PROMAT 2015

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Role of Education in Innovation

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Presented by:
Erik Sander, Director
University of Florida
Engineering Innovation Institute

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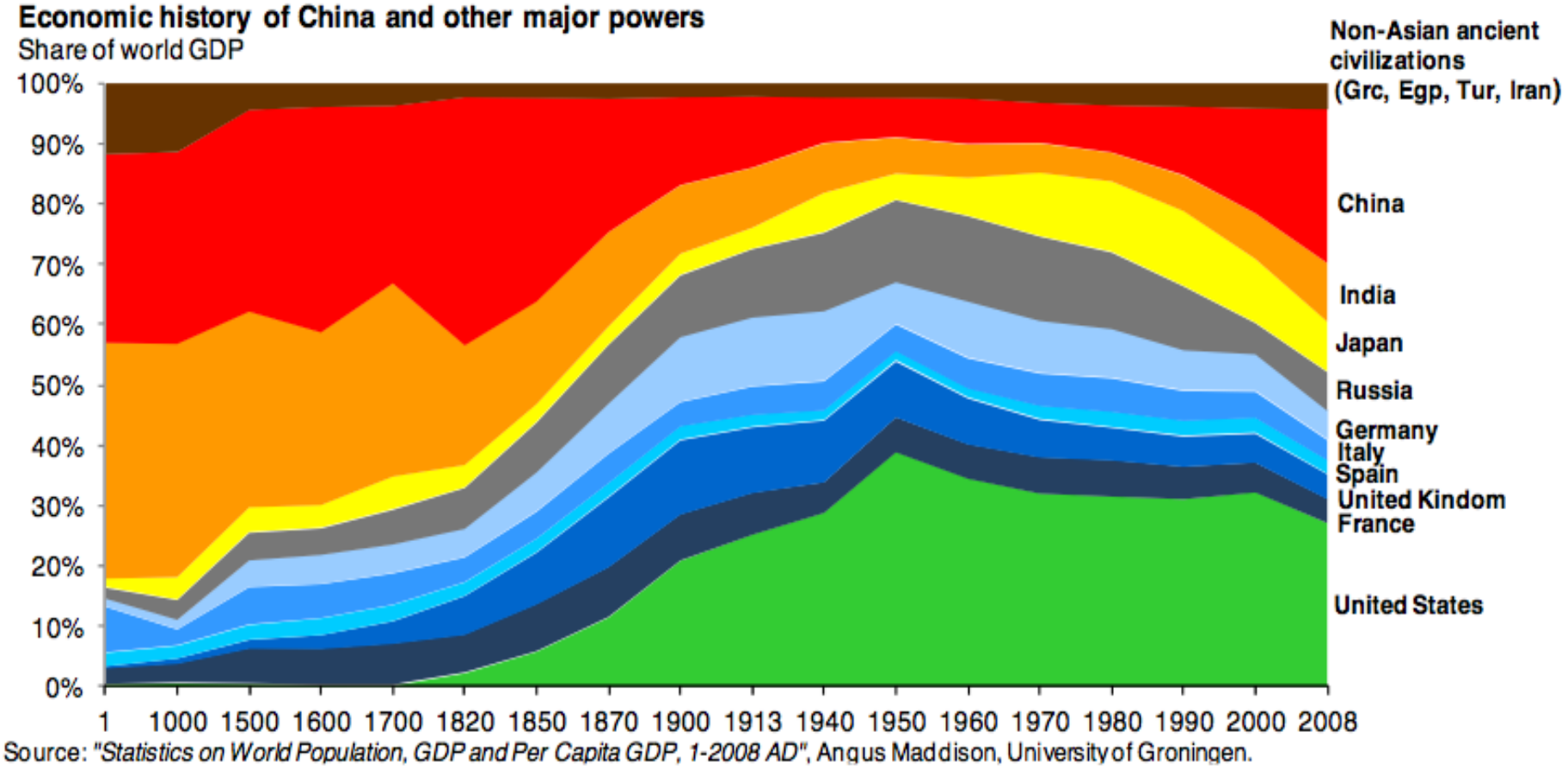
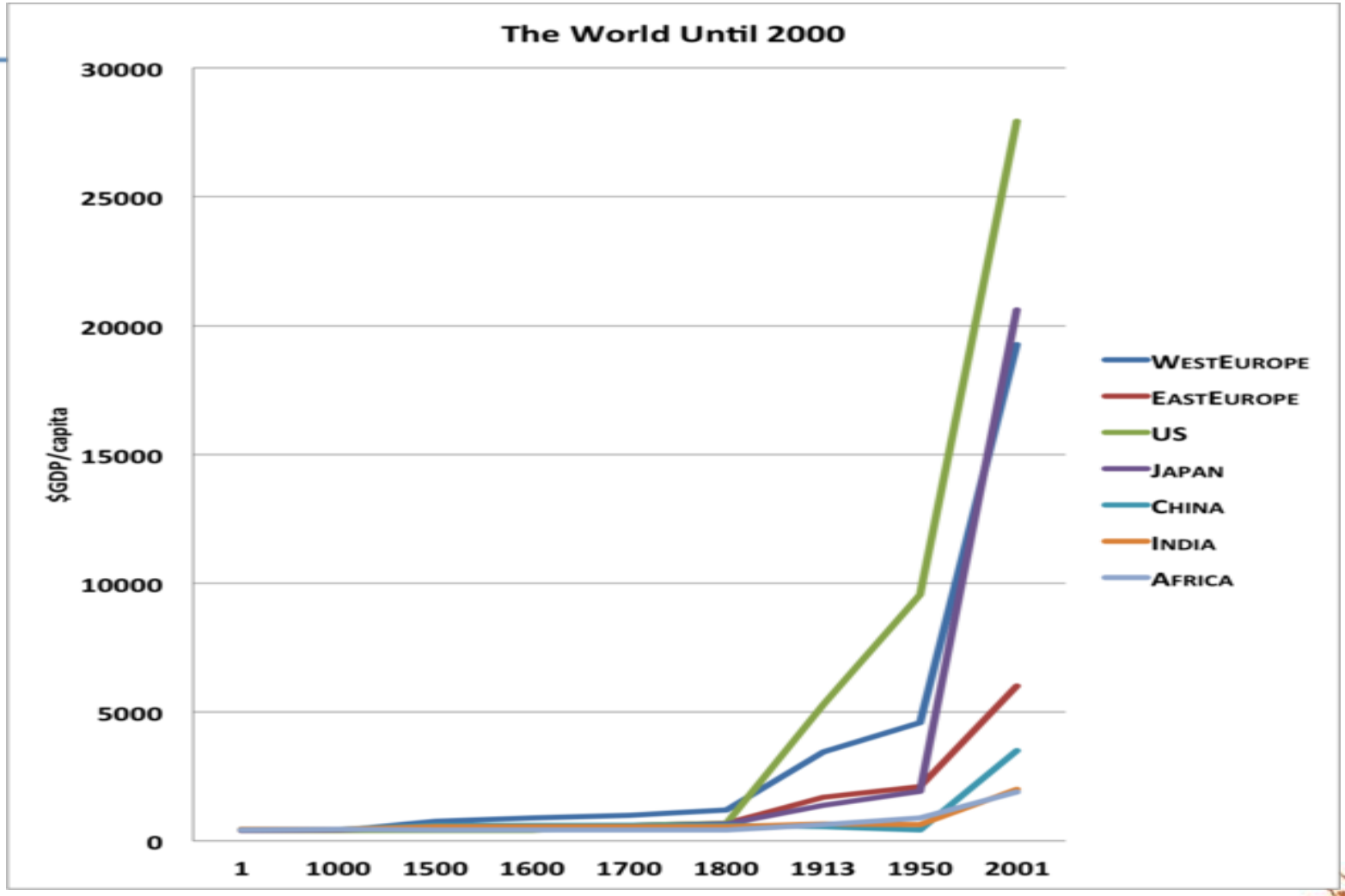
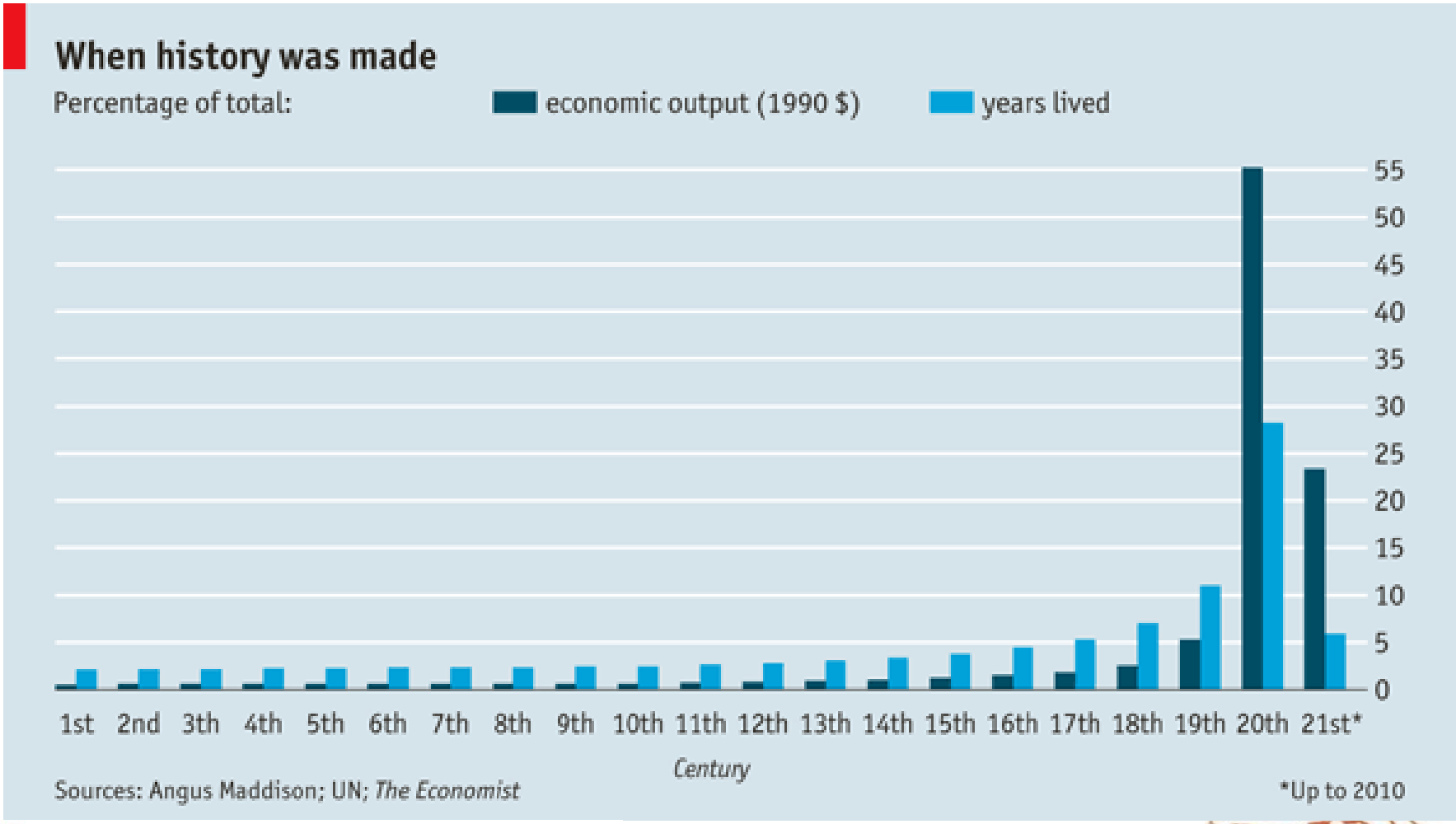
The Economic History of the World – The Impact of Innovation





