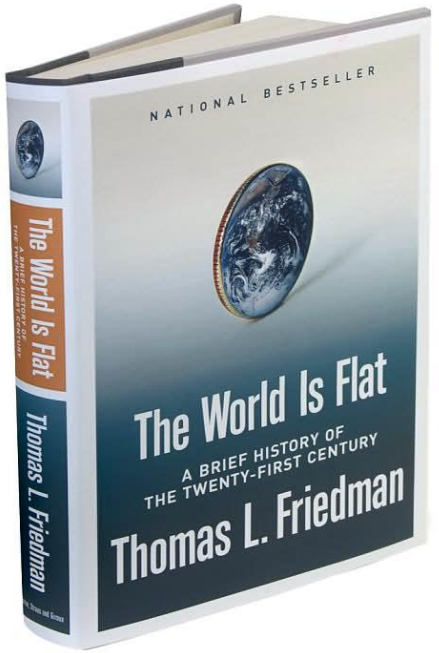
The World is Flat

& What You Can Do About it



Saturday, September 15, 2018

Dr. Douglas C. Schmidt
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Institute for Software Integrated Systems
Vanderbilt University
Nashville, Tennessee

What this Talk is About

- Globalization
  - “I speak Spanish to my God, Italian to women, French to men, & German to my horse, & Japanese to my boss”
    – Paraphrasing King Charles the 5th of Spain

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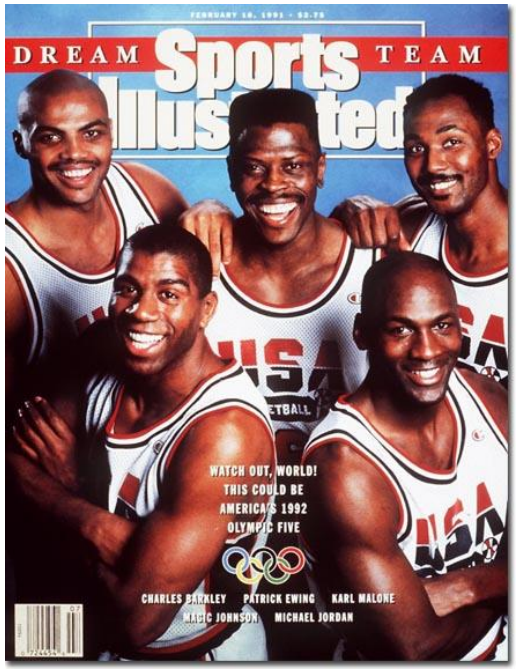
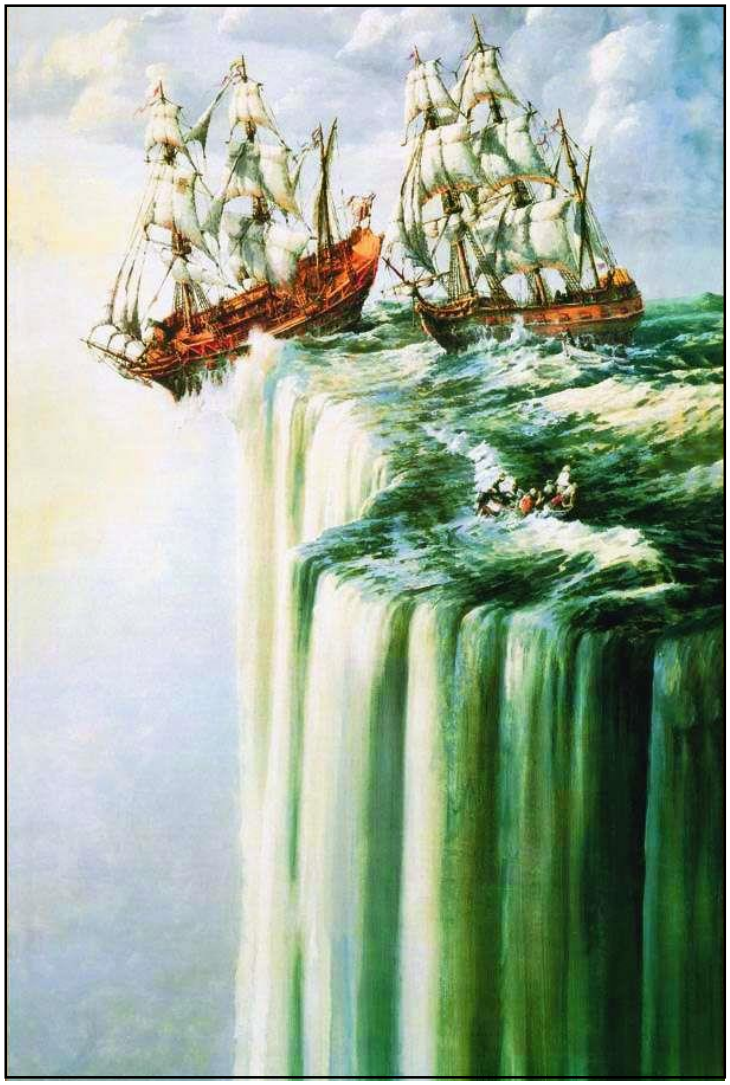
  - **Globalization 3.0** – 2000 to …, focus on individuals & groups to collaborate & compete *globally*



The Ten Forces that Flattened the World
… & Leveled the Playing Field

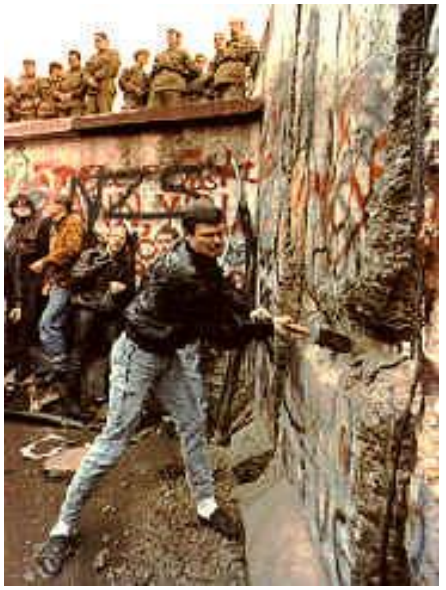
1. 11/9/89
2. 8/9/95
3. Work Flow Software
4. Open-Sourcing
5. Outsourcing
6. Offshoring
7. Supply-Chaining
8. Insourcing
9. In-forming
10. The Steroids



www.amazon.com/exec/obidos/tg/detail/-/0374292884/104-7071849-9705518?v=glance

11/9/89 – When the Walls Came Down & the Windows Went Up

- The fall of Berlin Wall
  - Unleashed forces that liberated most captive people in USSR & Warsaw Pact
    - Also affected India, China, Brazil, Middle East, etc.



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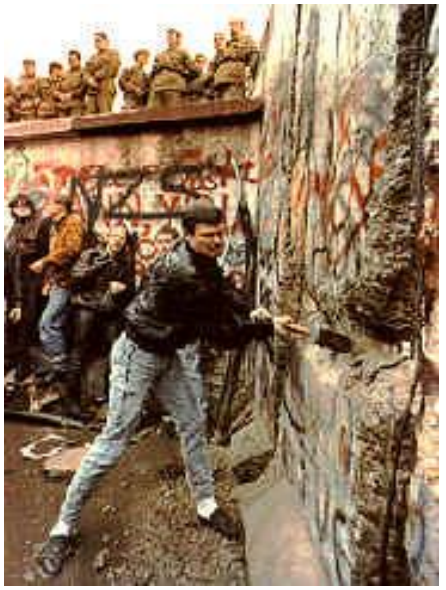
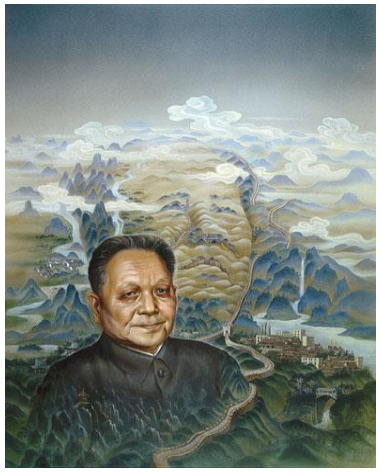


