SESSION I: NIST'S Roles in Innovation

VCAT Meeting
October 28-29, 2008
Eric Steel

NIST:

What are we known for?

What is our brand?

NIST Mission

•To promote U.S. **innovation** and industrial **competitiveness** by advancing

What

measurement science, standards, and technology

How

in ways that enhance *economic security* and improve our *quality of life*

Why

SESSION I: NIST'S Roles in Innovation

The purpose of this session is to solicit advice on NIST's strategy to promote U.S. innovation and industrial competitiveness. The presentation will focus on how NIST views its role in innovation, how it deploys its toolset to address this role, and the strengths and weaknesses of its current toolset.

Key questions for the VCAT:

- Does NIST have a role in U.S. innovation & competitiveness?
- What are NIST's roles in innovation?
- Is the role just measurement science and standards or does it include technology development?

Definition of innovation

"The design, invention, development and/or implementation of new or altered products, services, processes, systems, organizational structures, or business models for the purpose of creating new value for customers and financial returns for the firm."

from Innovation Measurement, 2008

an Advisory Committee Report to the Secretary of Commerce

Why worry about Innovation and NIST's role?

- Assumption/Assertions from the last VCAT meeting
  - Innovation is critical to the US economy and productivity growth
  - Technology is a if not THE major path to innovation and hence to GDP growth
  - R&D is critical to technology
    - Basic research often takes decades to impact commercial technology
- Conclusion
  - Speeding innovation is important
  - Providing a national technical infrastructure for innovation is important for efficient innovation

This is what NIST is trying to do

The VCAT can help us find strengths, weaknesses, and gaps in our approaches to providing the infrastructure for innovation.

"The Committee shall review and make recommendations regarding general policy for NIST, its organization, its budget and the programs, within the framework of the applicable national policies as set forth by the President and the Congress"

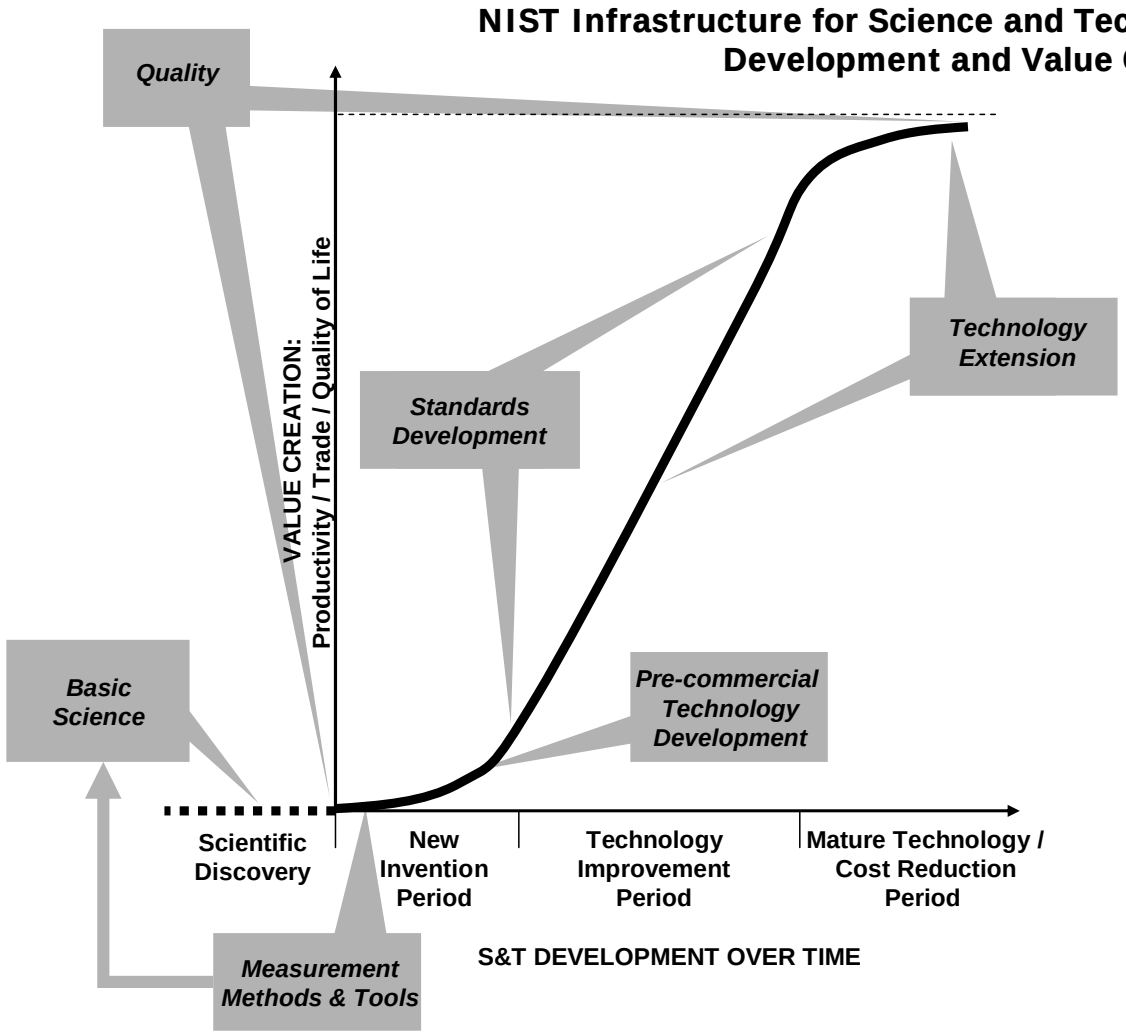
What Part Of Innovation To Focus On?

