The Offshoring Challenge for US Engineers

March 1st, 2006
Guest Lecture
Markets & Management Studies Capstone
Professor Gereffi’s Class
Duke University

Ron Hira, Ph.D., P.E.
Assistant Professor of Public Policy
Rochester Institute of Technology
rhira@mail.rit.edu
Why Do Companies Utilize Overseas Talent?

• **Cost – An “Imperative”**
• Politics & Access to the Local Market
• Developing Countries’ Strategy
  - Tax holidays & Incentives
• Economic Liberalization – 3 Billion New Capitalists
• Collaborative Engineering Technology
• Low Cost Telecommunications & Internet
• Unique Talent
• Localization
• **Fate Of US Workers No Longer Figures Into Corporate Decisions**
## Overseas Engineers Can Afford To Be Paid Less

<table>
<thead>
<tr>
<th>Country</th>
<th>Purchasing Power Parity (PPP)</th>
<th>Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>1.0 * $70k</td>
<td>$70,000</td>
</tr>
<tr>
<td>Hungary</td>
<td>0.367 * $70k</td>
<td>$25,690</td>
</tr>
<tr>
<td>China</td>
<td>0.216 * $70k</td>
<td>$15,120</td>
</tr>
<tr>
<td>Russia</td>
<td>0.206 * $70k</td>
<td>$14,420</td>
</tr>
<tr>
<td>India</td>
<td>0.194 * $70k</td>
<td>$13,580</td>
</tr>
</tbody>
</table>

Source: PPP data from World Bank International Comparison Project
Implications of Cost of Living Differentials

• US Workers Must Justify $5X + \text{Salary Premiums}$
  - Obvious answer: Be $5X$ more productive
  - Not so obvious: How?

• Low Indian, Chinese & Russian Salaries Likely to Persist for Many Years
  - Governor on workers’ expectations
  - Wage increases on very low bases
  - Most of what they buy will remain ‘non-tradable’

• Excess Supply of Labor & More On-line
  - Increasing graduates and more countries target offshoring as a development strategy (UNCTAD, WB)
Old US Engineering Labor Market

- Stability
- Nurturing Employment Relations
  - IBM’s Lifetime Employment Employment Until 1992
- Risk Absorbed by Employers
- Investing in Employees
  - Training
  - Career Path
- Speed of Technological Change Manageable
New US Engineering Labor Market

Stability

• Volatility

Nurturing Employment Relations

• Fate of US Workers No Longer Factor in Corporate Decision-Making
  ➢ CEOs not compensated based on number of workers (US or other)
  ➢ Want “flexibility” to rebalance labor input mix
  ➢ E.g., IBM forcing US workers to train foreign replacements as condition of severance
New US Engineering Labor Market

Risk Absorbed by Employers
• Risk Transferred to Employees

Investing in Employees
• Employees Should Invest in Themselves (“on their own dime and time”)

Speed of Technological Change Manageable
• “Half-Life” of Engineers Decreasing
Geographic Comparative Advantage for US Engineers

- Preferred Access to Latest Tools & Technologies
- Access to and Knowledge Of Most Sophisticated Market
- Best Infrastructure
- Preferred Access to Best Universities
- Companies Reluctant to Use Overseas Talent
- Capture Best & Brightest Foreign Students/Workers
  - Spillover benefits for US engineers
- R&D Labs in US
Geographic Advantages Diminish

Preferred Access to Latest Tools & Technologies
- Companies Take Latest Tools & Technologies to Foreign Talent
- Tools & Technologies Often Embedded in Software - Much More Mobile

Access to and Knowledge of Most Sophisticated Market
- Companies Manage Knowledge Flow
  ➢ Facilitated by communications technologies
- Foreign Markets Growing Faster Than US Markets
  ➢ More Sophisticated (?) - Technology leapfrogging
Geographic Advantages Diminish

Best Infrastructure
- Developing Countries Investing in Infrastructure
- Importance of Infrastructure Diminishing

