Summary of the ASEE Global Symposium on
Engineering Education and the Global Economy

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Summary to ASEE Int’l Forum
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Context of the Shanghai 2011 Symposium:
At the crossroads in geography and time
--1st decade of 21st C: 80% of world economic growth
In North America/Europe
--2nd decade of 21st C: 80% in rest of world
Context: USA Public Perspective
Education is key to Economic Competitiveness

Volunteered Reasons the U.S. is Falling Behind Technologically

- Education, poor education/system: 38%
- Lack of work ethic/pride/motivation: 12%
- Outsourcing, sending jobs overseas: 9%
- Government, too many regulations: 7%
- Greed, too much focus on money/profit: 7%
- Not a priority, not enough spending: 6%
- U.S. politicians/leaders/politics: 5%

U.S. Tech Decline Is:
- Temporary: 55%
- Long term: 39%

Context: Economists’ Perspective
Too many or too few engineers?

2005 NRC Report: Rising Above the Gathering Storm warned of lack of engineers to meet US economic needs, and foreign competition

Controversy: V. Wadwha challenged Chinese stats; Some economists challenged US shortage—asked “Where is the smoking gun?”
Context: Economists’ Perspective
Too many or too few engineers?

The Smoking Gun #1: Georgetown Workforce Study—Oct, 2011:
--US STEM graduates at every level, HS to PhD, earn significantly more than their non-STEM counterparts.
--47% of BS degree holders in STEM earn more than PhDs in non-STEM
--This is true even if they do NOT go into STEM career fields

The Smoking Gun #2: Recent US engineering employment stats
--<2% vs. >8% for all fields
• 75 international thought leaders from academia, industry, and government
• High level recommendations
• Address questions:
  • “How can university ideas best be translated into innovations that better society and drive the global economy?”
  • What skillsets are needed to drive the global economy of the 21st Century and how are these best learned?
  • What is the role of government in bridging the valley of death between university research and startups and businesses?”
• Organizers:
  • China—Zhang Jie, Pres SJTU; Nian Cai Liu, SJTU; Q. Wu, Tsinghua; J. Chen, Zhejiang; Q Ye, SJTU; Y Shouwen, Tsinghua
  • US—T. Katsouleas, Duke; D. Pines, U Md; R. Parker, SJI; H. Hoyer, ASEE

• Session Chairs
  • Joyce Msuya, World Bank; CS Liu, U Md; Greg Washington, UCI; L. Martin-Vega, NCSU

• Additional Speakers
  • Dan Mote, U Md.; D. Munson, UM; R. Natarajan; S. McLaughlin, GaTech; S. Ramakrishna, Singapore; Machi Dilworth, NSF; A. Peerman, AMD; D. Hastings, MIT; B. Elliot-Lichfield, UIUC

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• Sponsors – Autodesk, Dassault Systemes, National Instruments, HP, Mathworks
International Perspective
Lessons from China

How we teach Engineering matters:

• 750,000 engineers/year graduated (10x US w/ same GDP!)
  but...
• “On one hand, a significant part of universities graduates found it difficult to find a job. On the other hand, many enterprises could not find persons they need.” -- Zhu Gaofeng, Former Minister of S&T

• Lack of PBL, design, general ed and societal connections cited
• Top Schools – Tsinghua, SJTU, ... somewhat different, changing
“Reverse Innovation:”

- GE Asia Example
  Developed & Manufactured CT Scanners in US (Normal Innovation)
  Re-engineered a piece in China to meet higher throughput need
  Began replacing other components with Chinese made
  Better machine at lower cost sold to US (Reverse Innovation)

--Xiangli Chen, General Manager, GE China Technology Center
International Perspective Lessons from China

Manufacturing Cost Gaps Closing

• Kunshun per capita income $26,000
• Manufacturing cost gap as little as 20% (JR Mathews, Priv. Comm.)
• Some US Companies (e.g., CAT) re-onshoring as well as outsourcing elsewhere
Challenges facing today’s global engineer (AMD example—seeking 2000 engineers in China)

Managing Geographical differences
- 7 or more time zones
- 10+ countries
- 24-48 hour resolution

Communication challenges
- Language barriers, slang, accents
- Communication & Documentation styles
- Decision making process differences

Culture
- Chain of command works differently
- Body language differences missed
- Yes doesn’t always mean yes (soft skills are different)

Pace of Innovation
- Rapidly changing technology environment
- Constantly evolving standards and regulations
- Learn how to learn

+ In smaller companies, understanding the market, supply chain and competition

Courtesy Alison Peerman, AMD
International Perspective
Lessons from China

Strong demand for partnerships w/ US in China
SJTU-Michigan Example (SJI, Rob Parker)

• UM UG Engineering Curriculum, delivered in English in Shanghai
• Tuition 5x normal chinese but 1/5 x US Out of State
• Top Students attracted, placed in US PhD programs
High level recommendations I: Global Ed Experiences

• Solving problems in cultural context is essential
  --needs of MNC’s & Grand Challenges

• Even for schools supporting regional workforce
  --students will need global skills and perspectives to succeed locally

• Engineering programs must establish more meaningful and sustainable partnerships leading to cross-cultural collaborations for students

• Best practices: study abroad program, an international solar decathlon, or designing in a developing country

• Collaborations between industry, foundations and philanthropy, governments, and academic institutions establish the ecosystem for success
The Partnership for 21st Century Skills has developed a vision for student success in the new global economy.

- Global awareness
- Solving problems in cultural context
- Abroad programs
High level recommendations II: Translation & Research Parks

• Best practices for Intellectual Property:
  -- U relinquish IP to faculty, who can offer the U partial ownership
  -- University endowments co-invest with VCs in faculty spin-offs
• Best practices in Educational Programs:
  • entrepreneur classes, business plan competitions, etc.
  • business/entrep workshops to PhD students/postdocs
• Faculty reward system (including promotion and tenure) for translation-
• Enhance “research park” concept
  • more mixing of for-profit, not-for-profit, and educational spaces
  • “educational, translational and human resource development experience”
• Promote/Facilitate/Support more market/use driven research
• Translation as part of the grant funding process (e.g., NSF iCorps)
Discussion

• 1) What skillsets are needed to drive the global economy of the 21st Century and how are these best learned?

What is working, what could work, how can we partner?
Discussion

• 2) How can university ideas best be translated into innovations that better society and drive the global economy?

What is working, what could work, how can we partner?
Soon to be announced:

**Coming to London after the Olympics**

The 1\textsuperscript{st} Int’l Summit on Grand Challenges for Engineering for the 21\textsuperscript{st} Century

Organized by

The US NAE

Chinese Academy of Engineering

Royal Academy of Engineering (UK)

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