- The *Gathering Storm* and *Falling Off The Flat Earth* and many other reports focus on a few key areas of concern for the U.S.:
  - *Education*
  - ***Investment in R&D***

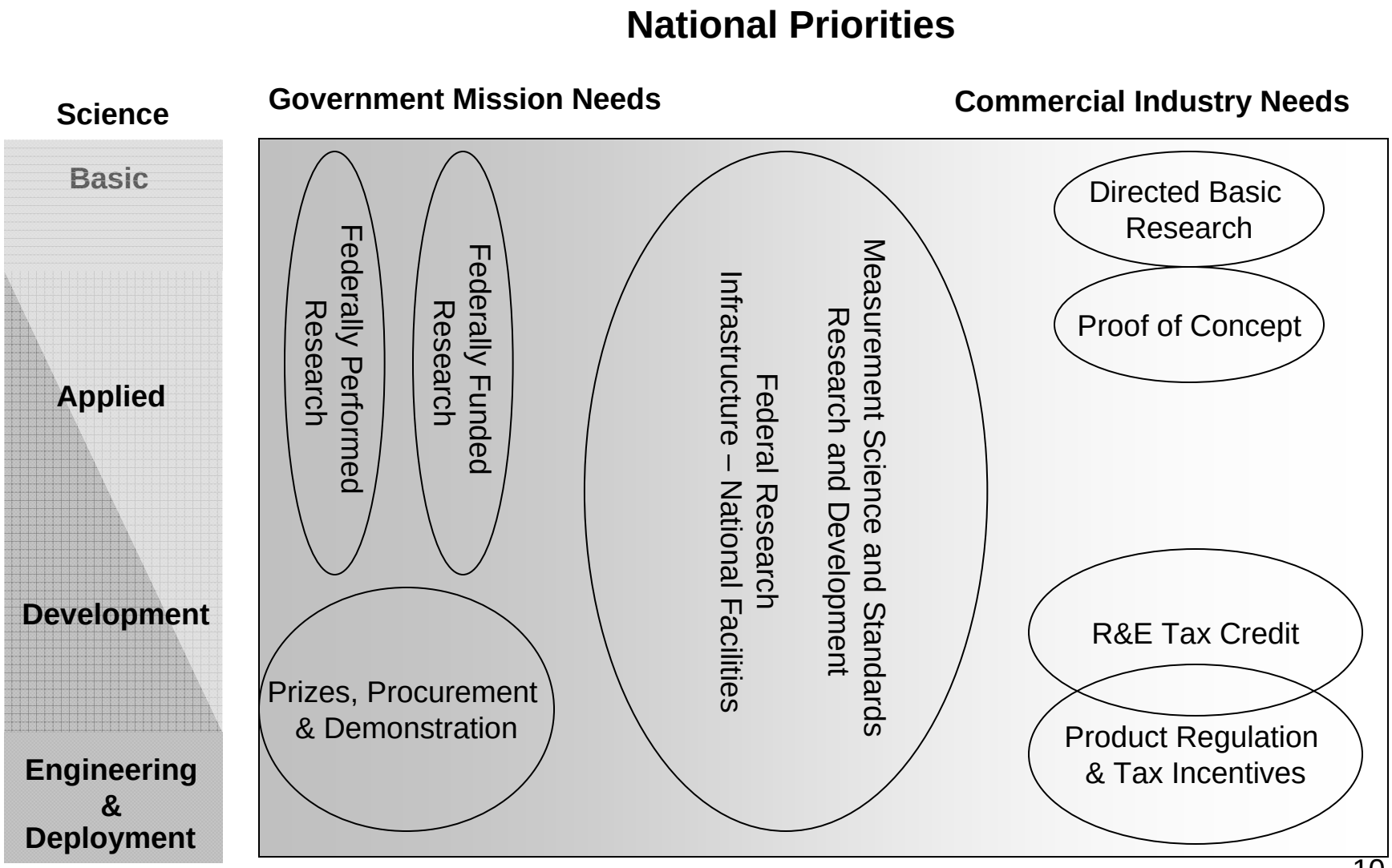
The "ability of U.S. technology corporations to sustain funding of basic research not linked to core corporate activities has been eroded."
Auerswald and Branscomb, "Reflections on Mansfield, Technological Complexity and the 'Golden Age' of US Corporate R&D," 2005

