TRANSFORMING THE WORLD. DRIVING THE NATION'S COMPETITIVENESS. LEADING INTO THE FUTURE.

The Impact of NITRD

Two Decades of Game-Changing Breakthroughs in Networking and Information Technology — Expanding Possibilities Ahead

IT Discovery and Innovation Ecosystem

Farnam Jahanian
Co-Chair, NITRD
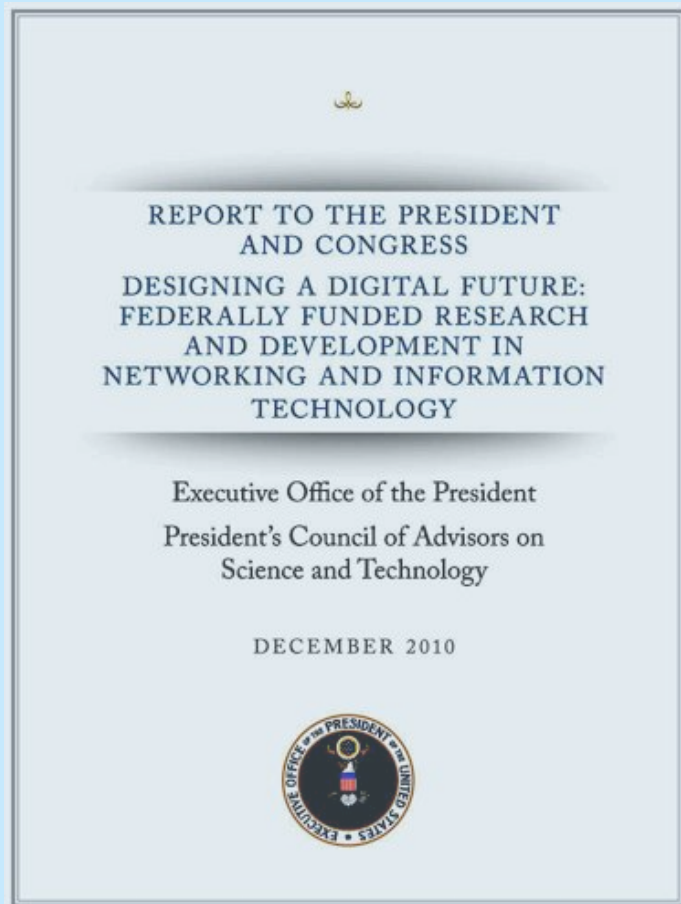Assistant Director for CISE, NSF

Pervasive Impact of NIT

- Networking and Information Technology (NIT) is at the center of an ongoing **societal transformation** and will be for decades to come.

- NIT underpins our **economic prosperity and national security**.

- NIT is a key driver of U.S. **competiveness** and sustainable **economic growth** in an increasingly global market.

- Advances in computational and data-enabled techniques **accelerate the pace of discovery and innovation** in nearly all other fields of inquiry.

Pervasive Impact of NIT

- NIT forms a **pervasive intellectual fabric** that intertwines a wide range of disciplines.

  - Scientific discovery and technological innovation are at the core of our response to **national and societal challenges** – sustainability, energy, transportation, manufacturing, education and workforce development, healthcare, public safety, cybersecurity, and national defense.

  - Many of tomorrow's breakthroughs will occur at the **intersections of diverse disciplines**.
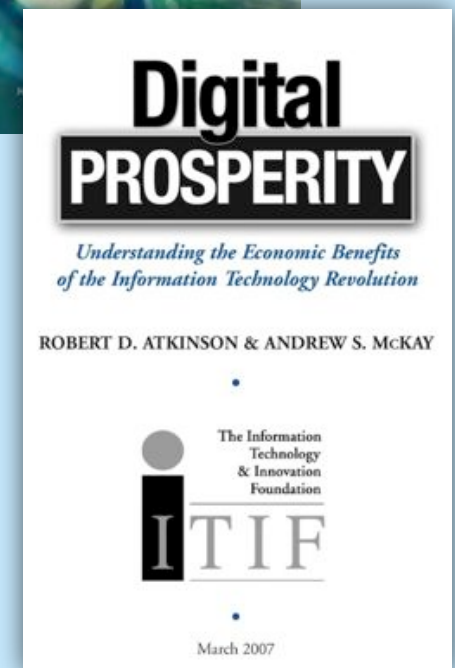
NIT is a National Imperative