- (Temporarily?) tipped the balance of power away from authoritarianism to free-market



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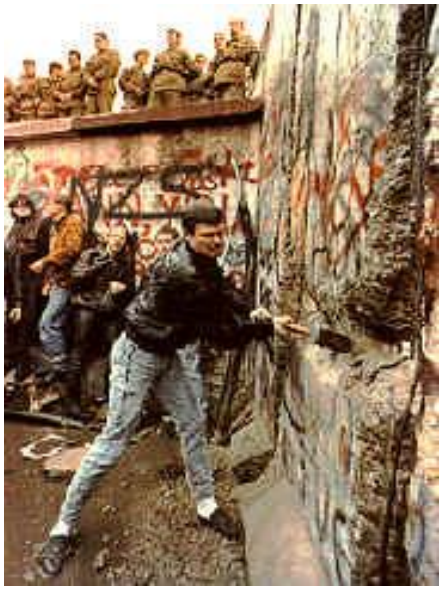

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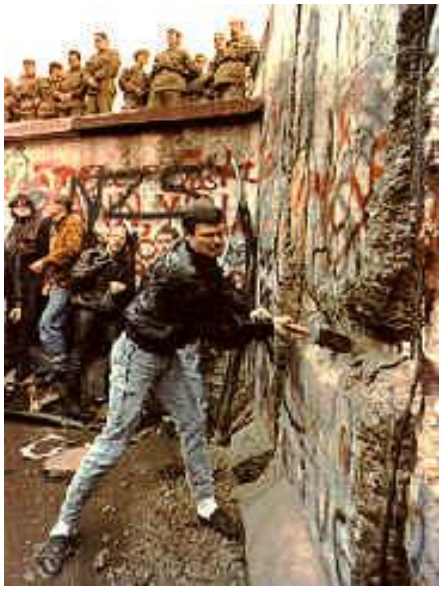
- Unleashed “mutant supply-chains” that gave rise to 9/11



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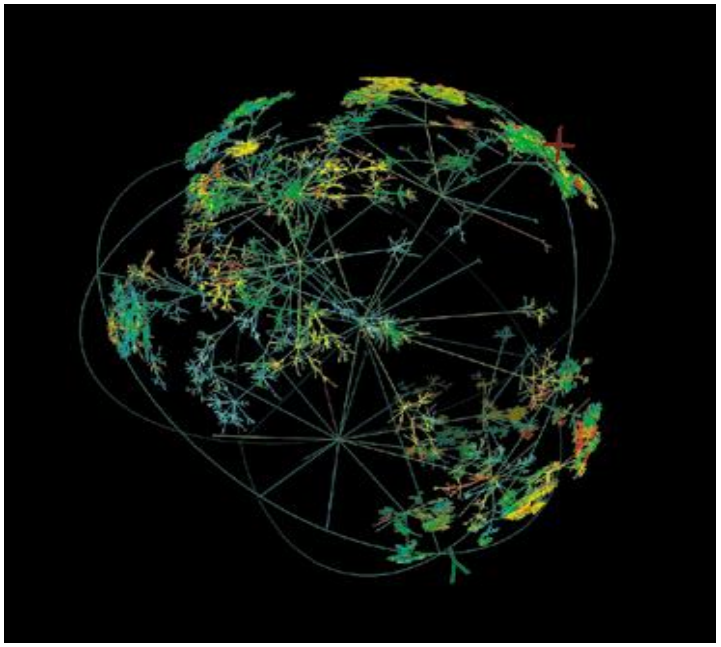

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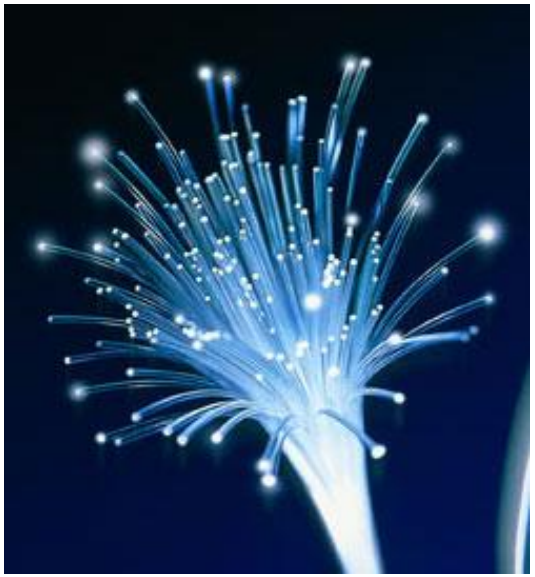
- Combined with Telecom Act of 1996 & new "killer apps" demanding bandwidth, telcos (over)invested in fiber-optics
  - Laid foundation (literally) for later flatteners



What/who will be the next "Netscape" & where will it happen?

Work Flow Software – Let's Do Lunch: Have Your Application Talk to My Application

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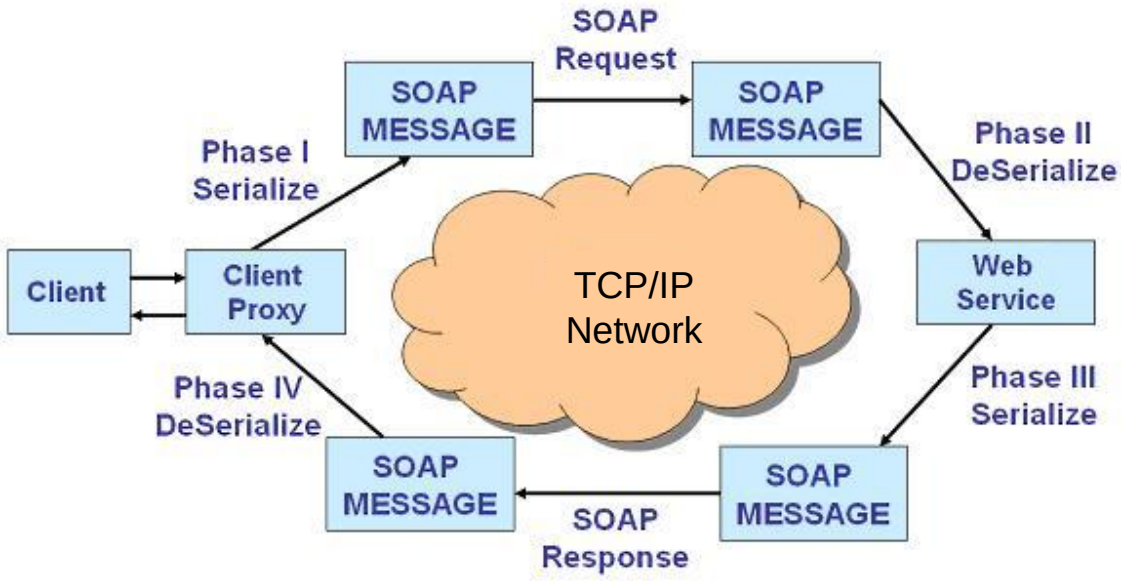

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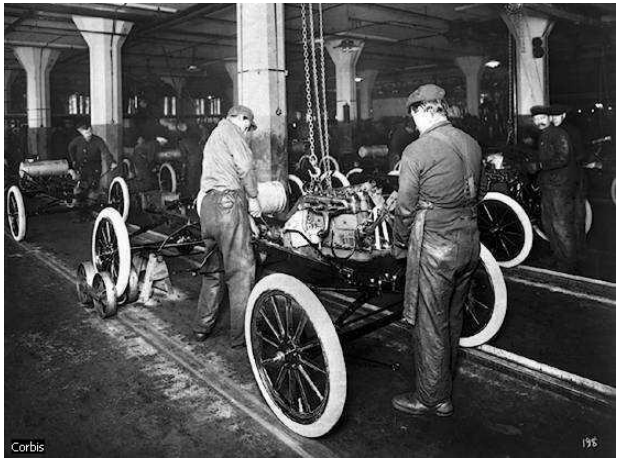
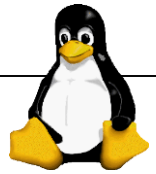
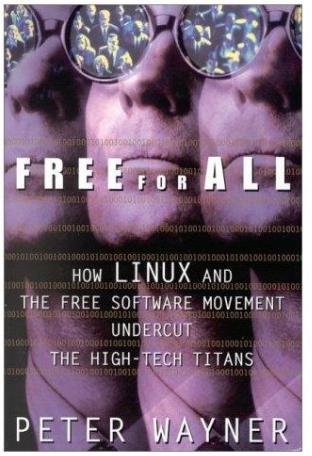
- Work flow platforms are enabling productivity boosts in service industry akin to what Ford did for manufacturing
  - This phenomenon also provides the foundation for subsequent flatteners