Preferred Access to Best Universities
- US Universities Go Global
  - Take latest education to foreign students
    - Franchising
  - Research labs
  - Leaders view their institutions as global resources – both public and private
Geographic Advantages Diminish

Capture Best & Brightest Foreign Students/Workers

• Cheaper to Train Foreign Students In-Country Than Import Them at Graduate School
  ➢ Education at Indian Institute of Technology (IIT) is 1/10th cost of US engineering education

• US Trained Foreign Students Have More Opportunities When They Return Home
  ➢ Brain circulation

• Employment Based Green Card Process is Broken
Geographic Advantages Diminish

Companies Reluctant to Use Overseas Talent

- Companies Substitute Foreign for US Workers
  - By shifting tasks overseas
  - By importing foreign workers on H-1B and L-1 visas
  - Forced knowledge ‘extraction’
    - Must train replacements as condition of severance
  - Workers no longer a stakeholder

R&D Labs in US

- Offshoring Production Attracts Design and R&D
Employment Situation for EEs in 2005

• Better Labor Market Than 2003 & 2004
  ➢ Some job creation – no robust hiring
  ➢ Some engineers drop out of the labor market

• Defense Contracting Rising
  ➢ Security clearance premiums

• Regional Opportunities Uneven
  ➢ Silicon Valley still sluggish
  ➢ Washington DC hot

• Insecurity About Future

• Different in Other Disciplines
Politics/Policy for Engineering Workforce Issues

• Interest Groups’ Goals Not Always Aligned
  ➢ US Industry
  ➢ US Universities
  ➢ US Engineers
  ➢ US Government
  ➢ Developing Countries Industry
  ➢ Developing Countries Governments

• Each Group Has Differential Influence (Power) on Policy-Making Process
Conflicting Goals

• US Industry
  ➢ On-demand access to citizen-independent high-skilled labor
  ➢ Training is government responsibility
  ➢ CEOs not compensated on number of workers (US or otherwise)

• US Universities
  ➢ Increasing supply of government funds
  ➢ Access to world’s best & brightest
    o Here and over there
Conflicting Goals

- US Engineers
  - Secure career – avoid commoditization
    - ROI for high up-front investment costs
  - Protection from “unfair” competition
    - H-1B & L-1 guest worker visa programs
  - Understanding and acquiring skills in demand
Conflicting Goals

• US Government
  ➢ Strong domestic technology human capital
    o National Innovation System – economic growth
    o Military Superiority
  ➢ Employment – good quality jobs
  ➢ Healthy science & engineering labor market
  ➢ Open new markets & develop good relations
  ➢ Capture best and brightest from abroad
Conflicting Goals

• Developing Countries’ Government & Industry
  - Ability to move labor in and out of US with no restrictions
    - Restrictions (such as safeguards for US engineers) are non-tariff barriers
  - Movement up the ladder of innovation
  - Access to US market
    - Largest and most sophisticated
  - Utilize an idle domestic labor force
Contradictory Theories

• Infinitely Expanding Opportunities
  ➢ Economist Paul Romer’s Gold Prospecting Thesis
    o More Engineers (prospecters) means more innovation (gold)
    o Demand for engineers is infinite
  ➢ Jobs moving overseas (or domestically to foreign workers) has negligible impact on US labor demand
    o No effect on number of jobs in the US
    o No effect on US wages

• Zero Sum Game
  ➢ Lumps of labor – a job moving overseas means one less job in the US
Contradictory Theories

- Confusion Enables “Convenient” Rationales & Policy Studies
  - No base theory to test empirics against
Human Capital Response: Increase US Engineering Pool

- Advocated by “Washington Consensus”
  - US Industry, Universities, NGOs (National Academy of Engineering), Government (National Science Board)
  - Based on Romer’s gold prospecting thesis
  - Thomas Friedman – Key spokesman
- Convince Students of Merits of Studying Sciences and Engineering
  - Bill Gates spreads gospel of opportunity - but only hired 500 net new US workers in FY04
  - Infosys, Tata, Wipro all >10,000 hires
Human Capital Response: Increase US Engineering Pool