Source: “Statistics on World Population and Per Capita GDP, 1-2008”, Angus Maddison, University of Groningen

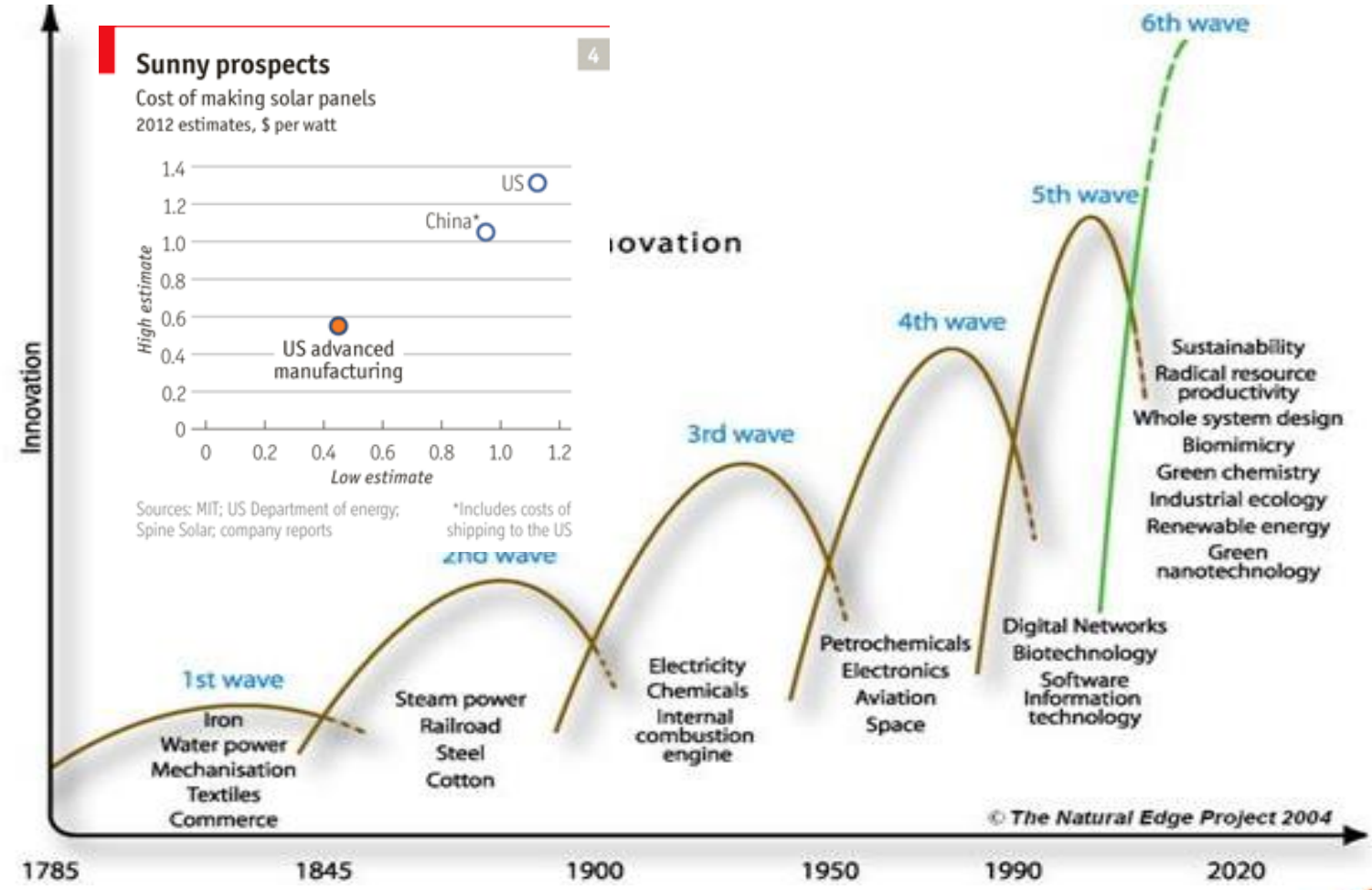
The Economic History of the World – The Impact of Innovation