Open-Sourcing – Self-Organizing Collaborative Communities



- Open-source is a scalable, cost effective, & reliable software process since:
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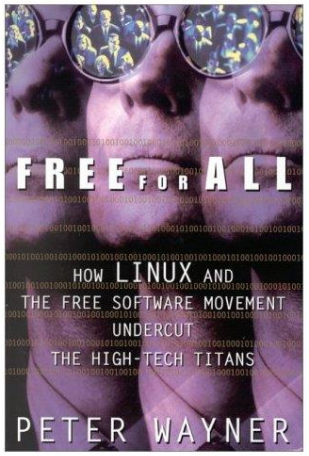

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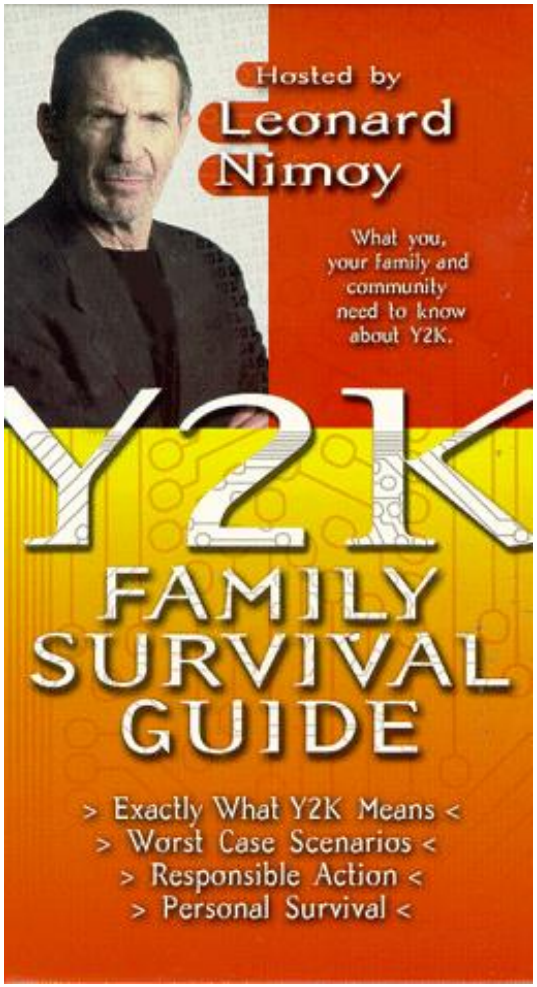
- Open-source enables other flatteners
  - Lowers barriers to entry
  - Leverages global software talent
  - Accelerates technology transfer

Open-source is essential for research visibility & impact

Outsourcing – Y2K

- Y2K created software work overload on US companies, who outsourced to India



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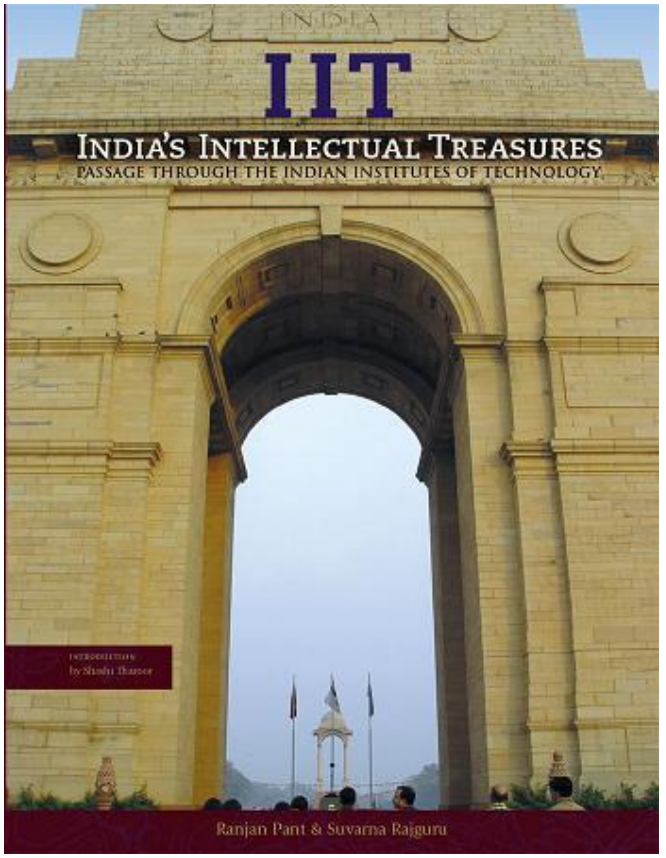

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- Dot-com bubble bursting reduced revenue, but not IT workload, so outsourcing became necessity

Outsourcing increasingly done for quality/productivity,not just cost

Offshoring – Running with Gazelles, Eating with Lions

- If *outsourcing* is India, *offshoring* is China
  - i.e., moving manufacturing to low-cost labor markets
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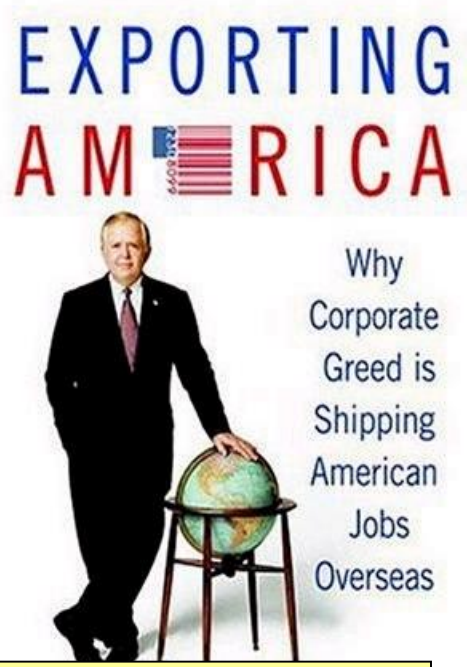
- This will ultimately be a political issue
  - e.g., Lou Dobbs' for president…



Multinational companies are increasingly replacing their IT outsourcing with offshoring via their global services groups

Supply-Chaining – Eating Sushi in (Bentonville) Arkansas

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- The fewer natural resources your country or company has, the more you innovate to survive
- Key is to use technology & business processes better than competitors
  - e.g., buy in bulk, cut middle-man, minimize inventories, use RFID tags, etc.

