The relationship between engineering work and "for humanity as a whole" varies dramatically as we move across the world…progress varies from place to place

—Downey 2014, Engineering Countries and the Problem of Globalization, Youtube

What is an engineer? What is engineering? What is engineering fo

Culture

Share set of values, ideas, concepts, knowledge, artifacts, customs, and rules of behavior shaping social group functions

What are dominant and non-dominant (often invisible) 'images' of engineering culture and role of engineer? Who gets to be an engineer?

How are e
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Engineering Culture(s)

Engineering culture and practice are not universal.

Perfection is possible

Serving people through government as elites

Nuclear energy becomes symbolic for France. Universal designs, orderly control over "nature", state + engineers = sustainable competitive advantage

Innovation for order--not innovation for consumption, private gain, or innovation for itself

Engineering evolves from 18th-19th century apprenticeship culture. Respect for minutiae, craftsmanship, rising through ranks

Status comes through collective action (prof. societies) and building private industry

Innovation is unclear and not driven by engineering even when discussed

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How do I credibly build a history of engineering as part of larger social forces?

U.S. Engineering Culture Evolved

- Pre Early 1800s looks like British apprentice situated around woodcraft (North America forests).
- Early to mid 1800s machining emerges and based production leading to precursors of industrialization
- Late 1880s into 20th century complexity of c grow and emphasize low cost, mass produc innovation through "perfection" (French & Engineers shift from labor (British) to mana capital class, and elite status
- 1920s to today Corporate Capitalism takes l leading up to Multi-national capitalism. Pro management stay in U.S. with labor moving cheaper areas and emerging markets.

What is a smaller "scope"? Who's grand challenges?

CHALLENGES

- Introduction
- Make Solar Energy Economical
- Provide Energy from Fusion
- Develop Carbon Sequestration Methods
- Manage the Nitrogen Cycle
- Provide Access to Clean Water
- Restore and Improve Urban Infrastructure
- Advance Health Informatics
- Engineer Better Medicines
- Reverse-Engineer the Brain
- Prevent Nuclear Terror
- Secure Cyberspace
- Enhance Virtual Reality
- Advance Personalized Learning
- Engineer the Tools of Scientific Discovery

Introduction to the Grand Ch Engineering

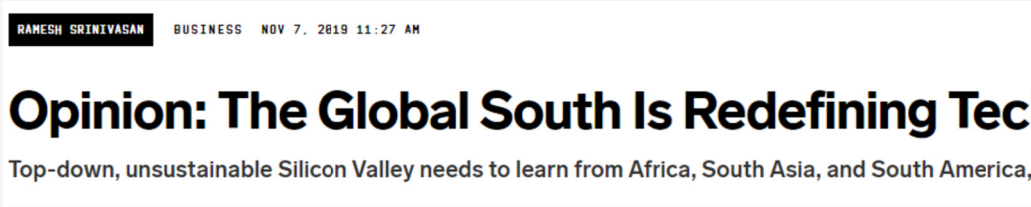
Throughout human history, engineering has driven the advance of civilizatio

From the metallurgists who ended the Stone Age to the shipbuilders who uni witnessed many marvels of engineering prowess. As civilization grew, it was r sophisticated tools for agriculture, technologies for producing textiles, and in Inventions such as the mechanical clock and the printing press irrevocably ch

In the modern era, the Industrial Revolution brought engineering's influence human labor for countless tasks, improved systems for sanitation enhanced and ships, and provided energy for factories.

In the century just ended, engineering recorded its grandest accomplishment and clean water, automobiles and airplanes, radio and television, spacecraft and the Internet are just some of the highlights from a century in which engi human life. Find out more about the **GREAT ENGINEERING ACHIEVEMENTS**

For all of these advances, though, the century ahead poses challenges as forr and its needs and desires expand, the problem of sustaining civilization's con looms more immediate. Old and new threats to personal and public health d Vulnerabilities to pandemic diseases, terrorist violence, and natural disasters prevention. And products and processes that enhance the joy of living remain since the taming of fire and the invention of the wheel.



