Globalization

from engineering to economic development

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Globalization: What’s Really Happening Here?
Globalization: What’s Really Happening Here?

- Evolving Economic Ecosystems
- Local Interpretation
- Changing Skillsets
- This is not new
- Accelerating Change
- Balance, Equilibrium
- Are We Ready?

Brien Aho / U.S. Navy via Reuters
Globalization: What’s the Role of Industry?

- Producers of Technology
- Consumers of Talent
- Partners in Creating New Knowledge
- Ecosystem is Complex
- Example: Hewlett-Packard
Globalization: What’s Needed?

~ Honest Assessment ~

~ The Right Attitudes ~

~ Inspiration ~
Thank You

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What’s Happening in…

China

- More Students in Colleges & Universities (20 million) than US, India, Russia, Japan
- Doubled Number of S & E PhDs From 1996-2001 to Greater Than 8,000
- Beijing Geely University, one of 1,300 Private Universities - 20,000 Students @ $1,000/yr
- Tsinghua University - the MIT of China - Most Faculty Studied Abroad, English Popular
- Applications to US Down 60% in Last Two Years

Lester Gerhardt, Dean of Graduate Education, Acting
World Bank – The Four Pillars of The Knowledge Economy

• **Education & Training**
  An educated and skilled population is needed to create, share and use knowledge.

• **Information Infrastructure**
  A dynamic information infrastructure-ranging from radio to the internet-is required to facilitate the effective communication, dissemination and processing of information.

• **Economic Incentive & Institutional Regime**
  A regulatory and economic environment that enables the free flow of knowledge, supports investment in Information and Communications Technology (ICT), and encourages entrepreneurship is central to the knowledge economy.

• **Innovation Systems**
  A network of research centers, universities, think tanks, private enterprises and community groups is necessary to tap into the growing stock of global knowledge, assimilate and adapt it to local needs, and create new knowledge.
Less than 15% of US students have the math and science prerequisites to realistically pursue technology/engineering related careers.
Global Competitiveness of US in Math and Science is on a decline.

NOTE: Countries not meeting international guidelines are shown in parentheses.

SOURCE: Third International Mathematics and Science Study.
The Changing Roles of Engineers

- **Globalization** of industry and engineering practice
- The **shift of engineering employment** from large companies to small and medium-sized companies, and the growing emphasis on entrepreneurialism
- The growing share of engineering employment in non-traditional, less-technical engineering work (e.g., management, finance, marketing, policy)
- The shift to a knowledge-based “services” economy
- Increasing opportunity for using technology in the education and work of the engineer
Successful Attributes for the Engineer of 2020

**ADAPTIVE LEADERS**

- Possess strong *analytical skills*
- Exhibit practical ingenuity; possesses creativity
- Good *communication skills* with multiple stakeholders
- Business and management skills; *leadership* abilities
- High *ethical standards* and a strong sense of professionalism
- Dynamic/agile/resilient/flexible
- Lifelong learners
- Ability to frame problems, putting them in a *socio-technical* and operational context
Jobs moving to India

US jobs are fleeing overseas...
United States
- GDP per capita $35,060
- Unemployment rate 5.8%
- Labor force 141.8 million
- Population below the poverty line 13%
- Typical salary for a programmer $70,000

India
- GDP per capita $480
- Unemployment rate 8.8%
- Labor force 406 million
- Population below the poverty line 25%
- Typical salary for a programmer $8,000

Top 5 US Employers in India
- General Electric
  - 17,800 employees
- Hewlett-Packard
  - 11,000 employees
- IBM
  - 6,000 employees
- American Express
  - 4,000 employees
- Dell
  - 3,800 employees

