

Advanced Manufacturing- Challenges, Opportunities & Federal Initiatives

“And when we make things here, we perfect that next idea.”

- President Obama on “Launching Advanced Manufacturing Initiative on June 24 2011

Sridhar Kota

Professor of Mechanical Engineering
The University of Michigan, Ann Arbor

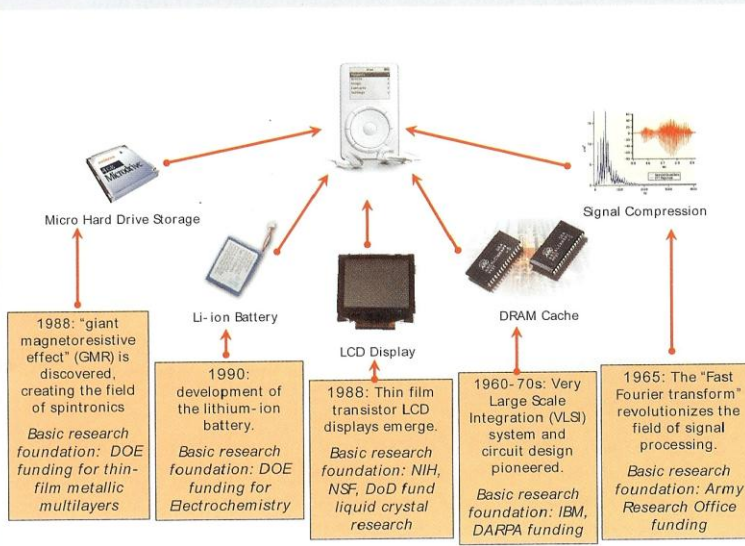
Former Assistant Director for Advanced Manufacturing,
White House Office of Science and Technology Policy

ASEE Engineering Dean Symposium, Washington DC, February 12, 2013

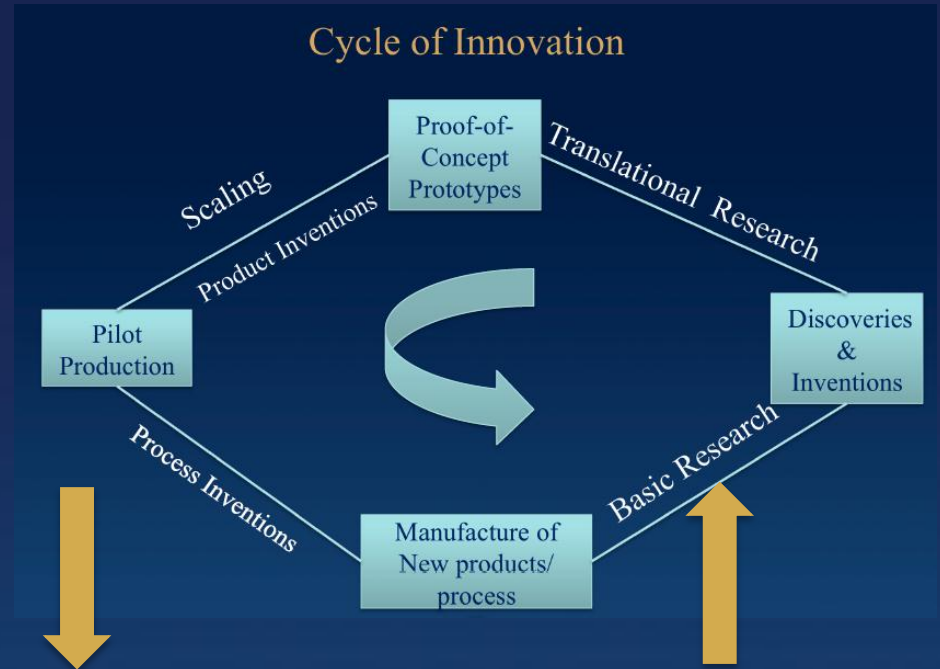
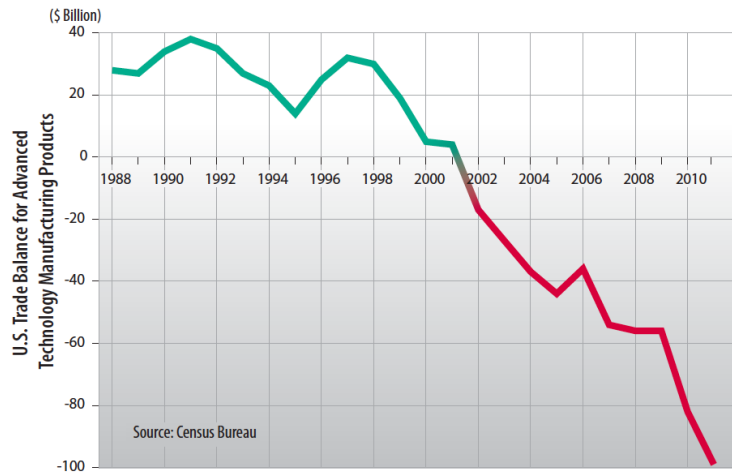


Creating Knowledge but Not Wealth

IMPACT OF BASIC RESEARCH ON INNOVATION



U.S Trade deficit in Advanced Technology Products



U.S. ATP goods deficits now exceed the total net foreign earnings on all Intellectual Property royalties and fees (including franchise fees) by all "U.S." incorporated companies, from Apple and Intel to Starbucks and McDonald's.

