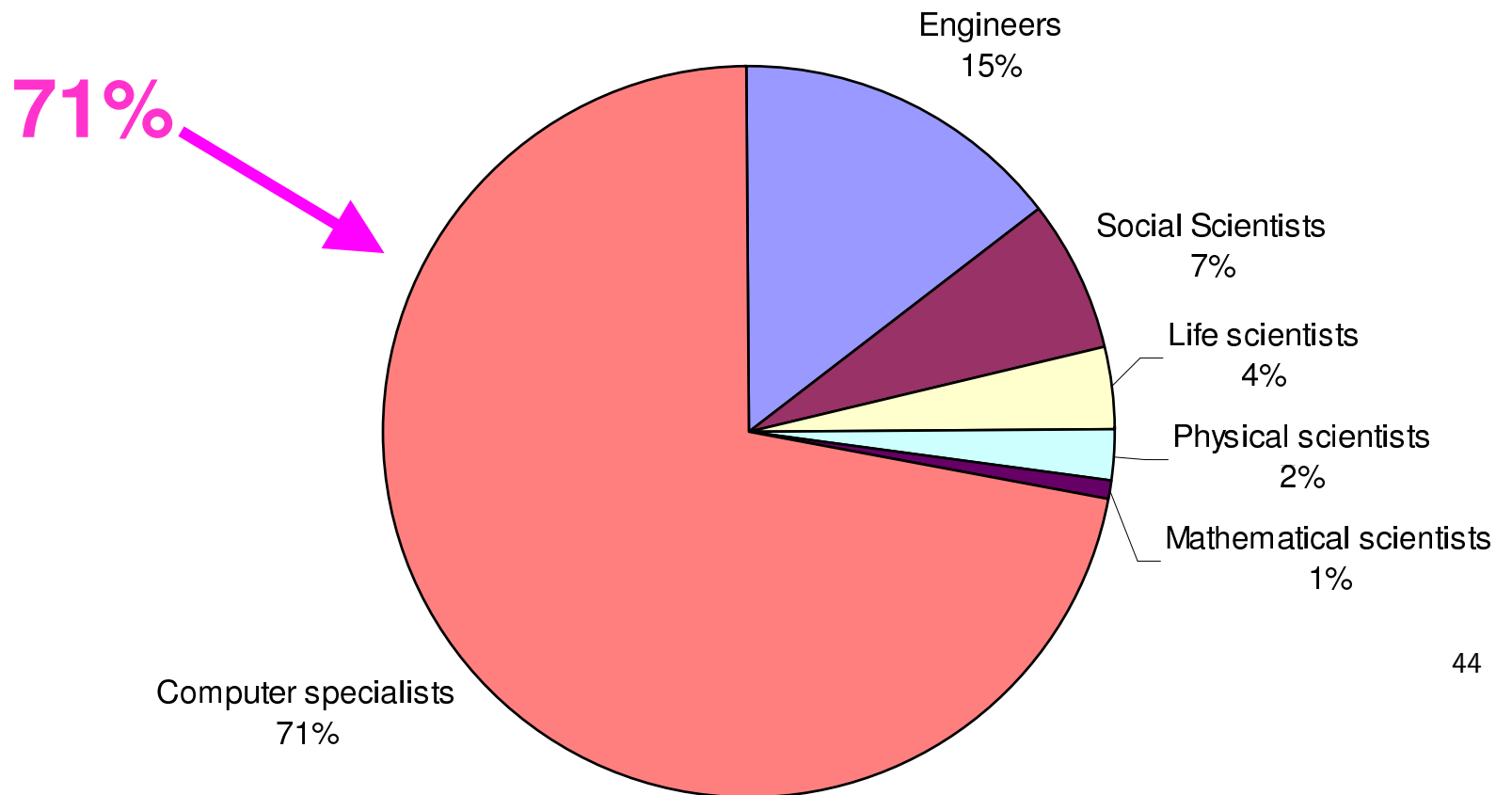
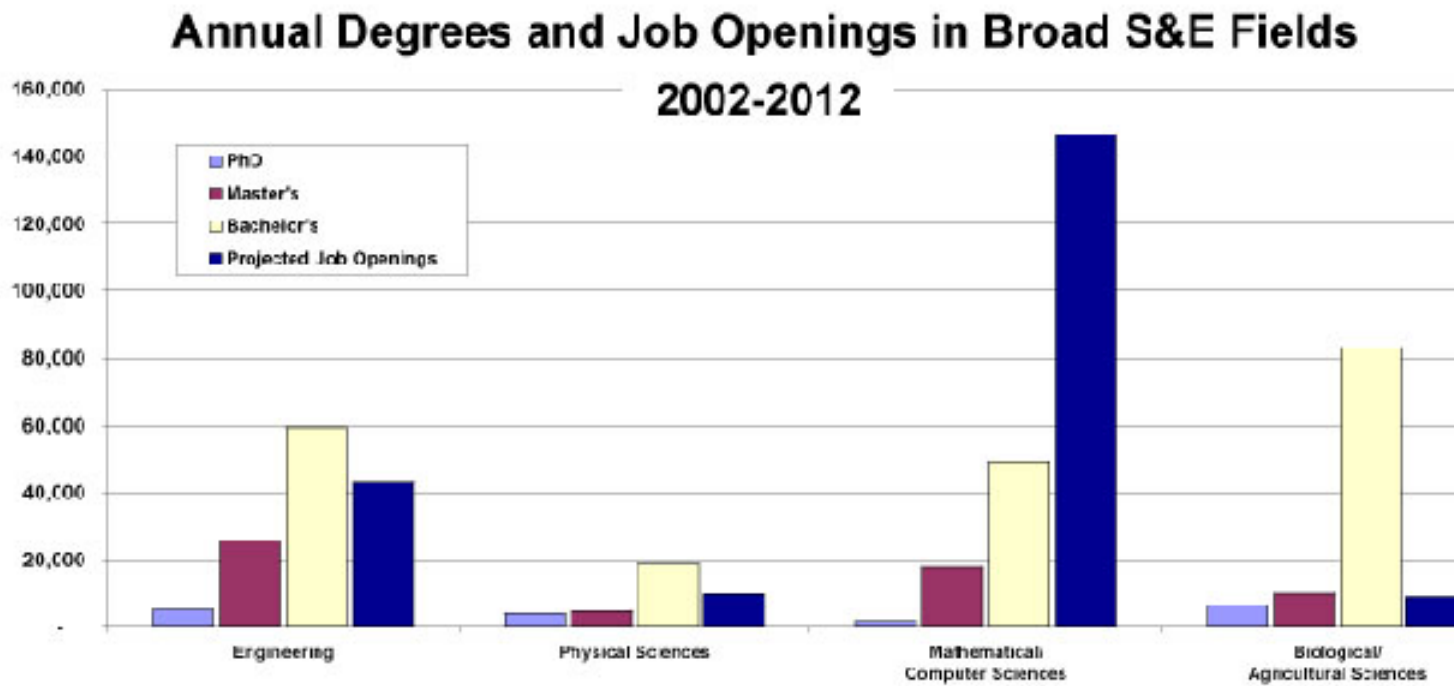


