



Career Defense in the Face of Globalization

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Technology Makes It Possible

- Moore's Law – more computer capability, lower cost – and trivial shipping costs
- Telecommunications ever cheaper
- Developing nations' labor cost lower
- Expanding education opportunities
 - Half U.S. tech grad degrees to foreign students
 - Increasing tech grads, India and China



Free Trade Agreements

- Impacted manufacturing first – GATT
 - AMD in Dresden
 - 23 chip foundries in Taiwan
- Now impacting services - GATS
 - Protections for Intellectual Property iffy
 - Outsourcing offshore cuts costs
 - States consider limiting tax-paid offshoring



Comparative Advantage

- David Ricardo: work should be done where most advantageous
- High productivity an IT advantage
 - Over \$1 trillion invested worldwide in IT
 - Enterprise Resource Planning spreads
 - Central databases, terminals anywhere
 - CAD/CAM, CATIA
 - Supply chain management efficiencies



Taxation Concerns

- U.S. corporate tax rate 35%
- Offshore rates mostly lower (e.g., Ireland 12-15%)
- Multinationals can shift profits
 - IP moved offshore, fees earned there, too
 - No U.S. tax unless foreign profits repatriated
 - Motorola vs. IRS: \$500 million dispute

D. C. Johnston, *Perfectly Legal: The covert campaign to rig our tax system to benefit the super rich – and cheat everybody else*



Innovation

- Key to competitiveness
- New ways to combine labor and capital
- Hard to forecast
 - Transistor
 - Fiber optics
 - Internet “Networking the World”
- When? #2 usually profits (e.g., iPod)



Productivity and Innovation

- India average productivity 15% of U.S. – unit costs rise if paid >15% of U.S.
- U.S. manufacturing productivity +17%, manufacturing employment –17%
- Innovation: new uses of labor and capital
 - U.S. led historically
- Diffusion of innovation – others catch up



Boeing Dreamliner Example

- Innovation – 25% higher efficiency, lower cost per seat mile to operate
- Seattle assembly from subassemblies from
 - Canada
 - Japan
 - Australia
- More use of lightweight composites
- Engines from GE or Rolls Royce



Government Regulation

- Environmental protection
- Pollution standards
- OSHA
- Employment practices
- Taxes
- Sarbanes-Oxley corporate governance
- Benefits