(Source: MTN -Nov 2011)



Innovation

Scientific Discovery → Engineering Invention → Innovation → Manufacturing,..

(A much broader) definition according to National Academies...

“Innovation commonly consists of being *first to acquire* new knowledge through leading edge research, being *first to apply* that knowledge to create sought-after products and services, often through *world-class engineering*; and being *first to introduce* those products and services into the marketplace through extraordinary entrepreneurship.”



Innovation Gap: The U.S. has steadily fallen behind in the “*application of knowledge*” in semiconductors, lighting, electronic displays, energy storage, computing and communications, advanced materials etc.



Innovation Policy to Establish a Robust Manufacturing Base

Creating new industries and strengthening existing industries



DEVELOPMENT

Total U.S R&D (2009): \$400 Billion

Industrial r&D \$275 B

RESEARCH

Fed. R & d \$125B

Federal labs
Universities
Non-Profits

U.S. Innovation Gap

Industry

Basic Research

Translational Research and Development

Applied R&D

Pre-production

Discovery-Invention

Radical Innovation

New Products

Incremental Innovation → Improved products

Basic Research \$76B

Applied R&D \$71B

Dev. \$253B

SBIR/STTR Phase I & II \$ 2.5 B

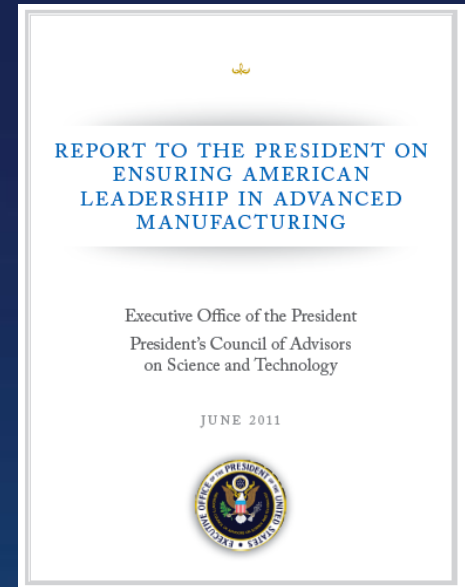
“Bell Labs” of yesteryears
German Fraunhofer Inst.
Taiwan’s ITRI



1. Closing the Innovation Gap

Launch an Advanced Manufacturing Initiative to support:

- Innovation in advanced manufacturing through **applied research** program for promising new technologies,
- PPPs around **broadly-applicable and pre-competitive** technologies,
- the creation and dissemination of design methodologies that drastically **decrease time** to make products, and
- **shared technology infrastructure** to support advances in existing manufacturing industries.



- \$1 billion (DOE, DOD, NIST and NSF) to establish a National Network of **Manufacturing Innovation Institutes**
- National Robotics Initiative (NSF, NASA, NOH, USDA)
- DOE – Manufacturing Demonstration Facilities
- DOD/DARPA investments to reduce product dev. time by 5X
- Materials Genome initiative



#2: Enhancing Competitiveness of SMEs

Democratizing 21st century tools - Access to Complex, Costly Computing Services

National Digital Eng. & Manf. Consortium

NDMEC – Midwest Pilot Initiative (2011)

Goal: Lower cost and expertise barriers to entry

Public-Private Partnership:

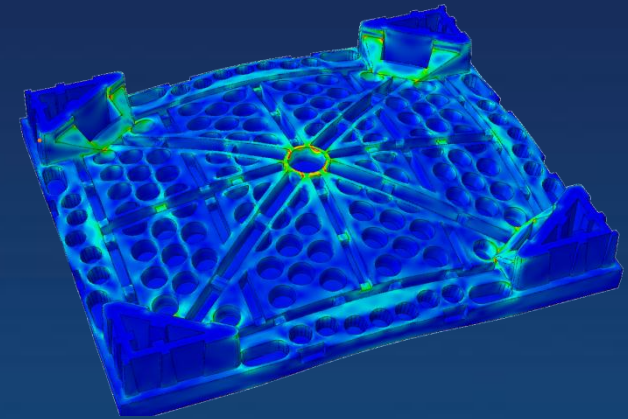
Commerce EDA - Council on Competitiveness, GE, John Deere, Lockheed, P&G, NCMS, NCSA, OSC, Purdue

• **Web browser is the gateway**

- Standard GUI across apps
- No software to download or install
- Run interactive applications
- Share work sessions live
- Access supporting content
- Software-as-Service business model

Jeco Plastics (Indiana)