Innovation Matters

Source: Time Magazine, February 25, 2014

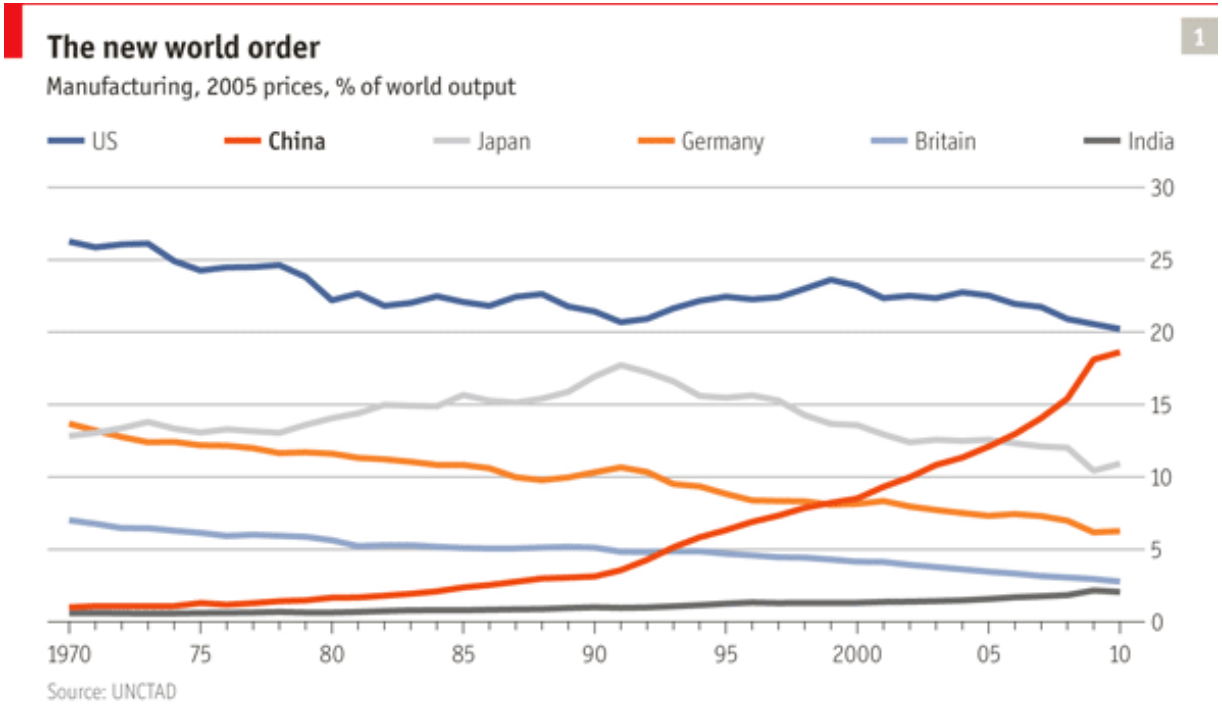
What is the next wave??



Large developing economies are moving up in global manufacturing

Top 15 manufacturers by share of global nominal manufacturing gross value added

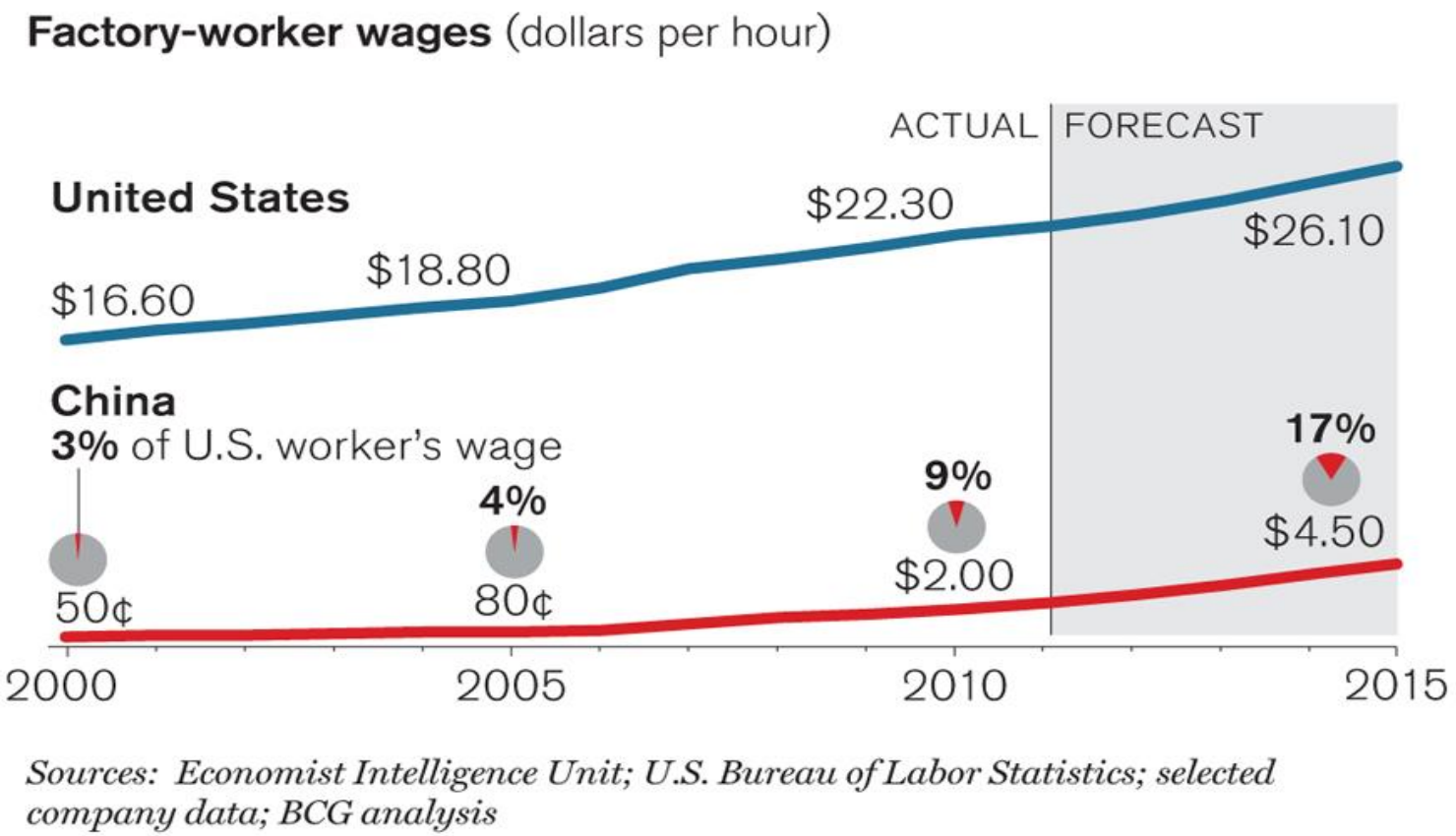
1 South Korea ranked 25 in 1980.
2 In 2000, Indonesia ranked 20 and Russia ranked 21.
NOTE: Based on IHS Global Insight database sample of 75 economies, of which 28 are developed and 47 are developing. Manufacturing here is calculated top down from the IHS Global Insight aggregate; there might be discrepancy with bottom-up calculations elsewhere.
SOURCE: IHS Global Insight; McKinsey Global Institute analysis