RAMESH SRINIVASAN BUSINESS NOV 7, 2019 11:27 AM

Opinion: The Global South Is Redefining Tec

Top-down, unsustainable Silicon Valley needs to learn from Africa, South Asia, and South America,

What is a smaller "scope"? Build Good Engineers

- Engineering Education accreditation forms alo
  rise of corporate capitalism and shifting roles o
- Early engineering training was of mixed quality
  to concerns for supporting engineers during th
  Depression accreditation builds out of the eng
  societies (learns from medical professionalizat
  elite status)
- By WWII national interest in STEM explodes, a
  seen as codifying "good" engineers for the suc
  nation
- 1940s to 1980s emphasis is on technical skills a
  quantification of curriculum. Humanities and S
  Sciences go from essential to "nice but not nec
- 2000 to present is reconsideration of how to bu
  engineers and engineering culture

ABET Logic

NAE Perspectives

- *More than 80 years ago, ABET was founded*
  that new graduates had the skills needed to e
  profession. And, to this day, we constantly ch
  ourselves to learn more about the changing r
  academia, industry and the world as a whole,
  our criteria relevant, fresh and compelling.

- *…we are sobered by two realities: first, that scatte*
  interventions across engineering education over th
  decade or so have not resulted in systemic change
  only in isolated instances of success in individual p
  individual campuses; and second, that the disconn
  the system of engineering education and the pract
  engineering appears to be accelerating. This is due
  explosion of knowledge, the growing complexity a
  interdependence of societal problems, the worldw
  those problems, and the need to operate in a globa

NAE Report

NAE President

- *a vision that an engineering degree has the potential to becom degree for the twenty-first century;*
- *an undercurrent of awareness that current complexities are so tinkering at the edges—reforming one course, one program, or at a time, developing isolated instances of success here and th longer a viable response if we are to build the kind of robust pr research and education now needed to strengthen the U.S. en community by 2020;*
- ***The intention to "do good" is not always realized in the e artifacts, processes, and systems… As we look to the futu should accept responsibility for incorporating the consid possible unintended consequences into their work and se minimize the possibility of their occurrence…***
- ***…engineers should seriously consider potential impacts invention on individuals, society, and nature. The connec engineering and society should be tighter than it is. Coul technology cause harm to segments of the population an gap between the haves and have-nots? Is there racial or the algorithms we are developing for artificial intelligen automated systems? Could a new product damage the en negatively affect the way humans interact?***

ABET Today as a proxy for Engineering Culture Change?

1. an ability to identify, formulate, and solve complex
   problems by applying principles of engineering, sci
   mathematics
2. an ability to apply engineering design to produce s
   meet specified needs with consideration of public h
   and welfare, as well as global, cultural, social, envi
   and economic factors
3. an ability to communicate effectively with a range
4. an ability to recognize ethical and professional resp
   engineering situations and make informed judgmen
   must consider the impact of engineering solutions i
   economic, environmental, and societal contexts
5. an ability to function effectively on a team whose m
   together provide leadership, create a collaborative
   environment, establish goals, plan tasks, and meet
6. an ability to develop and conduct appropriate expe
   analyze and interpret data, and use engineering ju
   draw conclusions
7. an ability to acquire and apply new knowledge as n
   appropriate learning strategies.

Quiz Question 1

1	2	3	4	5	
Very confident	Above average confident	Somewhat confident	Above average confident	Very confident	Ve
Above average confident	Somewhat confident	Not confident	Somewhat confident	Above average confident	Ab co
Very confident	Somewhat confident	Somewhat confident	Somewhat confident	Very confident	Ve
Above average confident	Very confident	Somewhat confident	Somewhat confident	Above average confident	Ab co
Somewhat confident	Somewhat confident	Above average confident	Above average confident	Somewhat confident	So co
Somewhat confident	Somewhat confident	Above average confident	Above average confident	Very confident	Ab co
Somewhat confident	Somewhat confident	Above average confident	Somewhat confident	Very confident	So co
Above average confident	Somewhat confident	Somewhat confident	Above average confident	Very confident	Ve
Above average confident	Above average confident	Very confident	Above average confident	Above average confident	Ab co
Above average confident	Somewhat confident	Above average confident	Somewhat confident	Very confident	So co
Very confident	Above average confident	Very confident	Above average confident	Very confident	Ab co
Somewhat confident	Not confident	Somewhat confident	Somewhat confident	Above average confident	So co
Above average confident	Above average confident	Above average confident	Somewhat confident	Somewhat confident	Ab co
Somewhat confident	Somewhat confident	Somewhat confident	Somewhat confident	Above average confident	So co

Other forms of Evidence

- http://www.engineeringchallenges.org/challenges.aspx

Other forms of Evidence

http://www.engineeringchallenges.org/challenges.aspx

Other forms of Evidence

Where is the text located?

What is the intended audience?

What are they attempting to share with the audience?

What are different interpretations if you are not the intended audience?

Global

What is a global engineer?

Why do engineering societies, accreditors, and universities care if you understand global cultures and engineering practice?

Global Classroom

What can we learn from other students becoming engineers in the context of Taiwan as boundary space between Eastern and Western cultures