NIST's Role in Innovation

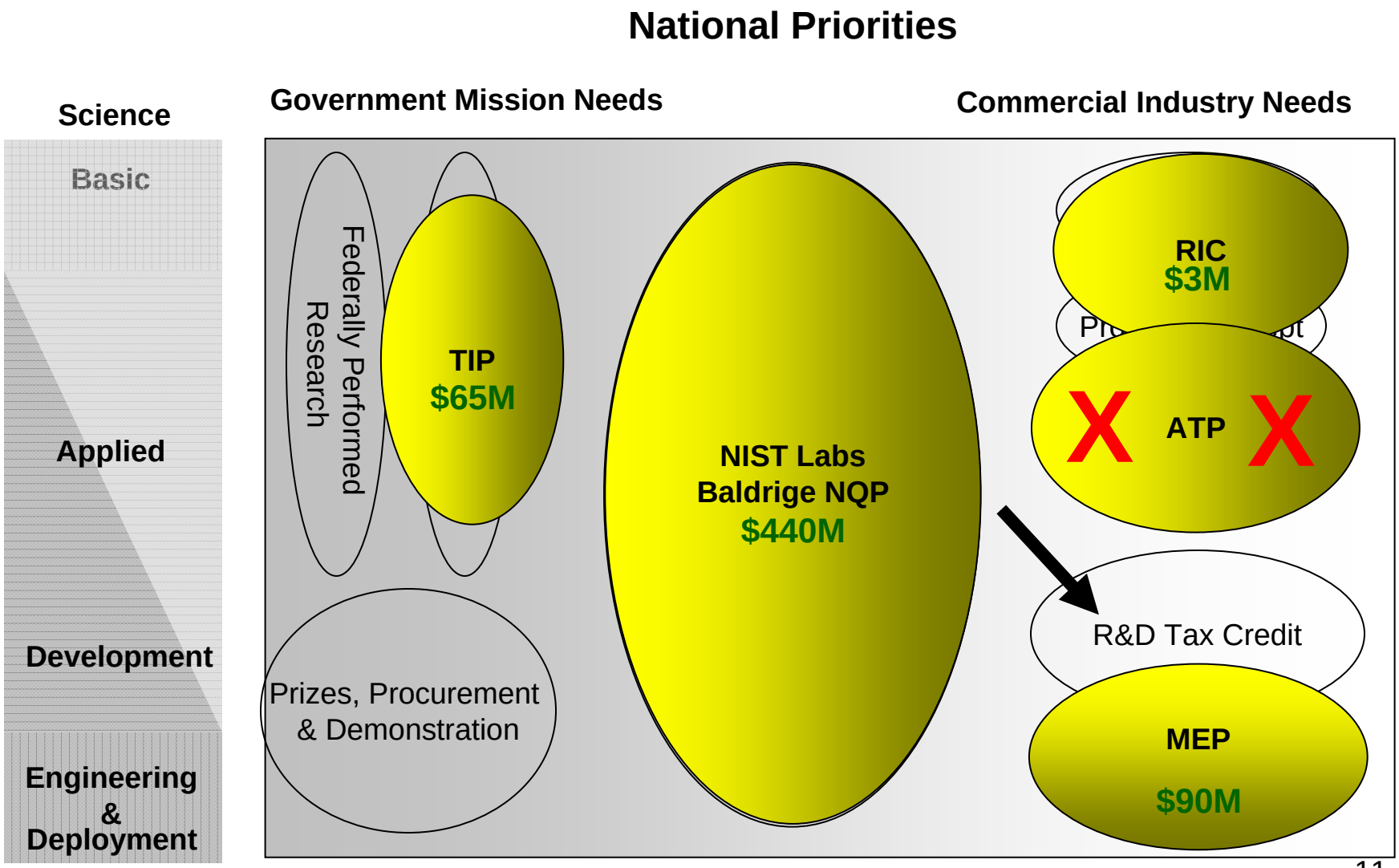
Technology infrastructure impacts every stage of innovation