REPORT TO THE PRESIDENT
AND CONGRESS

DESIGNING A DIGITAL FUTURE:
FEDERALLY FUNDED RESEARCH
AND DEVELOPMENT IN
NETWORKING AND INFORMATION
TECHNOLOGY

Executive Office of the President
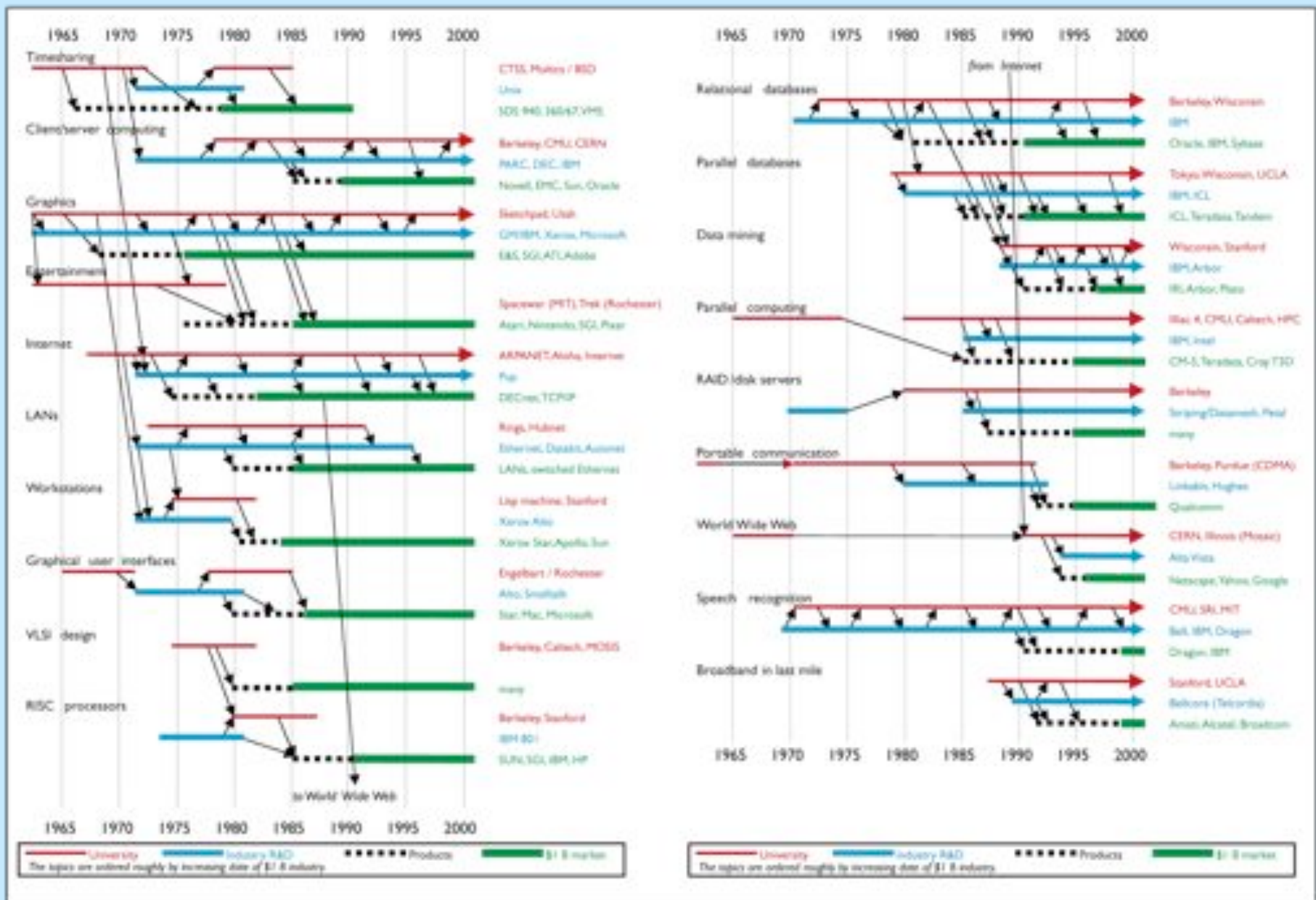President's Council of Advisors on
Science and Technology