Insourcing – What the Guys in Funny Brown Shorts Are Really Doing

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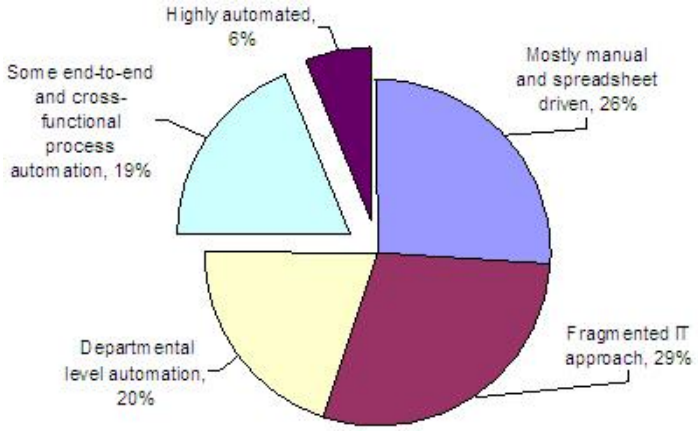
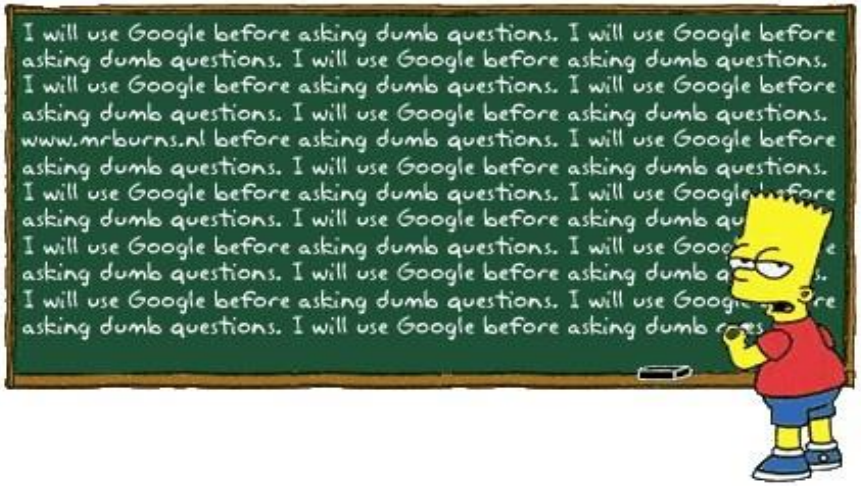
- Insourcing lets small companies leverage global supply chains previously only available to large companies



In-forming – Google, Yahoo!, MSN Web Search

- In-forming is the individual's personal analog to open-sourcing, outsourcing, insourcing, supply-chaining, & offshoring



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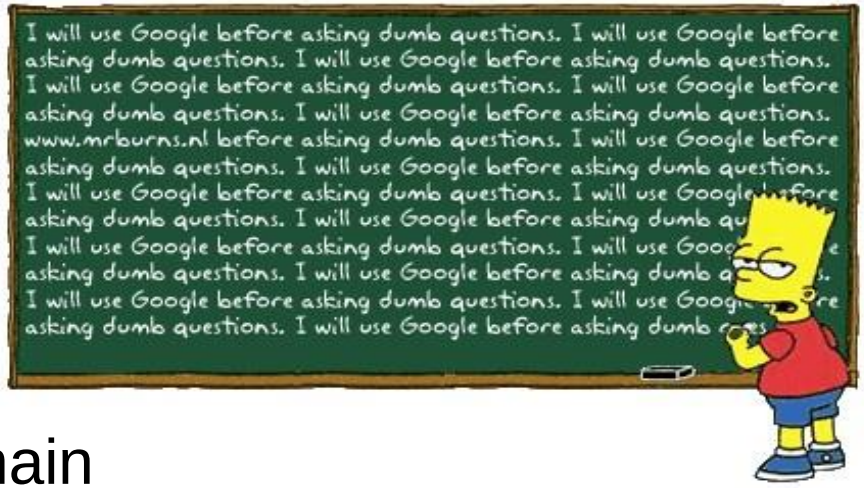

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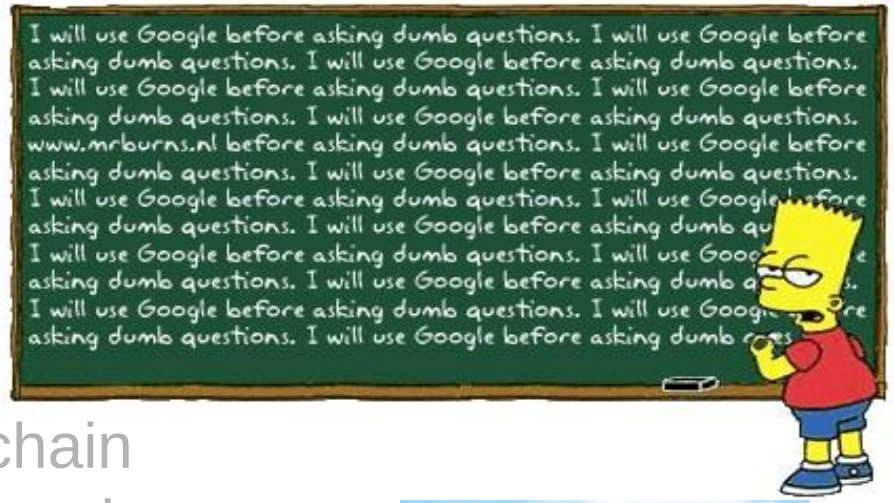

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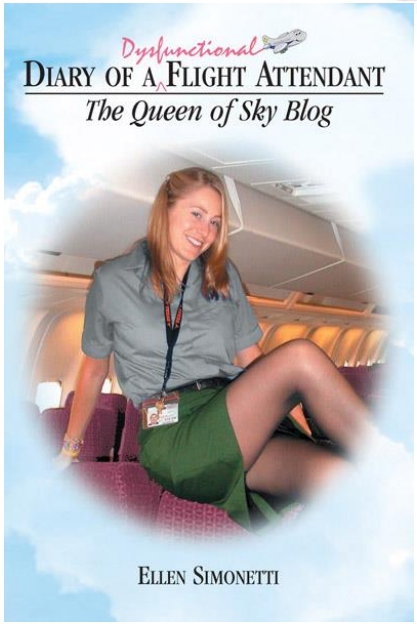
- Others can also find out (too much?) about us…
  - e.g., Face Book, Instagram, You Tube, Snapchat, etc.



Tip: Create a website that's a portal to your accomplishments

The Steroids – Digital, Mobile, Personal, & Virtual

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  - e.g., microprocessors, file sharing, VoIP, videoconferencing & collaboration tools, & wireless “seamless mobility”

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George C. Scott in "Dr. Strangelove"

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- Wireless & mobile systems (& security for said systems) are the hottest area of research & commercial growth in the post-dot-com era

At the heart of the steroids are *distributed real-time & embedded technologies* (www.dre.vanderbilt.edu)

The Triple Convergence for a Flatter World

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- **Convergence III – Global Workforce**
  - New players, on a new playing field, developing new processes & habits for horizontal collaboration

Is a Flat World Inevitable/Desirable?

- Not everyone benefits in a flat world, e.g.:
  - Traditional market leaders
  - The poor & disenfranchised
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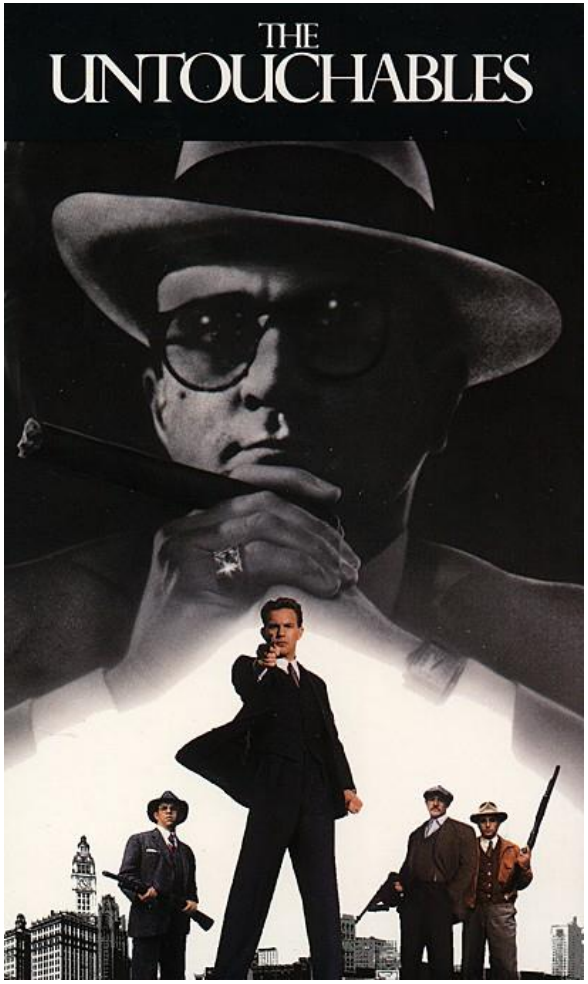
- Can the planet endure environmental side-effects of Globalization 3.0?
  - Demand & cost of non-renewable energy
  - Effects of long-term environmental damage is appearing

Is “Energy Crisis 2.0” an opportunity for renewable & sustainable energy sources?