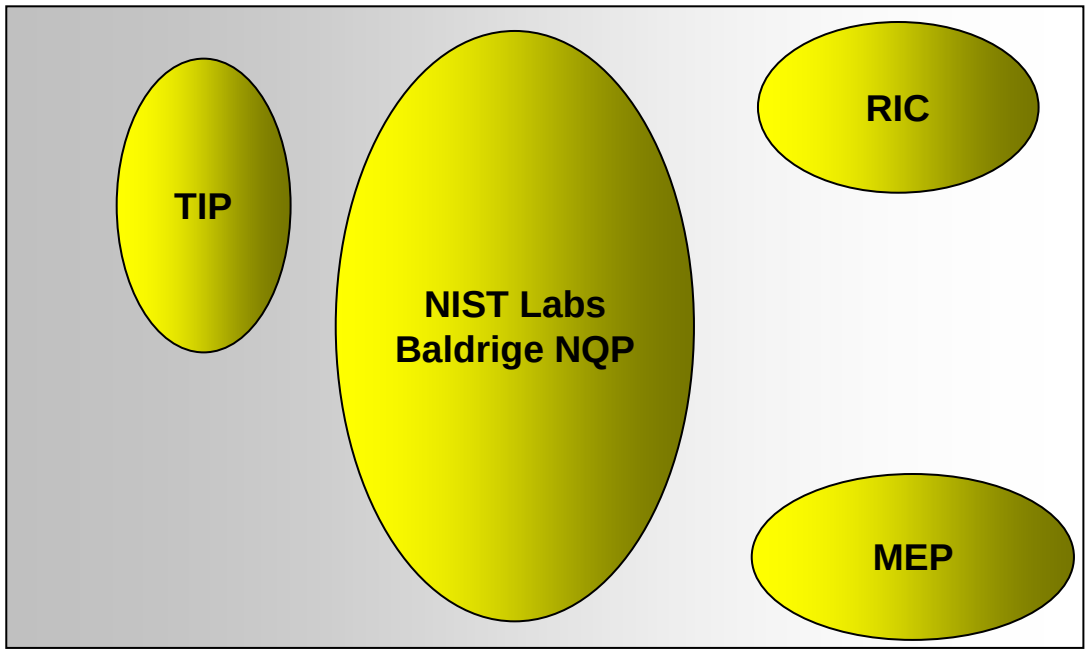
Federal Science and Technology Policy Options



Meeting NIST mission: Issues

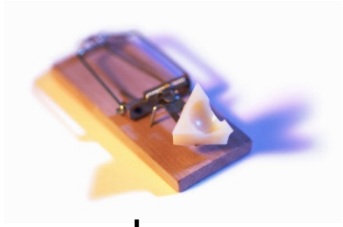


- NEXT slides: Brief reminders of each program



NIST Labs Role in Innovation

- Measurement Science
  - Sets the basis for all measurements of quality and quantity
    - Electrical, physical, chemical…
    - Enables valid comparisons among innovative and existing technologies (is the mouse trap really better?)
    - Enables innovative technologies to understand new approaches