- Spend Taxpayer $s to Expand Engineering Education Subsidies
  - Produce more graduates
  - Engineering education is expensive (money loser in many colleges)
- Expand H-1B Program
- We’ve Been Here Before
Better Response for US Technology Human Capital

• How Many Engineers Do We Need?
  ➢ Wrong question
  ➢ Let market for engineering talent work
    o Supply and demand

• Instead Focus on Creating New Geographic Comparative Advantages
  ➢ Invest in differentiation rather than simply expanding pool
  ➢ Make US engineers 8X+ more productive and supply issue solves itself
    o If wages increase students will appear
Better Response for US Technology Human Capital

• Differentiate US Technology Human Capital
  ➢ Can’t compete on price or quantity so must *differentiate*
  ➢ Adjust to new demand profile due to offshoring
    o Which jobs stay, which go?
    o Government responsibility in reporting objective information
  ➢ Preserve geographic proximity advantage
    o H-1B undercuts US worker comparative advantage
  ➢ Reform education curriculum based on division of labor
    o NOT simply divided by more/less education
  ➢ Lifelong learning
    o Half-life of an engineer is decreasing

• US Engineers Specialize on “Sticky” Jobs
Amount & Type of Work That Has Moved Offshore?

• No One Knows
• Government is Not Collecting Data
  ➢ Political appointees rewrite US Commerce Dept study “Just the Bright Side” - Oct 17th BusinessWeek
  ➢ GAO: “government data provide limited insight.”
  ➢ $2 million NAPA study concludes it’s an “elusive phenomenon”
• Trade in Services Data is Poor
  ➢ India reports exports to US: $8.7 billion (2003)
Amount & Type of Work That Has Moved Offshore?

• Companies Unwilling to Reveal Plans (Rational Behavior)
  ➢ Employee backlash
  ➢ Public backlash
  ➢ Customers would demand drop in prices

• Pressure by Wall Street To Announce Plans
  ➢ CapGemini downgraded by Morgan Stanley in July in part for not offshoring enough
    o By November announced “inorganic” growth to 10k headcount in India
  ➢ Accenture expanding low-cost country headcount by 30k – Quarterly analyst call
Amount & Type of Work That Has Moved Offshore?

• Some High Skill/High Wage Work Is Moving
  ➢ Division of labor does not follow a simple pattern
• We Know It Is Accelerating
  ➢ Moving from pilot stage to large deployments
• Poor Labor Market Signals

• Policy & Education Proposals Based On Little or No Data
Future Trends: Case of IT Services
Emerging Global IT Services Business Model

- Offshore Outsourcers Are *Market Leaders*
- Indian-Based IT Companies Trying To Capture US Customers – *Not US Workers*
  - Infosys has 5,050 H-1B & L-1 foreign workers in US
  - Not “Toyota-ization”
IT Services: Emerging Global Delivery Model

- Traditional IT Services Companies Adopt Offshore Business Model
  - IBM 6k to 38k in India (>10% employees)
  - EDS moves 20k jobs
  - Accenture increases low-cost workers by 30k
  - CapGemini downgraded by Morgan Stanley Announces *inorganic* growth in India of 10k
# Emerging Global IT Services Business Model

<table>
<thead>
<tr>
<th>Name</th>
<th>HQ</th>
<th>Market Cap</th>
<th>Latest FY Sales</th>
<th>Profit Margin (5 yr Avg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infosys</td>
<td>India</td>
<td>$19,877</td>
<td>$1,592</td>
<td>27.93%</td>
</tr>
<tr>
<td>Wipro</td>
<td>India</td>
<td>$15,268</td>
<td>$1,627</td>
<td>20.59%</td>
</tr>
<tr>
<td>Electronic Data Systems</td>
<td>US</td>
<td>$12,517</td>
<td>$25,865</td>
<td>2.74%</td>
</tr>
<tr>
<td>Computer Sciences Corp</td>
<td>US</td>
<td>$10,015</td>
<td>$14,059</td>
<td>3.23%</td>
</tr>
</tbody>
</table>