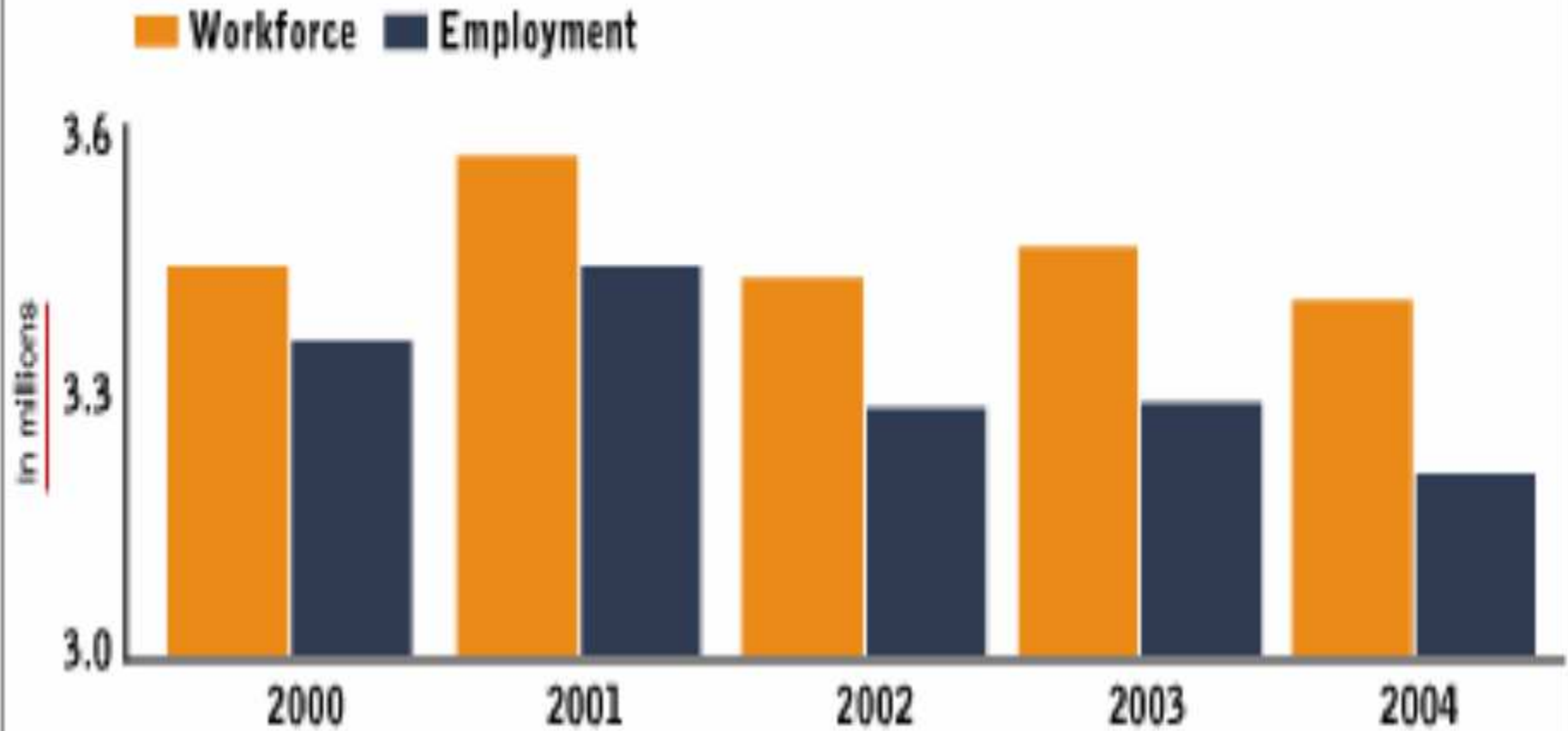


The Trends in IT

- First, a prima donna – paperless factory, etc.
- Now, a commodity
- “Buy it for less”
- Overall outsourcing growth: 7.8% CAGR between 2002 and 2007 –Gartner
- Lose 3.4 million service jobs by 2015 –Forrester Research
 - Cumulative \$136 billion in wages, 2000-2015
 - Job loss includes 470K Computer, 184K A&E, 1.7M Office
- Job losses over 20%: CS/SA, programmers – 2000 to 2004

Widening Gap

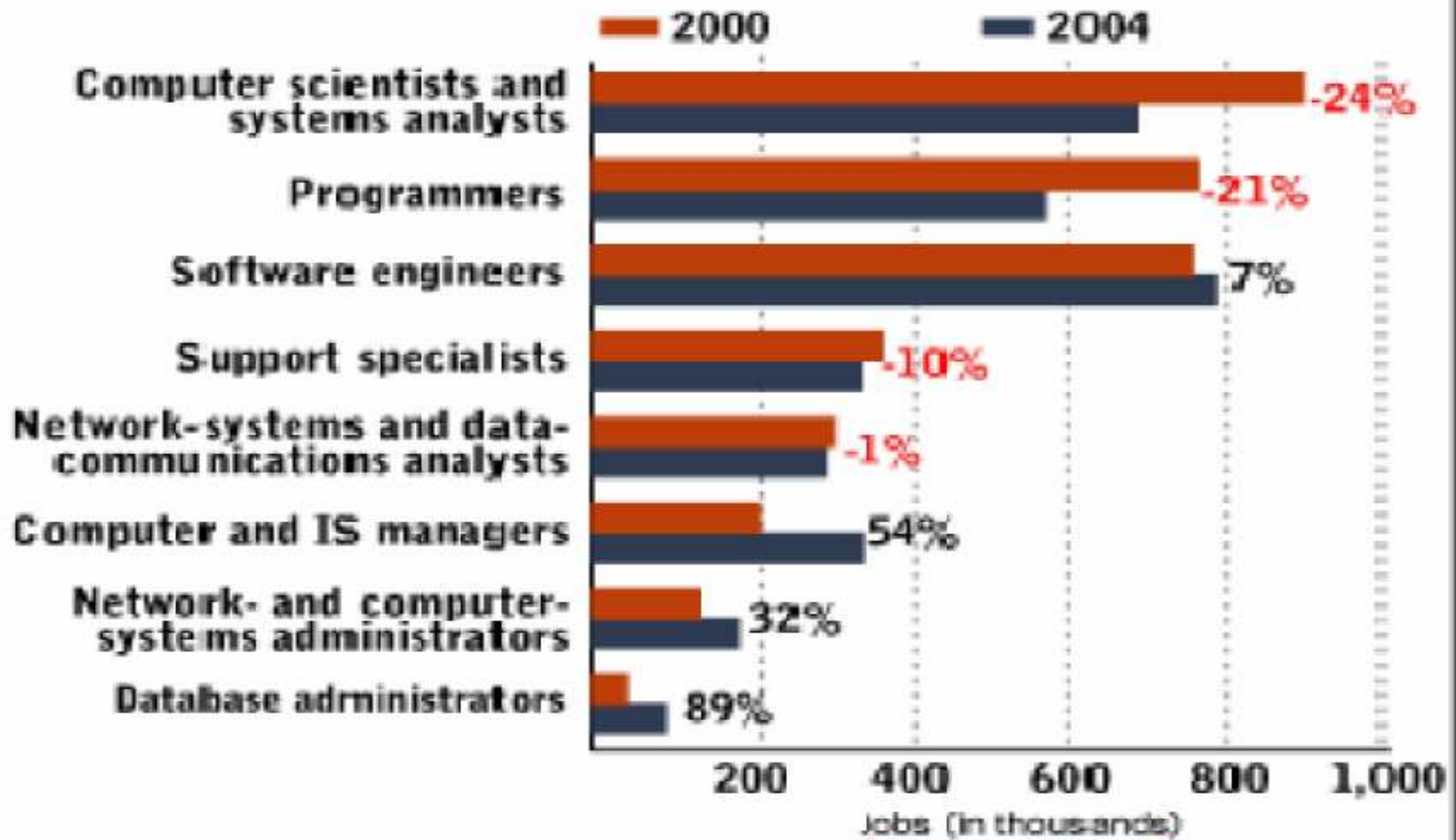
Size of IT workforce vs. actual employment in first half of year