How to Succeed in a Flat World

- Become an “Untouchable”



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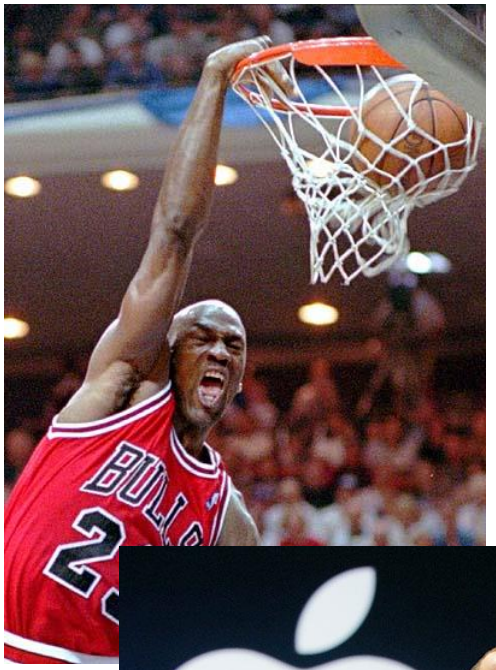
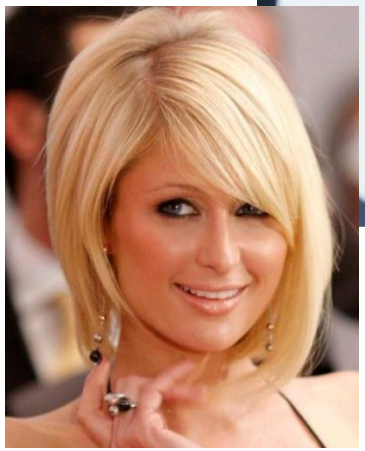


AP / Paul Sakuma



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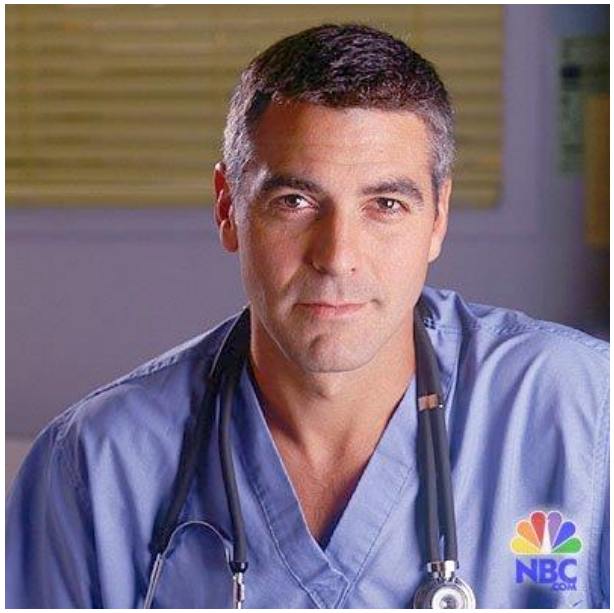

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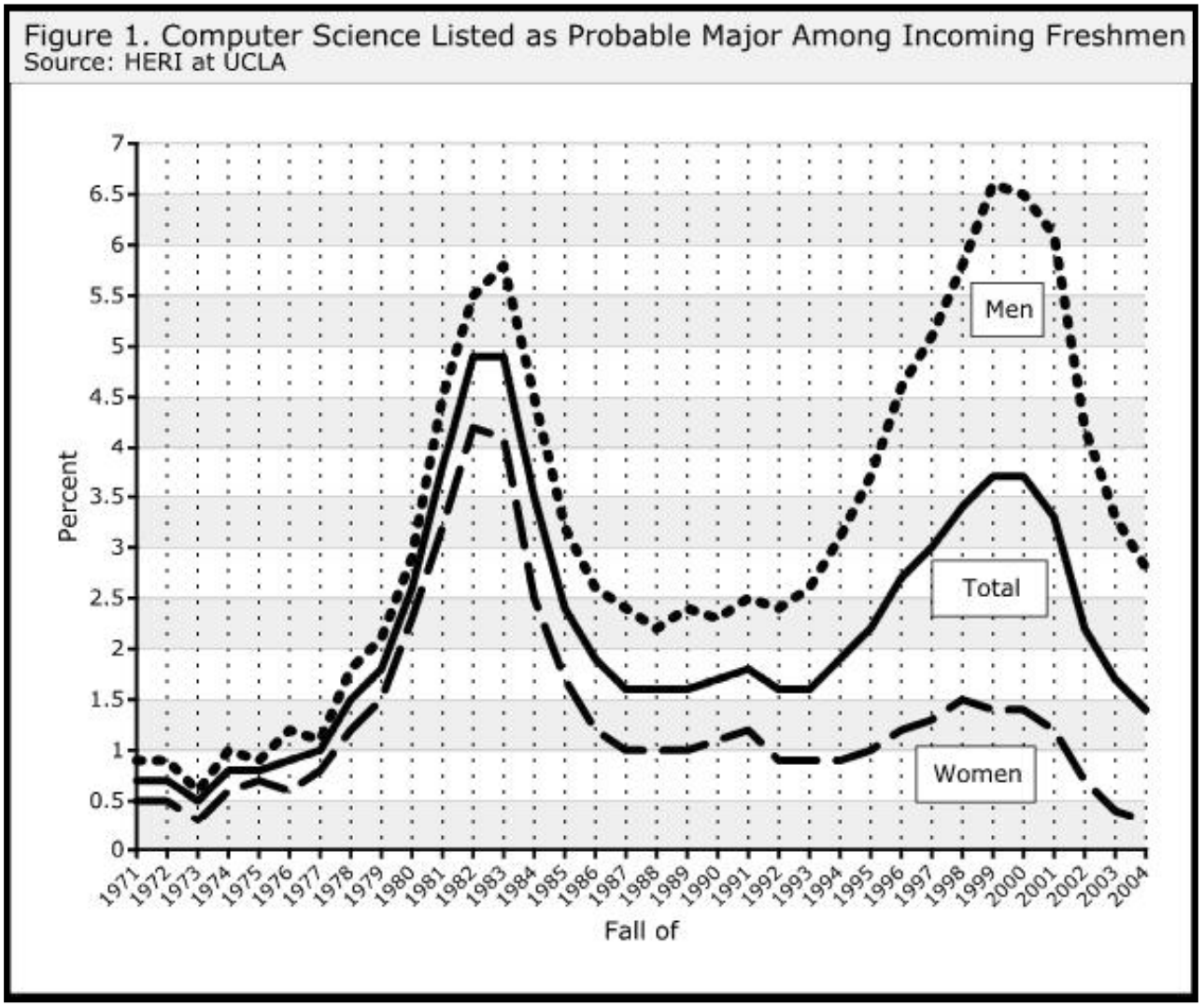
  - Workers who are "really adaptable"
    - e.g., "learn how to learn," acquire new skills & expertise continuously

Where do you fit & how does this affect your career choices?