US technology infusion and innovation displaces labor – Equivalent manufacturing GDP output to China with 1/10th the manufacturing labor force

Taken from “The Third Industrial Revolution”,
The Economist, April 21, 2012

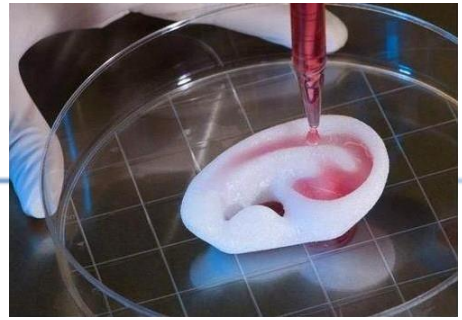
Differences in labor costs between China and the U.S. are shrinking, forcing some to rethink where to locate production.



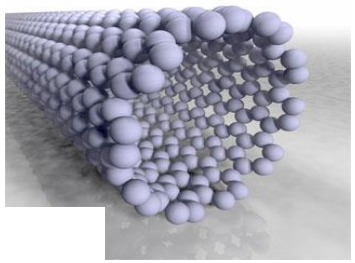
Sources: Economist Intelligence Unit; U.S. Bureau of Labor Statistics; selected company data; BCG analysis

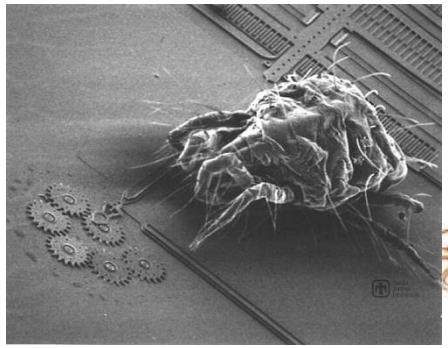
Taken from "Manufacturing in the Balance", MIT Technology Review, January 2013

The Future



- 3D Printing – Bioprinting
- Digital Design and Manufacturing
- Advanced Materials
- Intelligent Sensing Systems
- “Smart “Robotics
- Big Data
- Nanomedicine – therapeutics and devices
- Biological Production





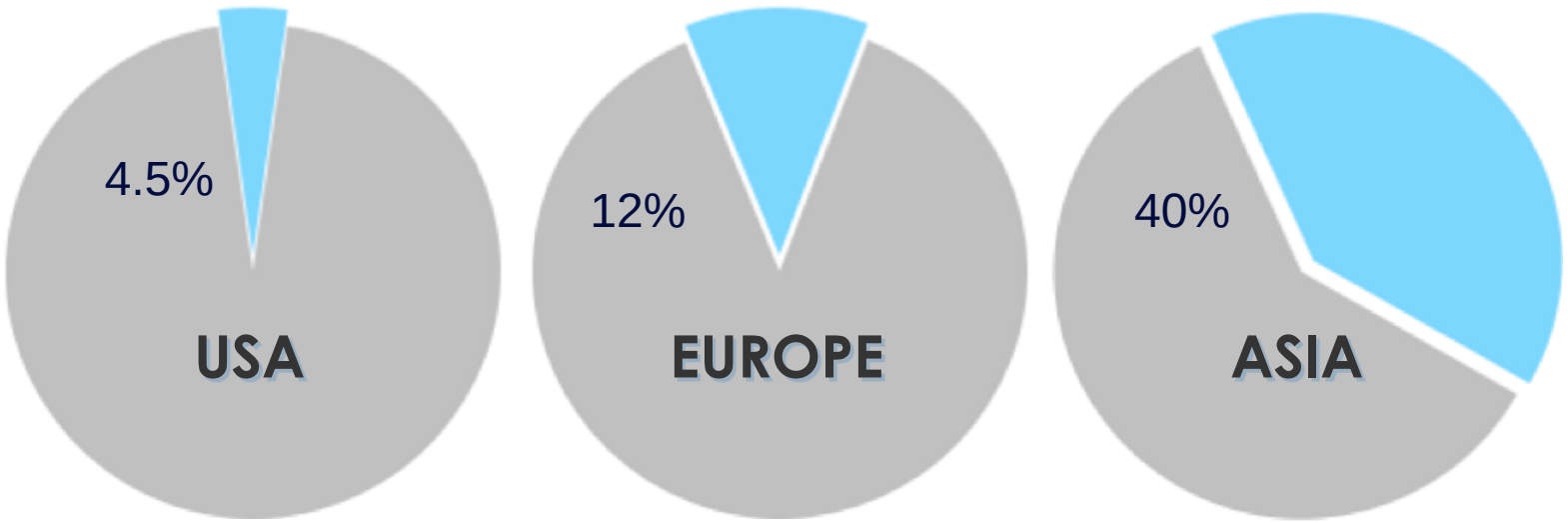
So Let's Look Forward
to the Next Generation

Can Innovation be Taught?