Figure 3: IT Is Still A Good Career II



SOURCE: Tabulated by National Science Foundation/Division of Science Resources Statistics; degree data from Department of Education/National Center for Education Statistics, Integrated Postsecondary Education Data System Completion Survey, and National Science Foundation/Division of Science Resources Statistics, Integrated Postsecondary Education Data System Completion Survey; projected job openings from Department of Commerce (Office of Technology Policy) analysis of Bureau of Labor Statistics 2010-2012 projections.

# Money Magazine 2006: Best Jobs in America

## No. 1: Software Engineer

- Average salary: \$80,500
- 10-year growth: 46%
- Average annual job opening: 44,800

*“Why it’s great?”* Software engineers are needed in virtually every part of the economy, making this one of the fastest-growing job titles in the US.”

# Salary Survey

**2006 ESJ Salary Survey:** Salaries grow for all IT staff positions!

*Application programmers:*

2006	2005	2004	2002	2001	5-year change
\$61,400	\$56,500	\$53,000	\$49,400	\$49,200	+24.8%

## “Computing Error”

NYT Editorial, March 6: “The outsourcing of computing work to other countries may not be as bad as many Americans think. In fact, it probably isn’t bad at all.

...

Information technology jobs won’t go away unless America lets them. In the next few years, jobs won’t just land in Americans’ laps. We have nothing to fear but the fear of competing itself.”