How a Flat World Affects CS: Enrollment

- CS enrollment has gone through several “boom & bust” cycles
- During boom times, many people who become CS majors were only in it for the $$$



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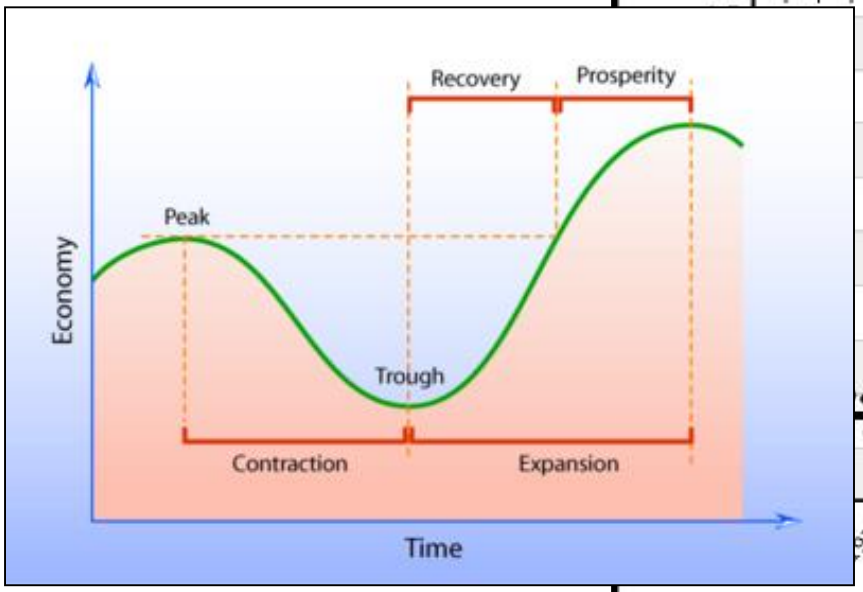
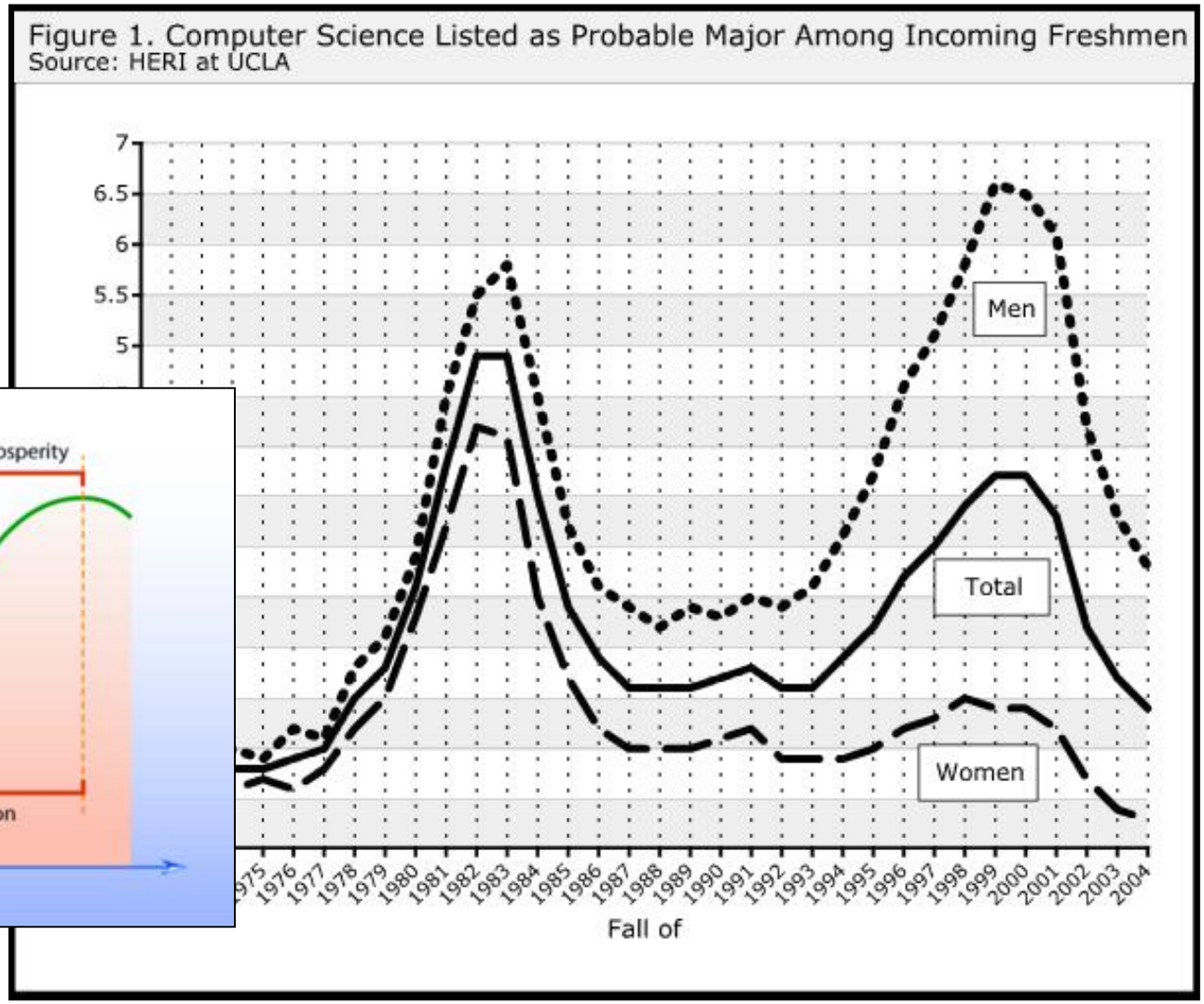
How a Flat World Affects CS: Enrollment

- This graph should look familiar to macro economics majors…





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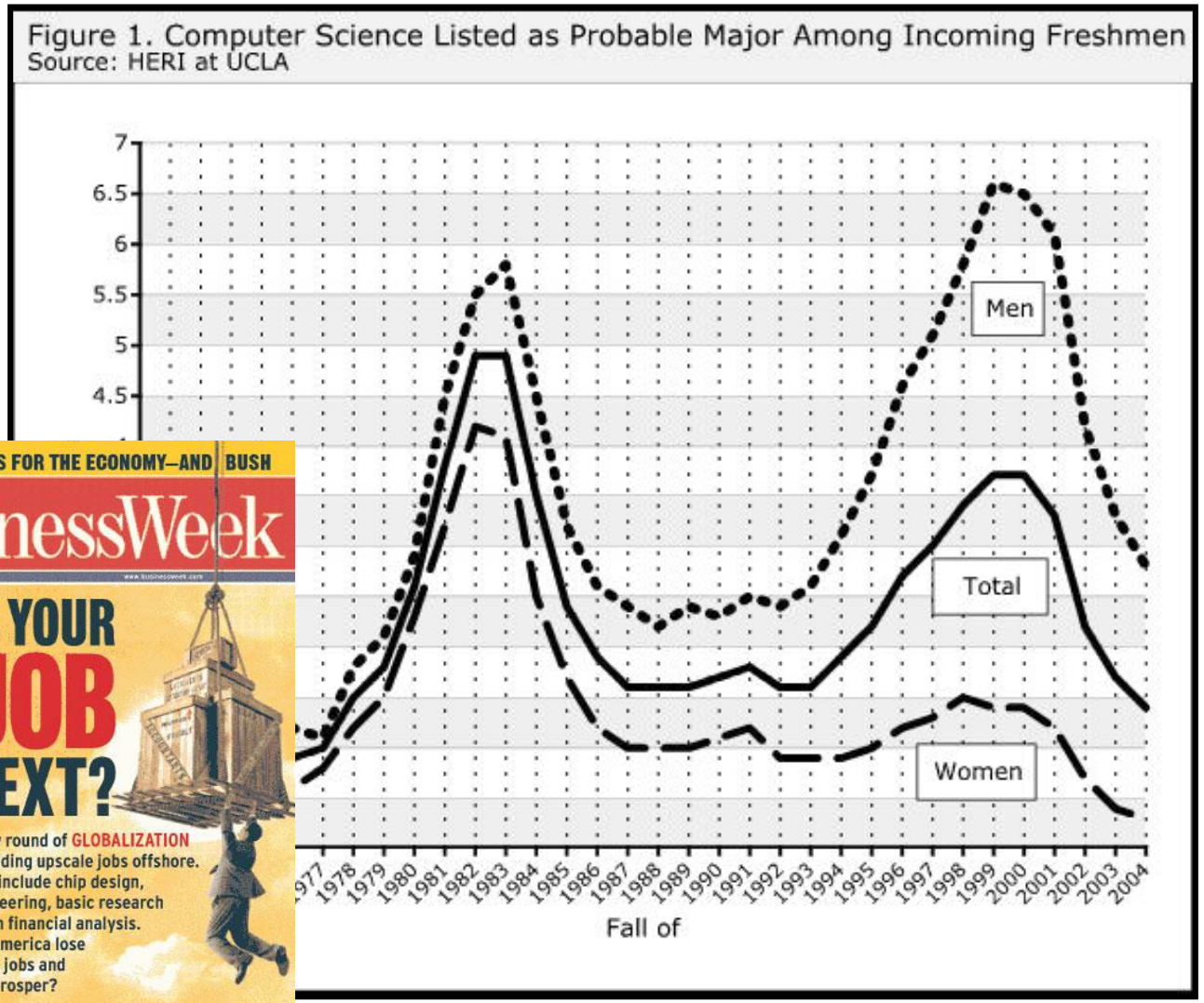
How a Flat World Affects CS: Enrollment