Is innovation over? Yes, several times.

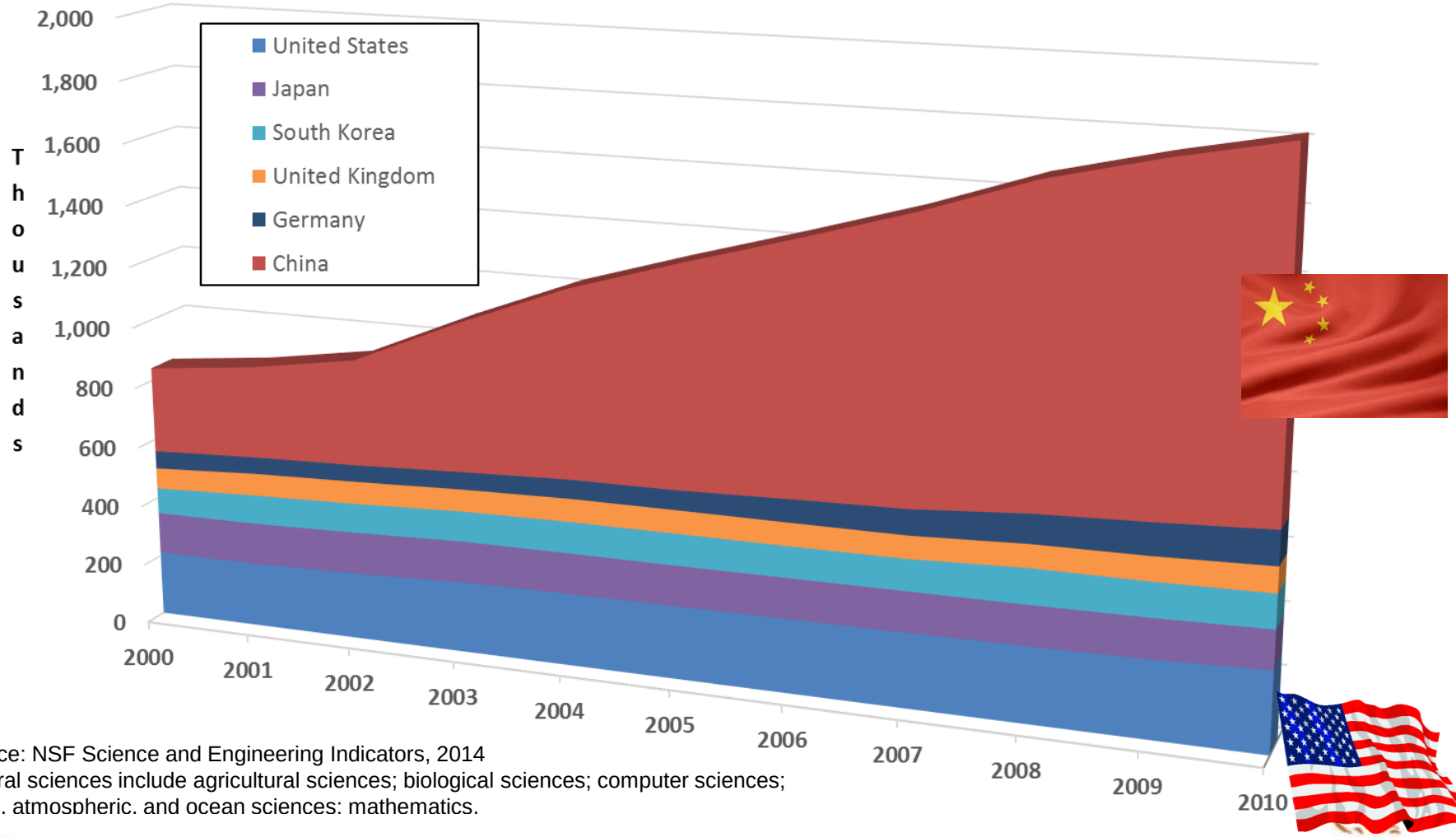
- No one will need more than 637 kb of memory for a personal computer. – Bill Gates, Founder and CEO Microsoft (1981)
- Television won't be able to hang on to any market it captures after the first six months. People will soon get tired of staring at a plywood box every night. – Darryl Zanuck, Founder 20th Century Pictures & United Artists (1946)
- I think there is a world market for maybe five computers. – Tom Watson, Chairman IBM (1943)
- Who the hell wants to hear actors talk? – HM Warner, CEO Warner Brothers (1927)
- Everything that can be invented has already been invented. - Charles Duell, Commissioner US Patent Office (1899)
- Inventions have long since reached their limit, and I see no hope for further developments. – Julius Frontinus, Roman Engineer (~10 A.D.)

Who Will Lead the Next Generation?



Source: National Academy of Engineering Press: Rising Above the Gathering Storm

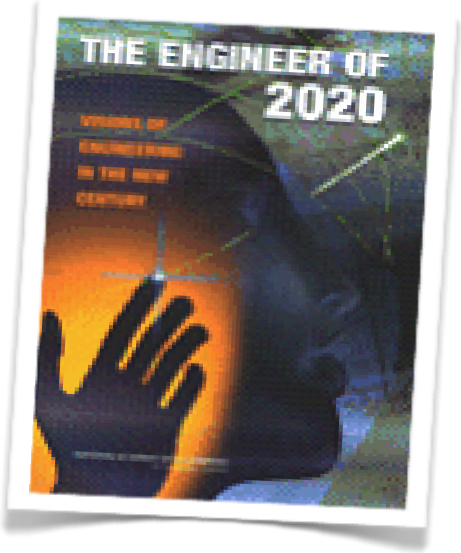
First University Degrees in Natural Sciences & Engineering (000's)



Source: NSF Science and Engineering Indicators, 2014
Natural sciences include agricultural sciences; biological sciences; computer sciences; earth, atmospheric, and ocean sciences; mathematics.