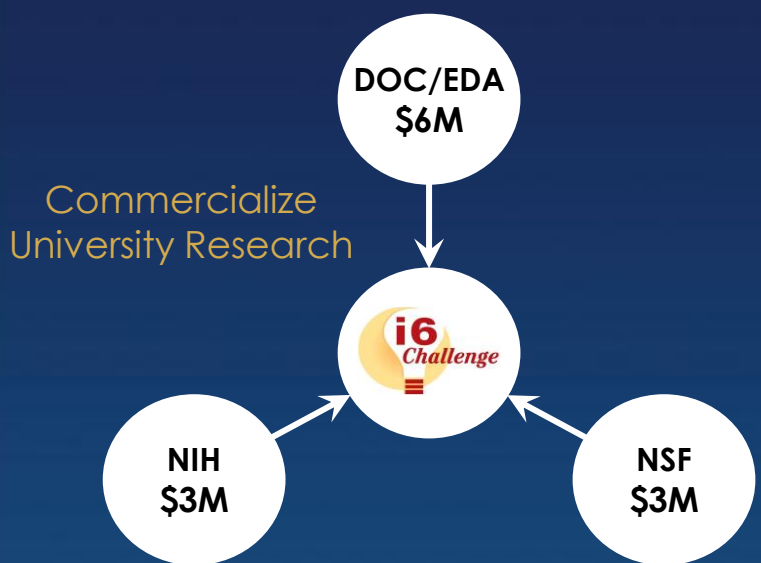
25-person SME Wins \$MM order, created jobs and exports



Leveraging nanoHUB

#3. Lab-to- Market Commercialization

Presidential Memo (Oct 2011)
committing each executive department and agency that conducts R&D to improve the results from its technology transfer and commercialization activities.



- EDA grant program focused on “proof of concept” centers.
- NSF’s Acceleration Innovation Research Program (proof-of-concept centers)
- I –Corps (faculty entrepreneurship) Programs

#4. Fueling Entrepreneurship: Startup America

- Access to capital
- Entrepreneurship education & mentorship
- Strengthen commercialization of federally-funded R&D



Responding to the President’s call to action, private-sector alliance launches online network where entrepreneurs can unlock critical resources valued at over \$730 million and climbing; goal is to accelerate the success of 100,000 high-growth entrepreneurs over 3 years



#5. Expanding the Participant Pool of Citizen Innovators & Manufacturers



- Establish a goal without having to choose the approach
- Pay only for results

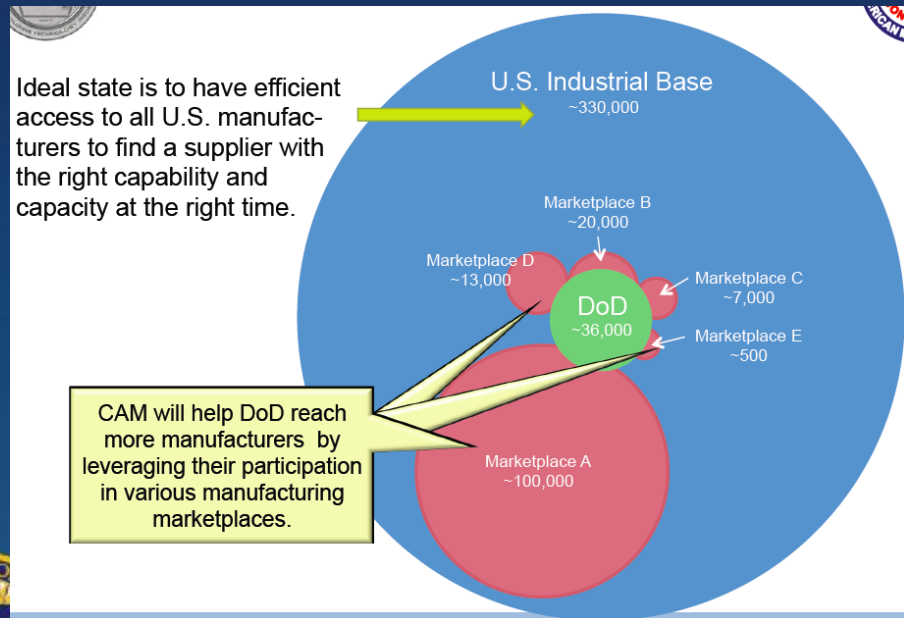
Connecting American Manufacturing: e-sourcing tools to find the right U.S. supplier with the right capabilities and capacity at the right time.

DoD purchases approx. \$200 billion of manufactured good every year... but it reaches out to one-tenth of U.S manufacturers (30,000) and another 10,000 foreign suppliers

DARPA taps Local Motors to design a support vehicle; 159 entries produced within two months by tapping growing network of 20,000 designers,

DARPA "Crowd-Derived" Combat Support Vehicle Pilot Delivers

Winner - "Flypmode" built in four months, presented to the President at AMP- June 24th, 2011



Source: DARPA, Local Motors, www.localmotors.com



Engineering 2.0

to create a pipeline of skilled, creative and innovative engineers

- **K-12**

- Bring Engineering into mainstream K-12 (not just extra curricular)
- Why not dissect a power tool?

- **Engineering Schools**

- Bridge the gap between theory & practice in education and research.
- Promote and reward entrepreneurship

- **Metrics**

- New set of metrics at universities and federal agencies for engineering (different from metrics for science)

- **Public Policy**

- We need a single and a strong voice representing the engineering discipline in Washington DC.