DECEMBER 2010

"Recent technological and societal trends place the further advancement and application of NIT squarely at the center of our Nation's ability to achieve essentially all of our priorities and to address essentially all of our challenges."
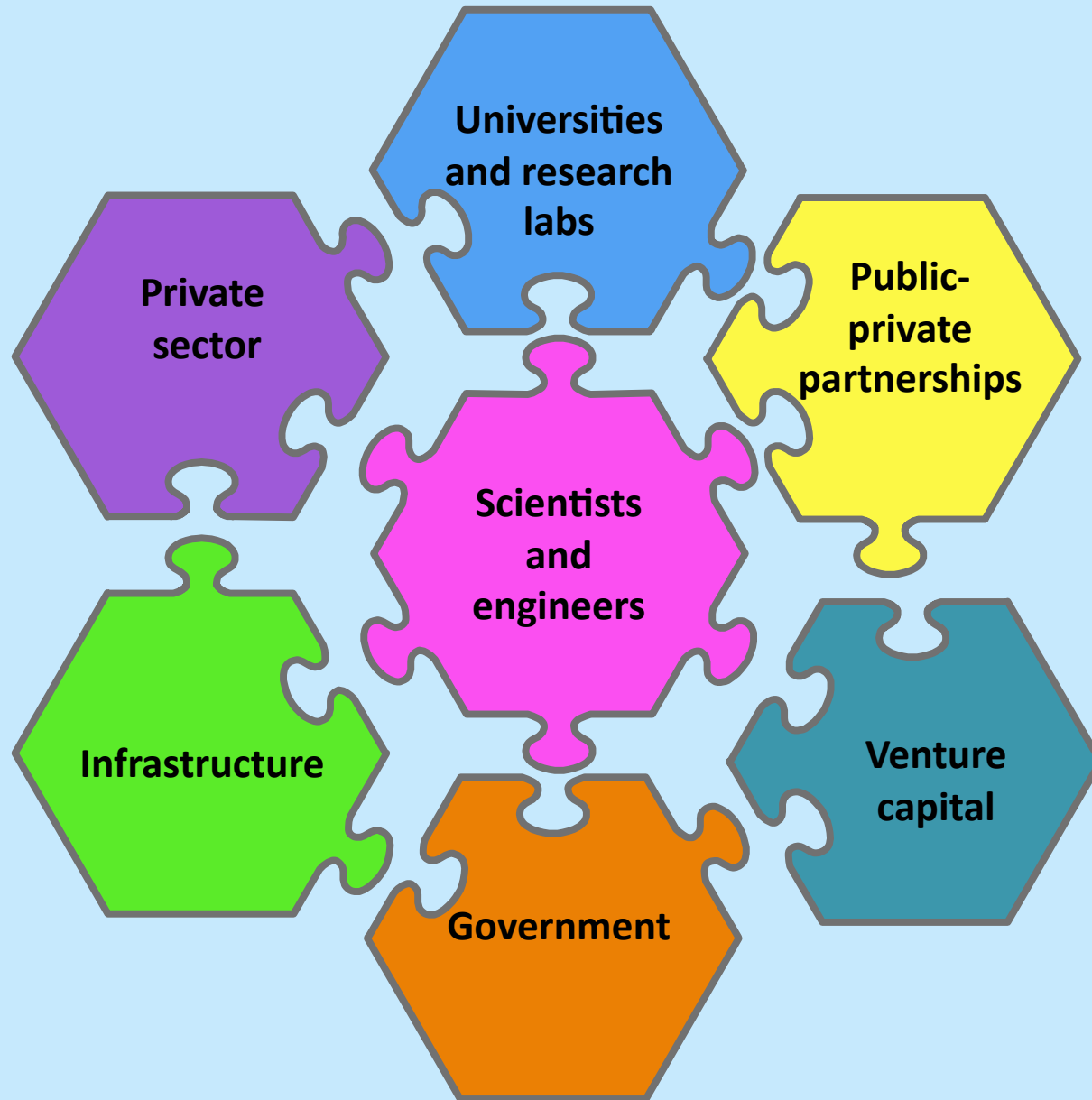
Economic Impact of IT