Next Generation Engineering Leadership Skills

National Academy of Engineering

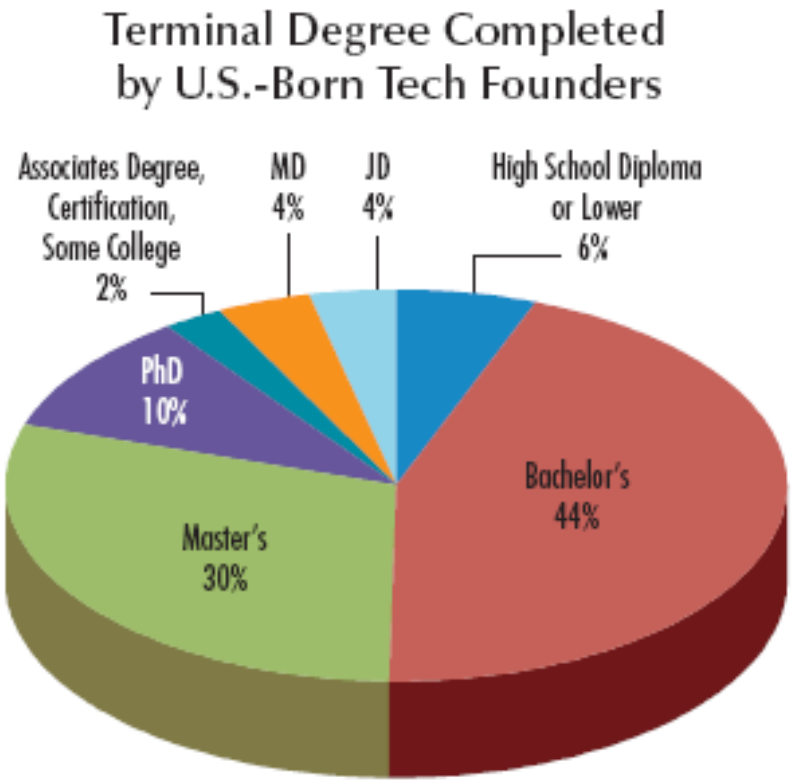


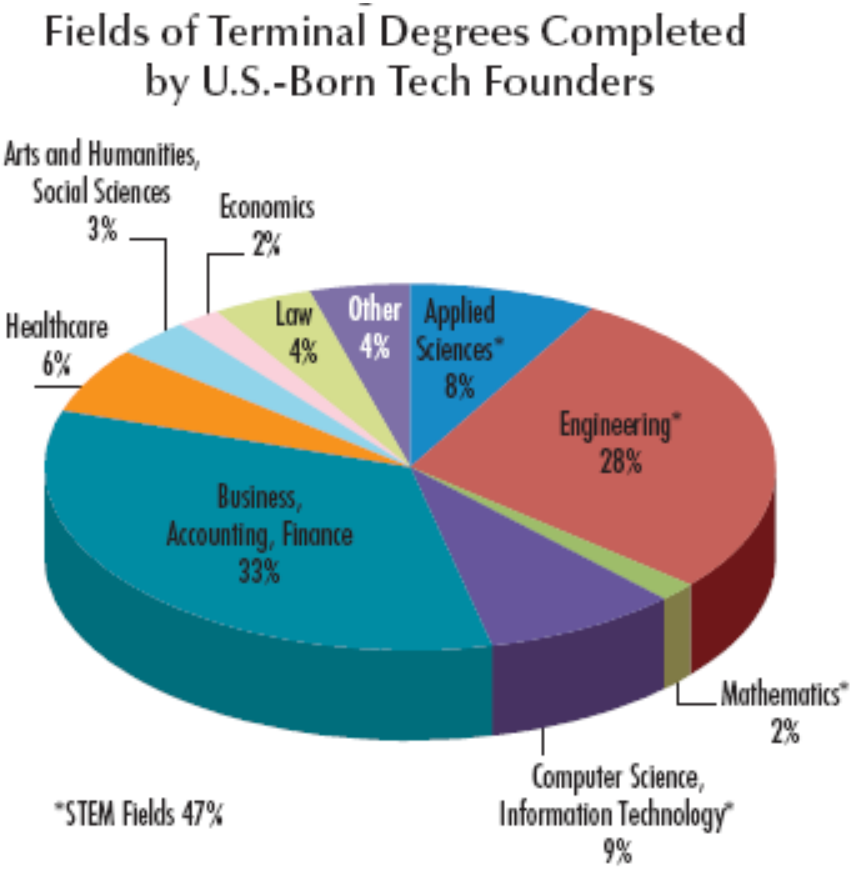
- Engineer of 2020; Rising Above the Gathering Storm
  - Strong analytical skills
  - Practical ingenuity, creativity, dynamism, agility, flexibility
  - Excellent communication skills
  - Understanding of business and management concepts
  - Leadership, high ethical standards, professionalism
  - Background in strategic and crisis decision-making

Can Innovation be Taught?