Data: InformationWeek analysis of Bureau of Labor Statistics data

Where The Losses Are

Employment by job category in first half of year



Data: InformationWeek analysis of Bureau of Labor Statistics data

I N F O R M A T I O N W E E K R E S E A R C H



Factors in Near-term Increase

- Word spreads about savings – more conservative companies going offshore
- Wipro, Infosys broaden IT services offered
- Captive centers for BPO e.g., BoA, Schwab, Lehman; GE does accounting, payroll, financial reports for all divisions in India
- Onshore IT tech/service vendors placing work in India, China, Belarus for product development and services



Why Outsource IT?

- Continual shortage predictions
- Guest worker quotas reached
- Cheap telecom- \$8/month, LA-Bangalore
- Cheap equipment – Pentium 4 < TRS-80
- Centralized CAD/CAM – work anywhere
- Cheap labor → better bottom line
- Offshoring becomes conventional wisdom



Going Up the Food Chain

- Simple tasks go first, e.g., software modules
- S/w architecture, integration & test, last
- Cell phone design, but not propagation tests
- Radiology interpretation but not patient interface
- CPAs send tax preparation to India BPOs
- Architects detail floor layouts in Hungary

80% Offshored to India – Why?



- English-speaking, well-educated
- Relative political stability
- Low living costs = low wages
 - Pay \$12K, bill at \$45K in India
 - Pay \$75K, bill at \$125K in U.S.
 - Savings of 50% after 6 months in IT services
- 2004 growth rate: 30% - 40% -**NASSCOM/KPMG**



Megadeals Increase

- Outsourcing megadeals worth >\$1 billion
 - 9 in 2001, worth \$15.1 billion
 - 14 in 2002, worth \$28.4 billion
 - 7 to IBM
 - 2 to EDS
 - 1 each to IBM/Keane, CSC, HP, Fujitsu, CGI
 - 15 in 2003
- *Gartner Dataquest*



Senior Work Stays

- Sales and marketing
- Customer site: 30% of WF for requirements definition, liaison, install, debug, and reporting
- Export restrictions keep some at home
- Security class. & privacy concerns holds some
- Overall project management, usually stays,
- BUT....



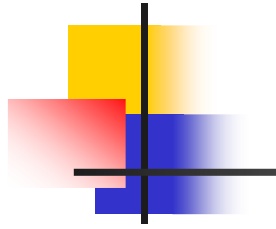
R&D Goes Global

- R&D Centers in India, e.g.,
 - Microsoft
 - H-P
 - Sun Microsystems
 - Motorola
 - Oracle
- IBM has 3 of 8 R&D Centers in U.S.
others in Zurich, Haifa, Beijing, Tokyo, Delhi



Offsets for Foreign Markets

- Foreign buyers keep some value-added
 - Aircraft: China builds subassemblies
 - Automobiles: GM builds Buicks in China
 - Chip production: China discounts VAT for own
- Boeing has 600 engineers in design center in Moscow
- Intel has 15 mfg. sites, 8 outside U.S.