- Growth of IT industry coupled with productivity gains across the entire economy.

- IT industries accounted for 25% of US economic growth since 1995.

- Use and production of IT accounted for ~2/3 of the post-1995 in labor productivity growth.

- IT sector generates jobs: IT jobs have grown 4x faster and pay 75% more than non-IT jobs.

- IT diversifies regional economies to include idea-driven "creative" industries.
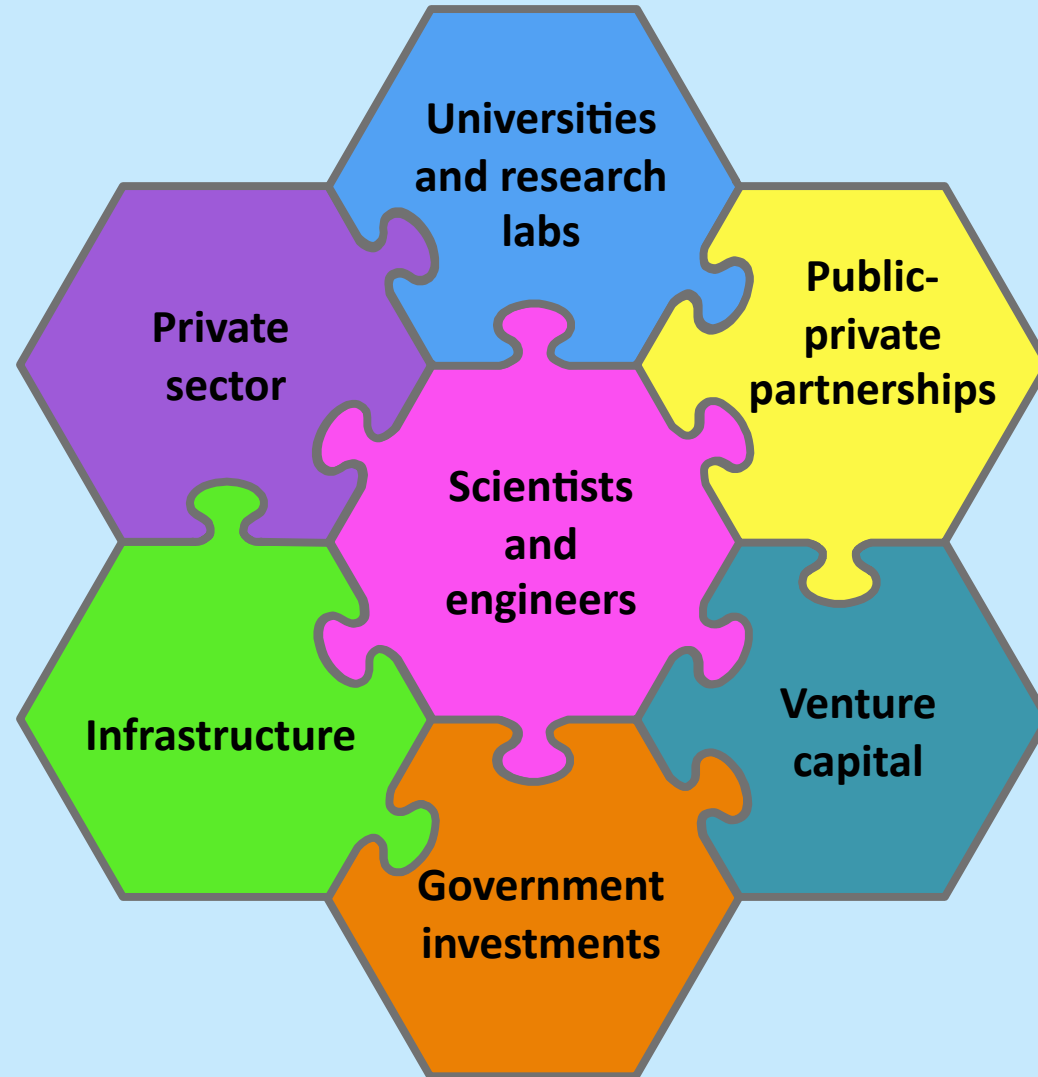
Sources: NRC, 2009. *Assessing the Impacts of Changes in the IT R&D Ecosystem*.
        ITIF, 2007. *Digital Prosperity*.