- Standards
  - Sets the bar
    - Performance based standards allow existing and new products and processes to tell how “good” they are
    - Enables innovators to know that they are innovating
      - Did we meet or exceed the standard?
    - Enables innovations to interact with existing systems

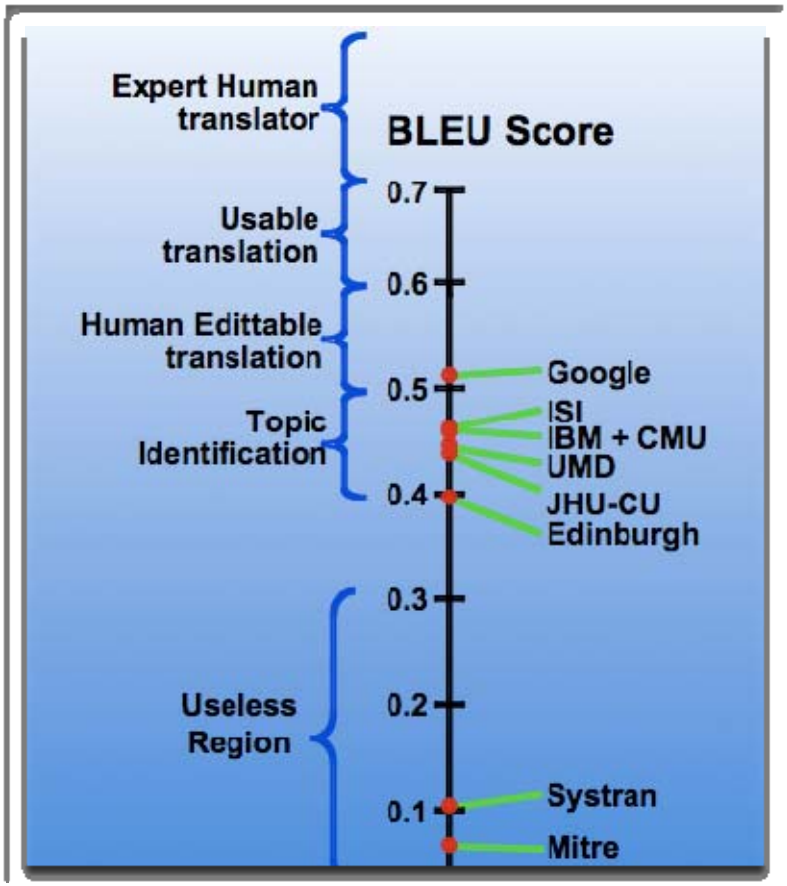
- Technology
  - Develops, maintains the infrastructure that enables technology
    - Develops technology for government/dual use; industry?

NIST Role in Innovation—Setting the Bar

Example 2005 NIST Machine Translation Challenge

Google "comes out of nowhere", employing massive data-intensive computing to win

Confirms the scalability of a range of algorithms

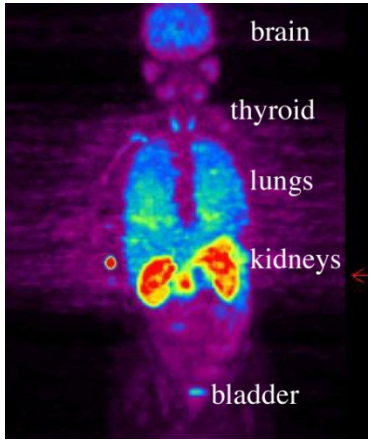


Innovating Measures & Standards for 2008

- BLEU-4 (MTeval-v11b: **official metric)**
- IBM BLEU (IBM's BLEU with original brevity penalty)
- NIST (NIST's refinement of BLEU, commonly referred to as NIST)
- TER
- METEOR

Economic Impact Assessment Studies

1997: Radiopharmaceutical standards
97:1 benefit-to-**cost ratio**



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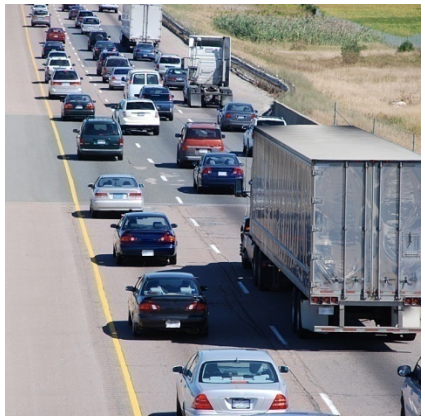
1998: Alternative refrigerants
4:1 benefit-to-**cost ratio**