India *Leader*

- XXX Geopolitical risk
- ✓✓✓ English proficiency
- \$\$\$ Average programmer salary

Pros: Remains the heavyweight champ of business process and IT services outsourcing. Two million English-proficient speakers graduate every year from more than 1,000 colleges that offer computer education. Then there's the famed Indian Institutes of Technology producing some of the world's top software engineers. With a strong history of software development, skilled labor pool and favorable cost structure, India is a highly desirable destination.

Cons: Political instability remains an issue. Labor costs are rising as demand for IT workers begins to exceed supply. Worker turnover—particularly in call centers and other business processing work—becoming a problem. Workers are sometimes so determined to please their American bosses that they don't speak up, even if they know the instructions they are given are wrong. Frequent power outages can delay projects.

Insider tip: Providers like Tata Consultancy Services and Satyam Computer Services are diversifying their bases of operations in countries such as Canada to bring them closer to U.S. clients.







Career Issues

- 40-year one-stop careers a rarity now
- How reliable is demand forecasting?
 - Econometric models based on GDP
 - Job loss from offshoring not deducted
 - Focus is on supply – 15 years of alarms
- How to gain experience when junior jobs go to Mumbai, Singapore, Belarus, Russia?



NSB Predicts SET Shortages

- Fewer students in “pipeline”
- BUT:
 - Salaries flat for over 20 years
 - Record high unemployment in 2003 for EEs/CS
 - Few new grads had job offers when degreed
 - Offshoring highly publicized
- For rebuttal to NSB report, see <http://www.todaysengineer.org/Apr04/outlook.asp>



CS Enrollments Falling in U.S.

- Graduation rate \sim 25,000 per year
- 2004 enrollments down 23% over 2003
 - San Jose State: -21%
 - Ohio State: -30%
- Five-year trend down over 40%
 - UC Berkeley: -41%
 - MIT: -44%
 - Georgia Tech: -45%



Foreign Grad Students Down

- Security concerns prompt SEVIS
 - Student and Exchange Visitor Information System
 - Student and Exchange Visitor Program (SEVP)
 - Reengineered nonimmigrant student and exchange visitor (F, M, & J visa categories) process
- 9500 campuses, 770K students, visitors
- First year, GRE testing down >50%
 - India: -56%; China: -52%



Three Answers to Shortage

- L-1 visa: intracompany transfer – 5 years
 - No limit to number
 - “Job shop” abuse
- H-1B visa: 65,000 per year – 6 year limit
 - Extended if green card petition filed
 - 3-year extensions, not limited
- Outsource the work



Career Trends

- Retrain, hire, or outsource?
 - Benchmark for training budget: 2% of sales
 - Just-in-time leads to shamrock organization
 - Hire skills temporarily as needed
 - Only the core or stem stays

Charles Handy, *The Age of Unreason*, 1989



Career Trends 2

- Know your company & industry
 - Business prospects
 - Book-to-bill ratios
- Keep current with technology
- Keep your boss posted on your work
- Think of your employer as your customer