*New report expected in 2012

Discovery and Innovation Ecosystem
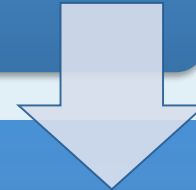
Discovery and Innovation Ecosystem

Interactions of research ideas multiply their impact and seed new ideas with the potential to lead to unanticipated advances.

Ubiquitous Digital Economy

EARLY FOUNDATIONS

- Internet, web browsers, search engines, public-key cryptography, database technology, transaction processing

RECENT

- Wireless access, mobile devices, recommender and reputation systems, auction systems, collaboration technology, digital media, smart sensors
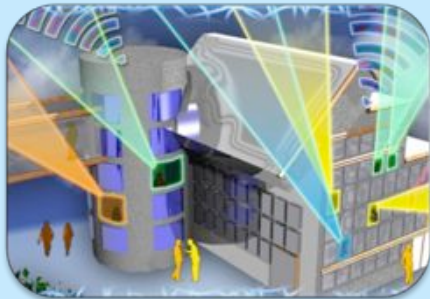
EMERGING

- Ubiquitous broadband access, socially intelligent computing, cloud computing, machine learning, big data, tailored and trustworthy cyberspace

Sustaining the IT Ecosystem

- Our investments in NIT **research** and **education** have returned exceptional dividends to our nation.

- To keep those benefits flowing, we need to constantly replenish the wellspring of new **ideas** and train new **talent**.
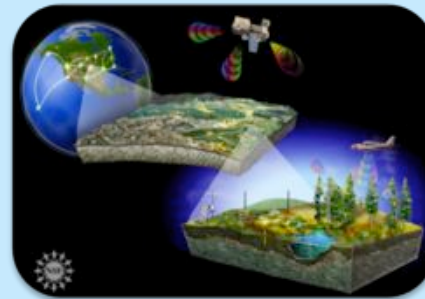
Economic Prosperity and Societal Wellbeing Depends on NIT
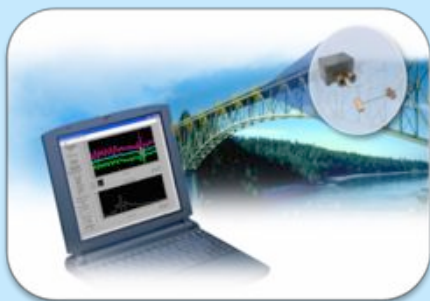