Dollar figures in millions; Retrieved from Reuters.com on November 13, 2005
<table>
<thead>
<tr>
<th>Name</th>
<th>Price to Sales</th>
<th>Sales Growth % 1 Year</th>
<th>P/E Ratio TTM</th>
<th>Effective Tax Rate 5 Yr Avg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infosys</td>
<td>10.42</td>
<td>40.96</td>
<td>42.38</td>
<td>14.01</td>
</tr>
<tr>
<td>Wipro</td>
<td>7.53</td>
<td>36.37</td>
<td>42.96</td>
<td>13.42</td>
</tr>
<tr>
<td>EDS</td>
<td>0.40</td>
<td>0.55</td>
<td>NM</td>
<td>35.87</td>
</tr>
<tr>
<td>CSC</td>
<td>0.54</td>
<td>30.15</td>
<td>15.82</td>
<td>30.55</td>
</tr>
</tbody>
</table>

Retrieved from Reuters.com on August 13, 2004 – Analysis by Ron Hira, RIT
Offshore Outsourcing
Firms Hiring Briskly

• Tata Consultancy Services
  ➢ Added a net 3,974 employees in the quarter and has now expanded staff by 7,000 this year

• Infosys
  ➢ “To meet vigorous demand for outsourcing, Infosys hired 5,010 people during the quarter, slightly less than 5,100 hired in the whole of the last fiscal year.”

• Microsoft
  ➢ Microsoft added 500 net new jobs to US payrolls between June 2003 and June 2004 – increase of about 1.4%
Wide Variety of Jobs Have Moved Offshore

“Any Task That Can Be Sent Down A Wire”

- Accounting
- Software
- News Reporting & Editing (VOA)
- Legal
- Architecture
- R&D
- VC Firms Pushing Engineering Design
- Insurance Claims Processing
- Radiology
- Call Centers
- Financial Analysis
Just Low Level Work?
Sample Intel India Job Ad

- **RF Simulation Engineer** (Job# 274125)
- In this position you will build various antenna, RF channel and PHY/MAC models for various RF technologies; and simulate platform noise impact. You will also interact closely with internal wireless product groups to develop solutions to enhance RF performance in notebooks.

**This position requires a M.S. or Ph.D. in Electrical Engineering with experience in mobile notebooks, WPAN, WLAN, WMAN, WWAN and platform noise.** You must also possess:
- Experience building various antenna, channel,
Outsourcing Saturation
Just the Beginning

2006

Saturation
TIME
Recent Announcements

- Intel Investing $1bn in India
  - 80% for Engineering and 20% for VC
- Microsoft Investing $1.7bn in India
  - Headcount from 4k to 7k in India by 2008 (>10%)
- CISCO Investing $1bn in India
  - For Engineering Design; Not for Manufacturing
- JP Morgan Chase
  - Doubling India staff by 2008 (+ 4,500); ~1/3 global back office
- Wachovia
  - 3,000 IT jobs in Charlotte to be offshored
Conclusions

• Need Better Understanding of Political Economy of Engineering Workforce
  ➢ Companies have a disproportionate influence on policy-making process

• Risk for Downward Spiral
  ➢ Poor job market leads to diminished interest

• Quantity is Wrong Measure
Conclusions

• Not All Engineering Disciplines Affected Same Way
  ➢ Civil engineering doing well because of construction boom
  ➢ Individual labor markets

• Need Solid & Transparent Research to Inform:
  ➢ Engineers; Educators; and Policy
  ➢ Too Many Working in “Answer Space” instead of “Problem Space”

• Consequences for Real People
• Consequences for Long Term Productivity
  ➢ Standard of Living