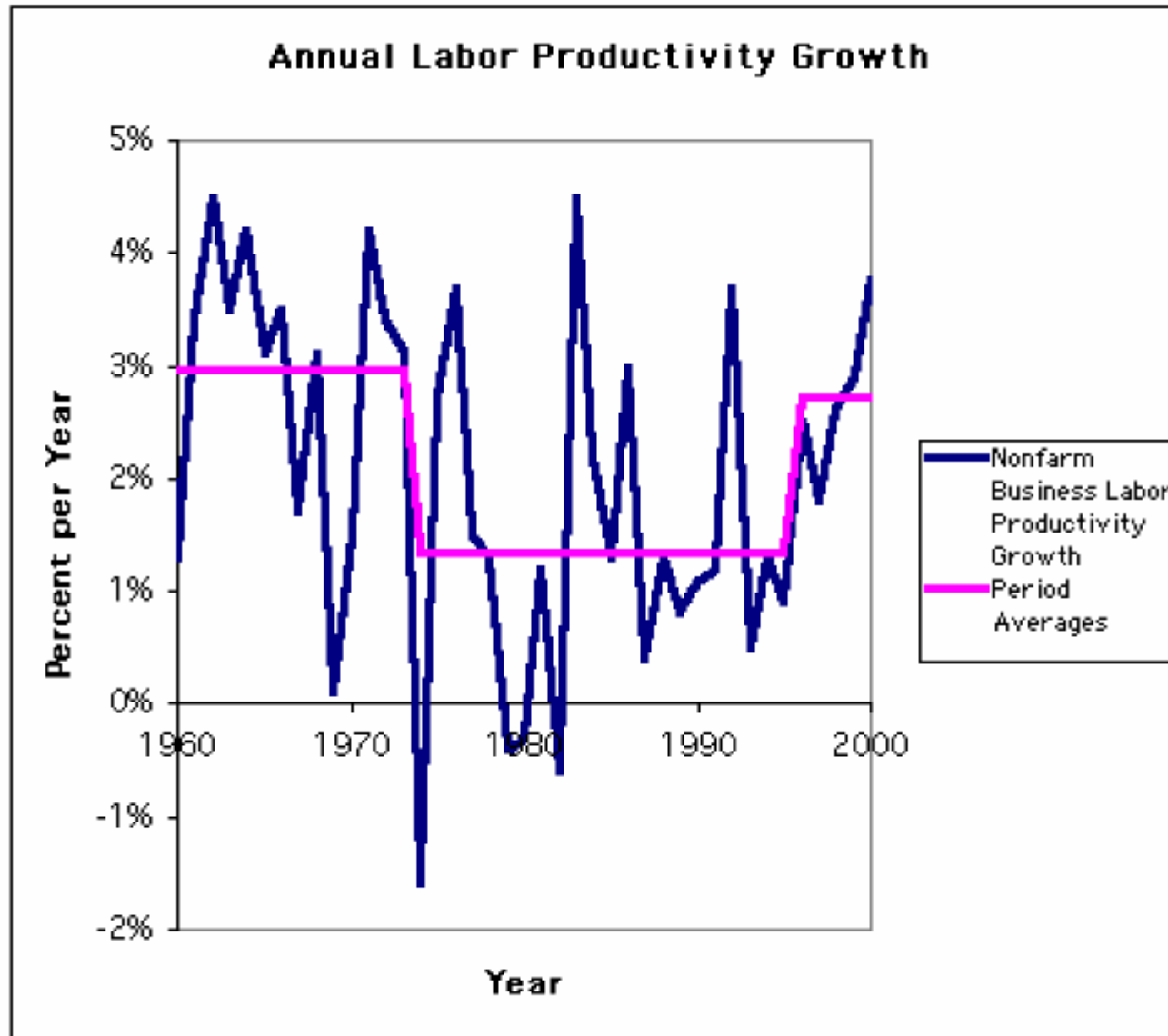
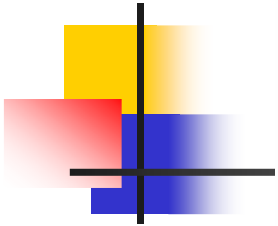
Career Trends 3

- Be prepared for “second stage” career
 - Early retirements endemic
 - Partial retirements coming?
- Maintain your professional networks
- Schedule an M-PAC for your section
 - Connect with Grassroots Network
 - <http://www.ieeeusa.com/pace/>



Productivity Gains Essential

- Non-farm, 2nd Qtr +2.9%, 1st Qtr 3.7%
- Mfg. Productivity, 2nd Qtr +7.5%
- Two previous quarters +5.6%
- 2001-2004: +4%





Manufacturing, 1995-2002

- IT productivity gain cuts mfg. jobs
 - U.S.: -11%
 - China: -15%
 - Brazil: -20%
- But, mfg. output increased by 30%
- Mfg. Technology: 2/3 R&D, 90% of patents
- IP theft in China: \$1.8 billion in 2002



Career & Workforce Policy Cmte

- Tracks issues affecting WF supply/demand
- Prepares position statements for advocacy
 - H-1B Visas, L-1 Visas, Offshore Outsourcing
 - Career Equality in Engineering
 - Cash Balance Pension Plan Conversions
 - Engineering Licensure
- www.ieeeusa.org/ public policy



New State-level Committee

- Government Activities Committee
 - Lee Stogner, chair
 - r.t.harrison@ieee.org, staff
- Monitors state-level developments
 - 35 states consider ban on gov't. offshoring
 - Software shrink-wrap licensing (UCITA)
 - Election machinery (HAVA)
 - State-level insurance regulation



Resources

- EIA Planbook, “The Technology Industry at an Innovation Crossroads.” www.eia.org
- *The Race to the Bottom: Why a Worldwide Worker Surplus and Uncontrolled Free Trade are Sinking American Living Standards* (Westview Press).
[/www.americaneconomicalert.org](http://www.americaneconomicalert.org)
- Adequacy of U.S. S&E Workforce, John Sargent,
www.cra.org/govaffairs/sargent_adequacy_of_S-EW.ppt