- Fear now grips the land…



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Reality Check: CS Job Prospects

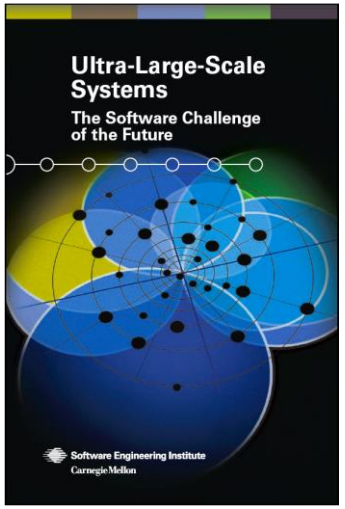
Source: U.S. Department of Commerce

The 10 fastest growing occupations, 2002-2012 (1000's of jobs)					
Occupation	Employment		Change		Most significant education or training**
	2002	2012	#	%	
Medical assistants	365	579	15	59	Moderate OTJT
Network and data communications analysts	186	292	106	57	Bachelor's degree
Physician assistants	63	94	31	49	Bachelor's degree
Social and human service assistants	305	454	149	49	Moderate OTJT
Home health aides	580	859	279	48	On-the-job-training
Medical records and health info. technicians	147	216	69	47	Associate degree
Physical therapist aides	37	54	17	46	On-the-job-training
Computer software engineers, applications	394	573	179	46	Bachelor's degree
SW engineers in computing, also in systems	281	409	128	45	Bachelor's degree
Physical therapist assistants	50	73	22	45	Associate degree

Many of these jobs will either involve

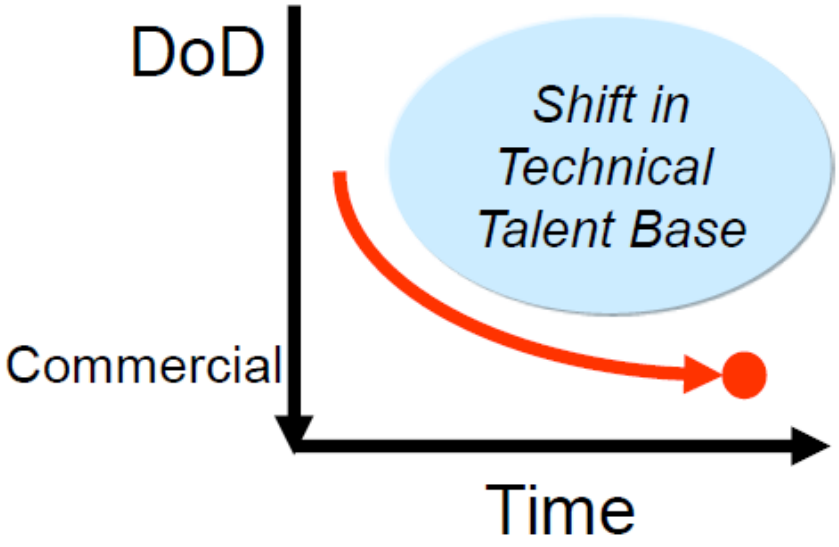
- Developing computing technologies
- Using computing technologies

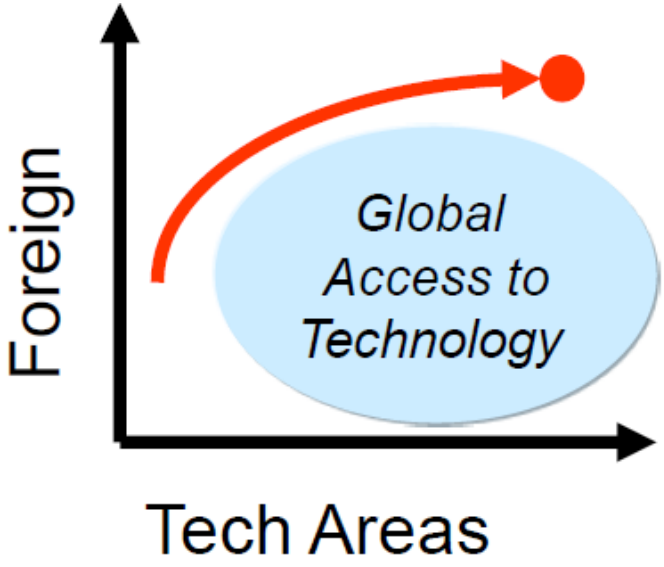
Many of these jobs cannot be outsourced

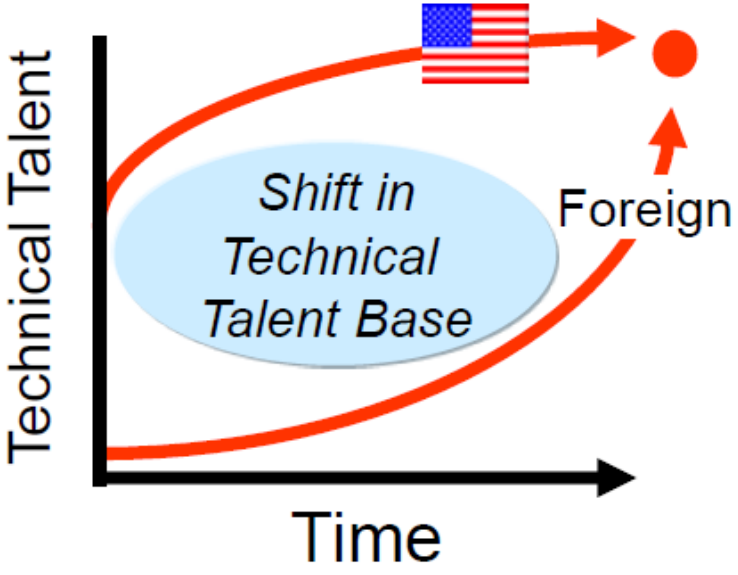


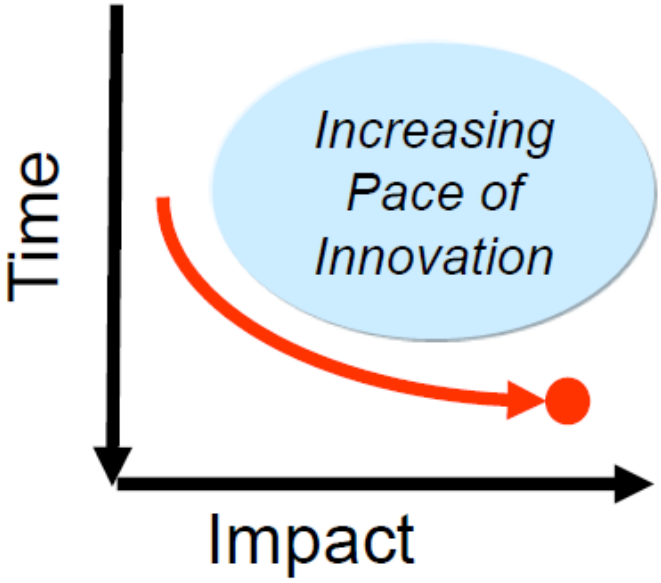
ULS systems report available at www.sei.cmu.edu/uls