Source: Wired Magazine Feb 2004

Dr. Pezeshki, GCEE 2005
## Engineering Graduates

<table>
<thead>
<tr>
<th>Region/Location</th>
<th>Number of Engineering Graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>300,000</td>
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<tr>
<td>India</td>
<td>200,000</td>
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<tr>
<td>Japan</td>
<td>104,478</td>
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<tr>
<td>Russia</td>
<td>82,409</td>
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<td>United States</td>
<td>59,536</td>
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<td>South Korea</td>
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<td>Taiwan</td>
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<td>Mexico</td>
<td>24,184</td>
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<tr>
<td>Germany</td>
<td>23,196</td>
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<tr>
<td>Brazil</td>
<td>18,072</td>
</tr>
<tr>
<td>Romania</td>
<td>6,632</td>
</tr>
</tbody>
</table>

Source: NRC Science and Engineering Indicators - 2004
Engineering for the Americas

Lima Declaration Action Plan states:
“Build local engineering capacity to create knowledge that ensures the solution of local needs and opens the chance to compete for global opportunities.”

Engineering for the Americas endorsed
Engineering for the Americas Partners

- The Organization of American States (OAS)
- The U.S. Trade and Development Agency (USTDA)
- The World Federation of Engineering Organizations (WFEO)
- High Tech Enterprises
- The Western Hemisphere Initiative (WHI)
  - accreditation agencies in USA, Canada, Mexico & Peru
- Experts and volunteers from universities across the Americas
Capacity building and economic development

“Give a person a fish: you have fed them for today.

Teach a person to fish: you have fed them for a lifetime.”

Teach them how to process and package fish for export, and you have stimulated economic development.

Russel C. Jones, Ph.D., P.E.
President, WFEO Committee on Capacity Building
HP Values

- passion for customers
- trust and respect
- achievement and contribution
- teamwork
- speed and agility
- meaningful innovation
- uncompromising integrity
- citizenship

HP benefited from one of the earliest examples of knowledge transfer and a strategic relationship process with the investment by Stanford Professor Frederick Terman in the work of his former students, Dave Packard and Bill Hewlett.
Intellectual Property and Government Partnerships

•Our Position: *Cooperation in university-industrial relationships, strong partnership between government and industry, and a robust intellectual-property framework, are critical to HP's success as a creator and provider of high-technology products.*

•Alliance for Science and Technology Research in America (ASTRA)
•Bay Area Science and Innovation Consortium (BASIC)
•Corporate Foundation Alliance (CFA)
•Glion Colloquium (GC)
•Government of Puerto Rico
•Government-University-Industry Research Roundtable (GUIRR)
•National Council of University Research Administrators (NCURA)
•Texas Engineering and Technical Consortium (TETC)
Engineering Accreditation and Engineering Education

Our Position: As a global employer, HP is keenly aware of the need for equivalence and portability in technical degrees granted around the world. The company actively promotes progress toward this end.

- Accreditation Board for Engineering and Technology (ABET)
- Ibero-American Science, Technology and Engineering Consortium (ISTEC)
- International Conference on Engineering Education (ICEE)
- International Network for Engineering Education and Research (iNEER)
- Information Technology Based Higher Education and Training (ITHET)
- Pan-American Union of Engineering Societies (UPADI)
- American Society of Engineering Education (ASEE)

- Engineering for the Americas
Engineering/Science Pipeline

- **Our Position:** *HP wants to increase the number of women and underrepresented minorities in technical careers. The company supports an approach that reaches to the earlier educational years, and advocates transformation of the university learning experience to improve retention rates.*

- Advancing Minorities’ Interest in Engineering (AMIE)
- Alliance for Teaching, Learning, and Society (ATLAS)
- (BEST)
- Computer Research Association (CRA)
- Institute for Women and Technology (IWT)
- National Academy of Engineering (NAE)
- MentorNet (MN)
- Society of Women Engineers (SWE)
- Women in Engineering Programs & Advocates Network (WEPAN)
Learning Science and Technology

• Our Position: HP believes watershed changes in teaching and learning are possible by combining technology with related course-content adjustment, and the company supports organizations pursuing this goal.

• Learning Federation (LF)
• Frontiers in Education (FIE)
• American Society for Engineering Education (ASEE)