2000: Sulfur in fossil fuels
113:1 benefit-to-**cost ratio**



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Average benefit-to-**cost over 19 impact studies: 44:1**

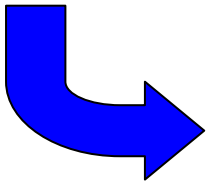
What MEP Does

- Focus on meeting manufacturer's short term needs, but in context of overall company strategy
- MEP Center areas of common strength
  - Engineering Services for products and processes
  - Growth Services – new or expanded market opportunities
  - Lean Manufacturing
  - Quality Systems
  - Environmental Services
  - Workforce Development
- Over 27,000 manufacturing client interactions (projects, workshops, etc.) annually*

*Based on FY2007 MEP Center reported performance data.

Why Deploy Technology?

- MEP 20/20+ Vision for Manufacturers
  - **Efficiency:** Take 20% off bottom line expenses through Lean, Quality, other programs targeting plant efficiencies
  - **Growth:** Add 20% to top line sales through Eureka! Winning Ways and other growth services
- Focus for Top Line Sales Increase:
  1. New Sales
  2. New Markets
  3. New Products



TECHNOLOGY is critical to realizing these goals….

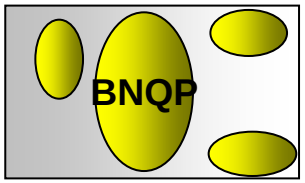
…. critical to

ACCELERATING MANUFACTURER GROWTH

Client Impacts Resulting from MEP Services

• New Sales	$3.11 Billion
• Retained Sales	$3.65 Billion
• Capital Investment	$1.65 Billion
• Cost Savings	$1.115 Billion
• Jobs Created	16,740
• Jobs Retained	35,845

FY 2006 economic impact results are based on a survey of 4,959 MEP clients out of 5,384 attempted.



The Malcolm Baldrige National Quality Program

- **Six eligibility categories**
  - **Manufacturing**
  - **Service**
  - **Small Business**
  - **Education**
  - **Health Care**
  - **Nonprofits, including government agencies**

What Is Performance Excellence?

An integrated approach to organizational performance management that results in

- **delivery of *ever-improving value to customers* and stakeholders, contributing to organizational sustainability**
- ***improvement of overall organizational effectiveness* and capabilities**
- **organizational and personal learning**

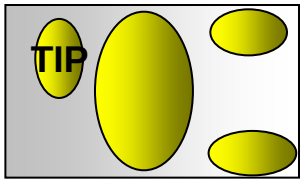
Hard (impossible?) to accomplish without significant <u>innovation</u>…
Fundamental changes in product, process, or organizational (business) model

Baldrige NQP
Magnitude of Impact

“. . . the conservative estimate of the present value (in constant 2000 dollars) of social benefits associated with the Baldrige National Quality Program is $24.65 billion.. . .from an evaluation perspective for the economy as a whole, the benefit-to-cost ratio characterizing the Baldrige National Quality Program is conservatively 207-to-1.”

Economic Evaluation of the BNQP, 9/2001

Albert N. Link, UNC and John T. Scott, Dartmouth



Key Features of TIP

- **Novel Purpose:** address societal challenges not being addressed in areas of Critical National Need (CNN) with benefits that extend significantly beyond proposers
- **Rich Teaming:** businesses, academia, national labs, nonprofit research institutions and other organizations
- **Scientific & Technical Merit:** high-risk, high-reward research
- **Transformational Results:** strong potential for advancing state-of-the-art and contributing to U.S. science and technology base
- **Societal Challenges:** demand government attention
- **Clear Government Need:** no other funding sources are reasonably available

TIP awards based on *"high-risk, high-reward"* innovation,
need for public funding, and potential to meet unaddressed societal challenges

Potential CNN Topic Areas

- **Civil Infrastructure**
- **Energy**
- **Manufacturing**
- **Water**
- **Communications**
- **Complex Networks**
- **Personalized Medicine**

These seven areas represent the potential broad topic areas that TIP has identified to date. However, this list is not exhaustive; TIP may select a different or more specific Critical National Need.