Technical Innovation Foundational Skills		
Change Management	Team Building/Dynamics	Basic Finance
Project Management	Persuasive Communications	Technology Vetting
Organizational Structure/Behavior	Ethics & Values	Marketing, Sales & Distribution
Basic Business Principles	Visioning/Value Proposition	Market Research
Project Risk Assessment	Working Across Cultures	Intellectual Property Management
Global & Historical Awareness	Negotiation & Advocating	Business Planning
Sustainability	Risk & Crisis Management	Entrepreneurial Fundraising
Innovation & Creativity	Network Building	Competitive Analysis
Understanding Core Values	Critical Thinking/Problem Solving	Excellence In Execution

Tech Rock Stars - Education





Source: Education and Tech Entrepreneurship: Kauffman Foundation; May 2008

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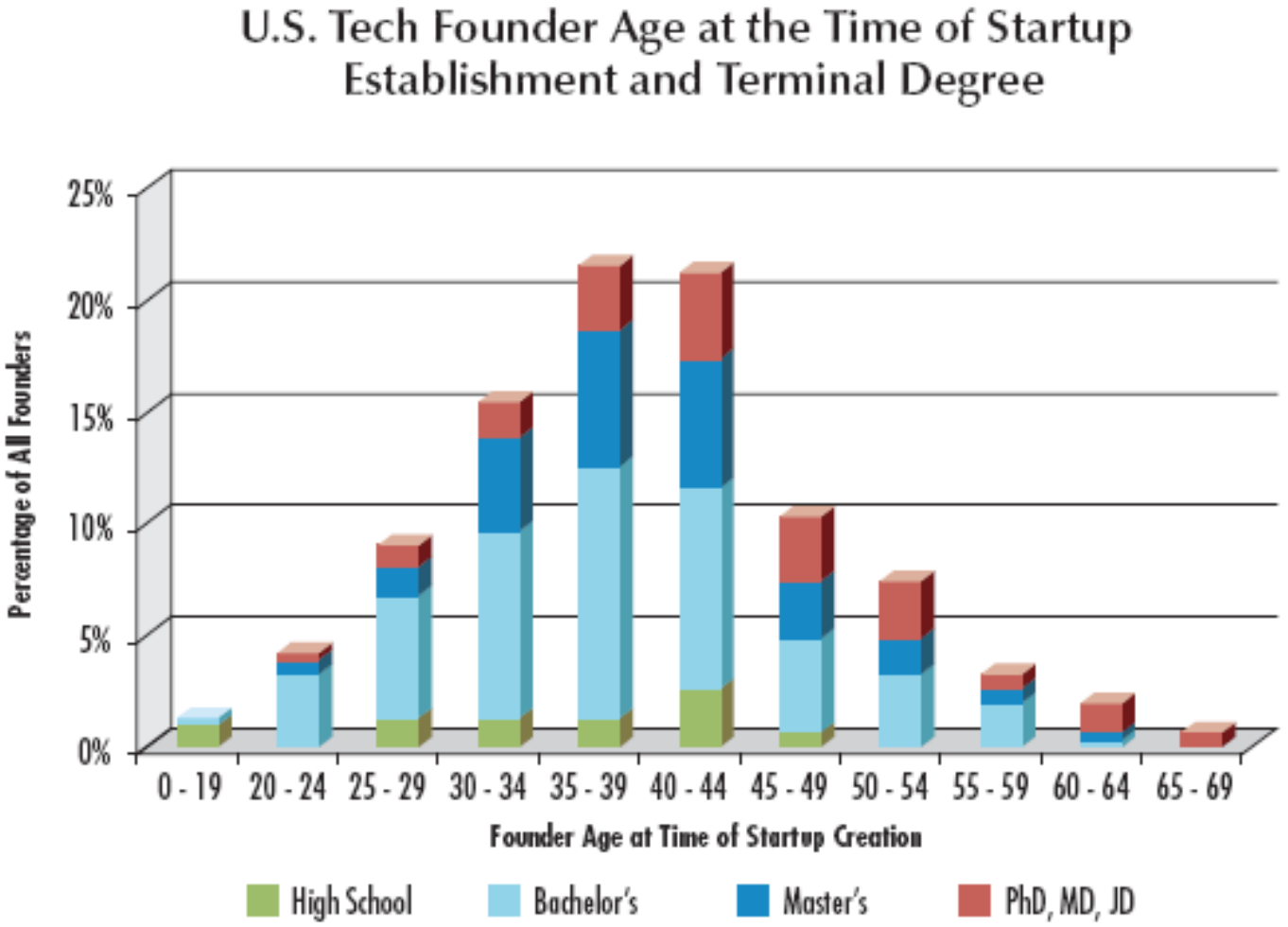
POWERING the NEW ENGINEER

Tech Rock Stars - Age



Source: Education and Tech Entrepreneurship: Kauffman Foundation; May 2008

Stanford Economic Impact Study

- ~39,900 active companies can trace their roots to Stanford creating an estimated 5.4 million jobs and $2.7T revenue.
- 29% of respondents reported being entrepreneurs who founded an organization (for-profit or nonprofit)
- 32% of alumni described themselves as an investor, early employee or a board member in a startup at some point in their careers.
- 25% of faculty respondents reported founding or incorporating a firm at some point in their careers.
- Among survey respondents who became entrepreneurs in the past decade, 55% reported choosing to study at Stanford because of its entrepreneurial environment.

Source: www.epicenter.stanford.edu

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Building a Culture of Innovation

- Rethink the way your organization thinks (Divergent vs. Convergent; Linear vs. Entrepreneurially)
- Enable and empower the inner child on an institutional basis
- Tie invention to innovation in how you measure success (Outcome vs. Activity Based)
- Understand that innovation comes from different models (Filament vs. Scotchguard®)
- Take a leap, but mitigate the risks

For More Information:

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Website: www.eng.ufl.edu/innovation