Broadband & Universal Connectivity

Emergency Response & Disaster Resiliency
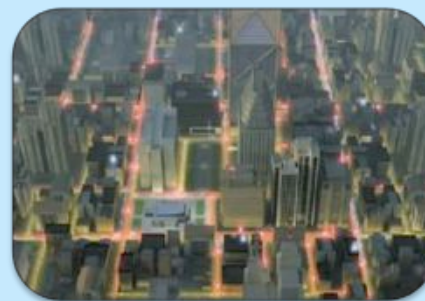

Environment & Sustainability

Health & Wellbeing

Manufacturing, Robotics, & Smart Systems

Secure Cyberspace

Transportation & Energy

Education and Workforce Development

Smart Infrastructure

Imagine a world where…
static infrastructure is adaptable and safe

Image Credit: *MicroStrain, Inc.*

Environment and Sustainability

Imagine a world where…
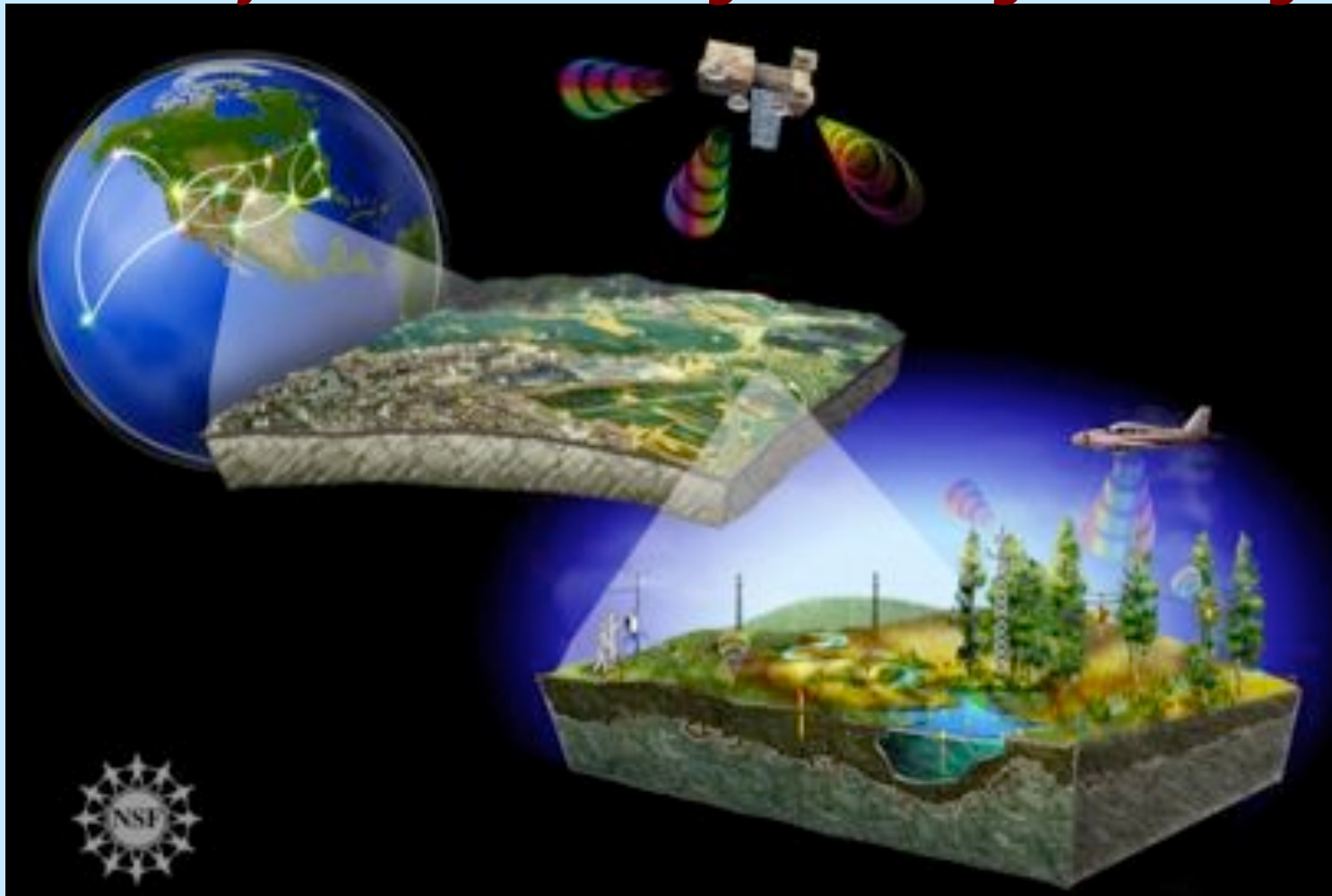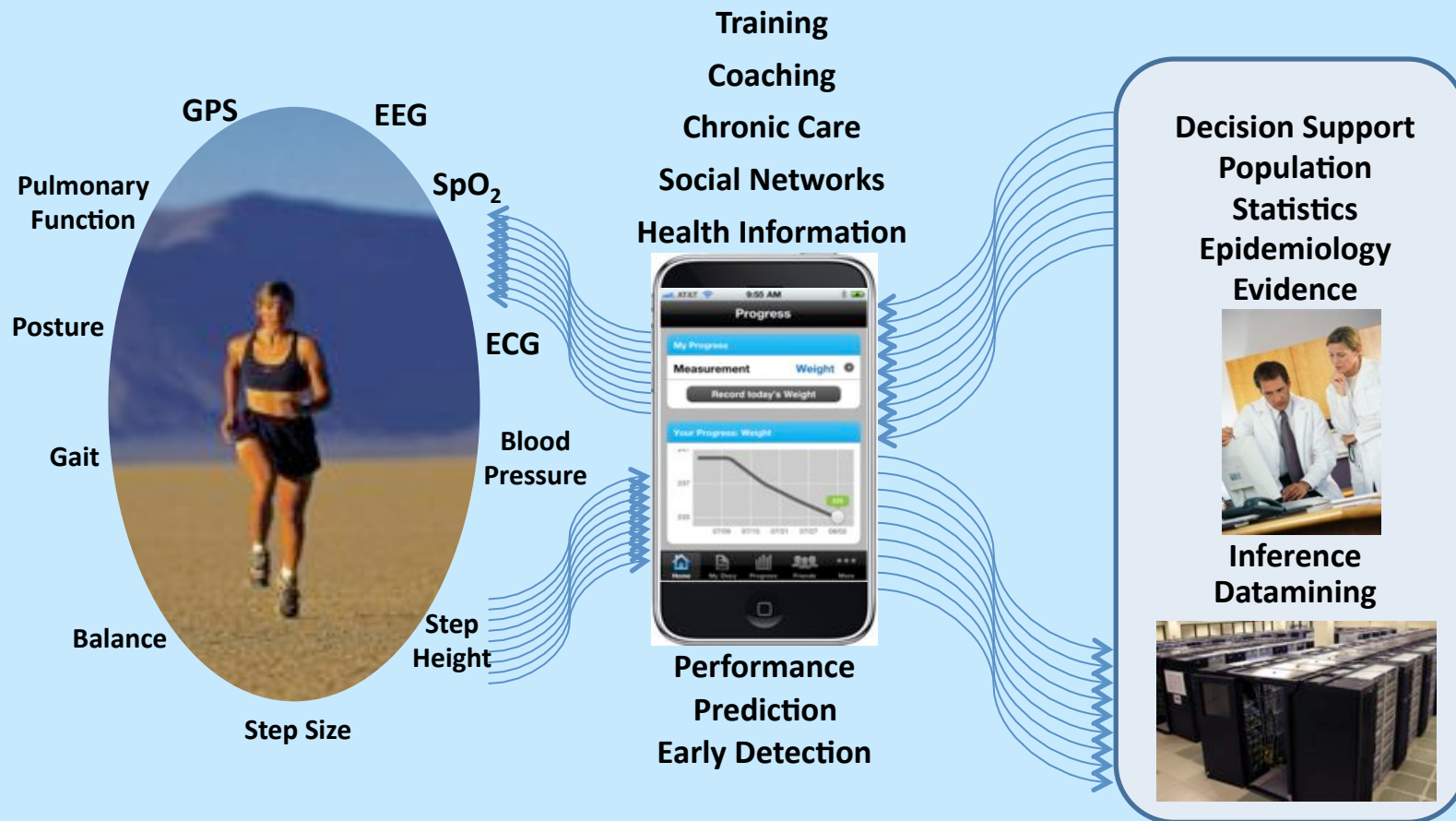   *we can forecast and mitigate ecological change*