Reality Check: CS in the Flat World









Take Home Points

- People who are well-educated in “hard” disciplines have & will have an edge

Employment and Wages, All Occupations, 2002

Occupation	Wage	Number Employed	Number Employed (rank)
Management	$85,530	6,200,940	8
Legal	$79,910	958,520	21
Computer and Mathematical	$65,510	2,915,300	16
Architecture and Engineering	$61,750	2,372,770	17
Healthcare Practitioners and Technical	$57,310	6,359,380	7
Business and Financial Operations	$56,380	5,131,840	11
Life, Physical, and Social Science	$55,920	1,131,390	20
Arts, Design, Entertainment, Sports, and Media	$43,710	1,595,710	19
Education, Training, and Library	$42,080	7,891,810	6
Construction and Extraction	$37,520	6,170,410	9
Installation, Maintenance, and Repair	$37,220	5,215,390	10
Community and Social Services	$36,440	1,673,740	18
Protective Service	$34,840	3,006,100	15
Sales and Related	$32,210	13,507,840	2
Production	$29,280	10,128,200	4
Office and Administrative Support:	$29,020	22,649,080	1
Transportation and Material Moving	$27,880	9,581,320	5
Healthcare Support	$23,220	3,271,350	13
Personal Care and Service	$21,800	3,099,550	14
Building and Grounds Cleaning and Maintenance	$21,490	4,300,440	12
Farming, Fishing, and Forestry	$20,310	458,850	22
Food Preparation and Serving	$17,530	10,507,390	3

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Take Home Points

- People who are well-educated in hard disciplines have & will have an edge

- The *fear* of outsourcing has driven away a lot of US talent from science & technology since the dot-com bubble burst

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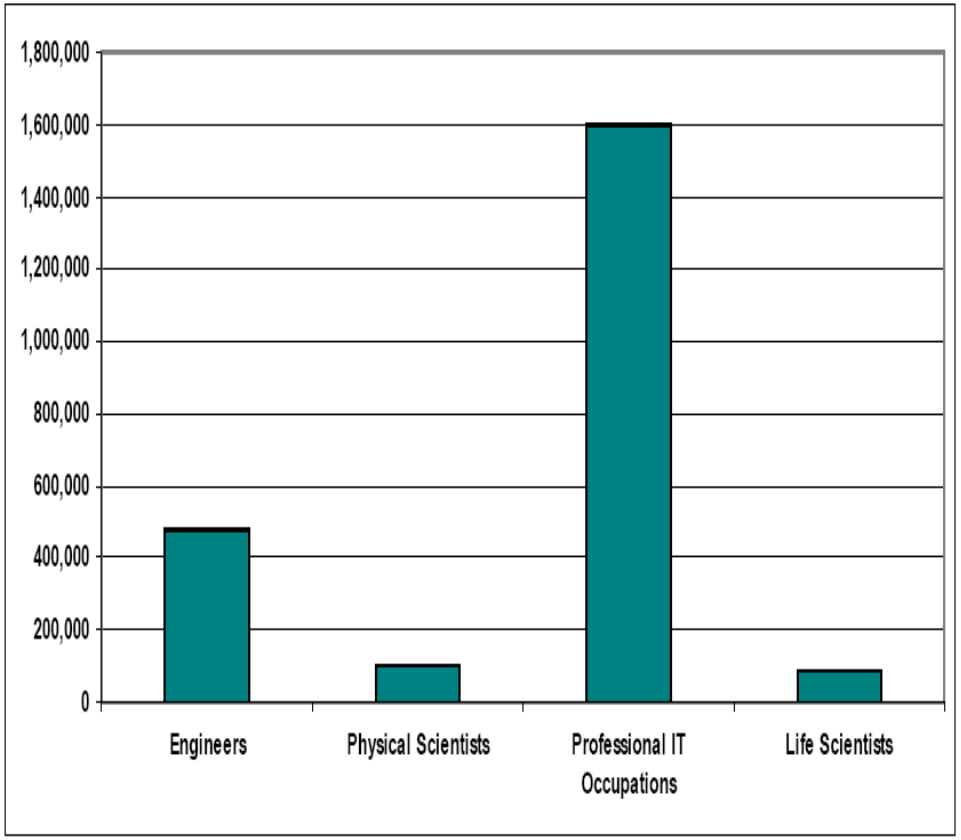
Take Home Points

- People who are well-educated in hard disciplines have & will have an edge
- The *fear* of outsourcing has driven away a lot of US talent from science & technology since the dot-com bubble burst
- All the numbers now indicate a huge need & bright future for interesting & lucrative jobs in the computing field

Total Job Openings IT, Science, & Engineering Occupational Projections: 2002-2012



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Wrapping Up

- Globalization, i.e., “leveling the playing field” is happening whether we know it or like it

Every morning in Africa, a gazelle wakes up.
It knows it must run faster than the fastest lion or it will be killed.
Every morning a lion wakes up.
It knows it must outrun the slowest gazelle or it will starve to death.
It doesn’t matter whether you are a lion or a gazelle.
When the sun comes up, you better start running.

Wrapping Up

- Globalization, i.e., “leveling the playing field” is happening whether you know it or like it
  - “Brace yourself, you are about to enter a flat world” – Tom Friedman
  - “Fortune favors the prepared mind.” – Louis Pasteur

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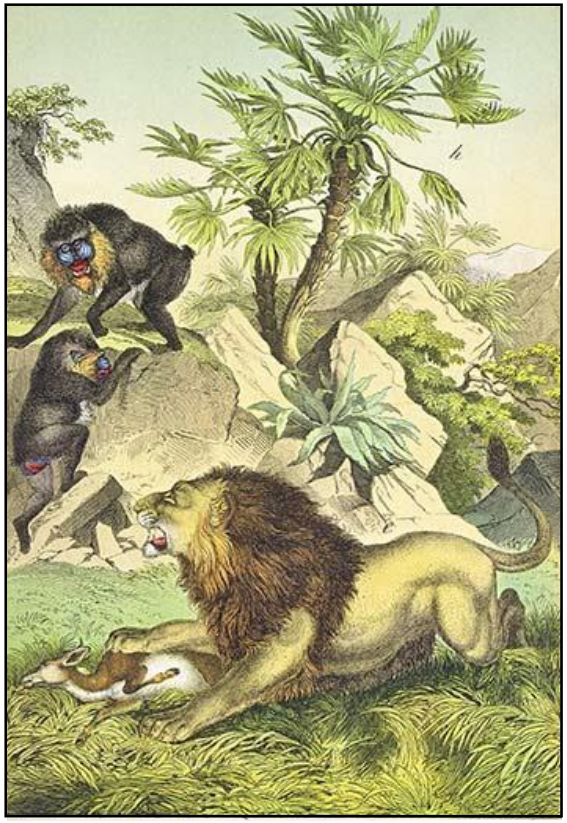
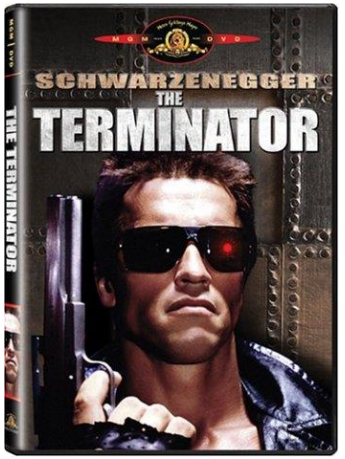
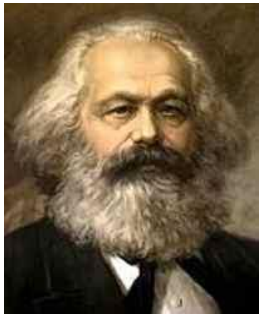


Final Points to Ponder

"Today, I would rather be a genius born in China than an average guy born in Poughkeepsie"
– Bill Gates

"If you don't like change, you'll like irrelevance even less" – General Eric Shinseki

"It can't be bargained with. It can't be reasoned with. It doesn't know pity, or remorse, or fear! And it absolutely will not stop, ever, until you are dead."
– Terminator



"Every system contains the seeds of its own destruction" – Karl Marx