Image Credit: *Nicolle Rager Fuller, National Science Foundation*

Health and Wellbeing

Imagine a world where…
  wellbeing is pervasive and healthcare is personalized

GPS   EEG

Pulmonary
Function   SpO$_2$

Posture

Gait   ECG

Blood
Pressure

Balance

Step
Height

Step Size

Training
Coaching
Chronic Care
Social Networks
Health Information

Performance
Prediction
Early Detection

Decision Support
Population
Statistics
Epidemiology
Evidence

Inference
Datamining

Smart Grids

Imagine a world where…
energy is efficiently used and intelligently managed

Image Credit: *Cisco, Inc.*

Emergency Response

Imagine a world where…
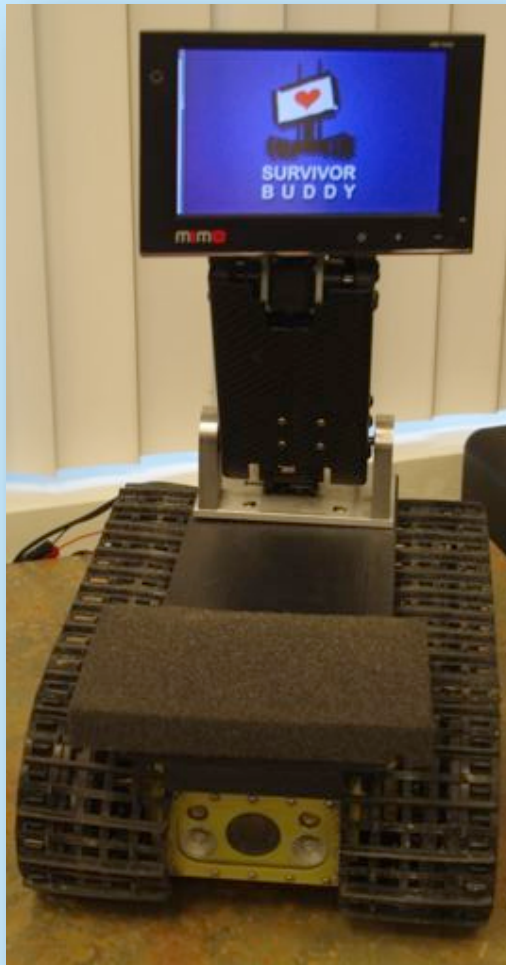*we can prevent, mitigate, and recover from disasters*

Image Credits: *Karen Geary, NSF* (left) and *Texas A&M University* (right)

Transportation: Safety and Energy

Imagine a world where…

traffic fatalities no longer exist

Image Credit: *PaulStamatiou.com*

Cybersecurity

Imagine a world where…

a cyber-enabled world is secure

Image Credit: *ThinkStock*

The Promise of NIT

Advances in networking and information technology promise to reshape our world with more responsive, secure, and efficient systems that:

- transform the way we live
- drive economic prosperity
- underpin national security
- enhance societal well-being

Agenda Highlights

- IT and People

- IT in the Physical World

- Economic Impact of NITRD

- Building Blocks of IT

- IT for the Advancement of Science

- IT and the World of Data

- Future "Big Ideas" Panel

- Agency Showcase

Thank you!