Civil Infrastructure…

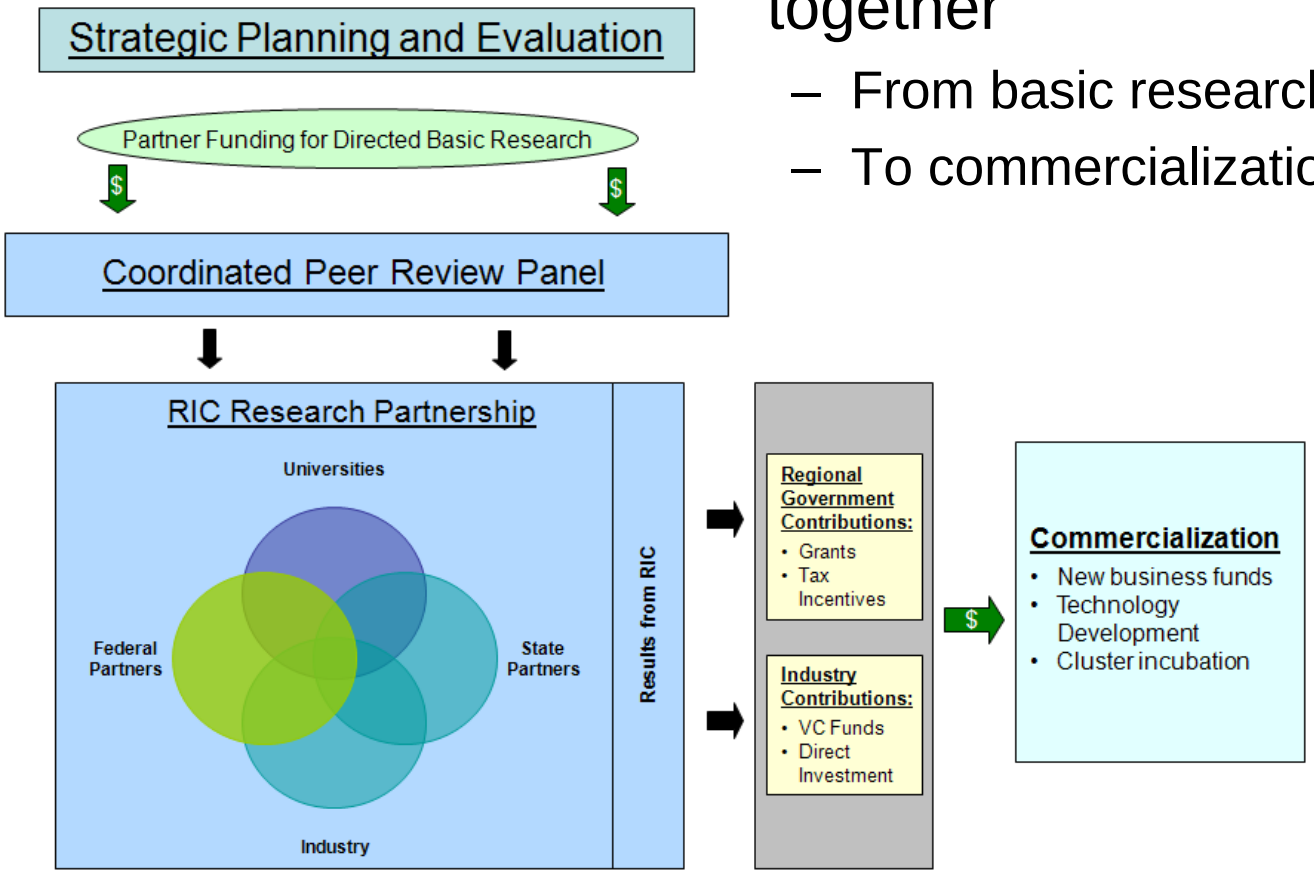
Poor road conditions cost U.S. motorists $54 billion a year in repairs and operating costs.

More than 33% of the nation's 600,000 bridges are rated structurally deficient or functionally obsolete.

Failure to reverse a trend of increasing highway infrastructure deterioration will lead to reductions in national and economic security, lower worker productivity, and a overall reduction in the quality of life.

Rapid Innovation & Competitiveness initiative

- A business model that attempts to put the whole technology process together
  - From basic research, use inspired
  - To commercialization



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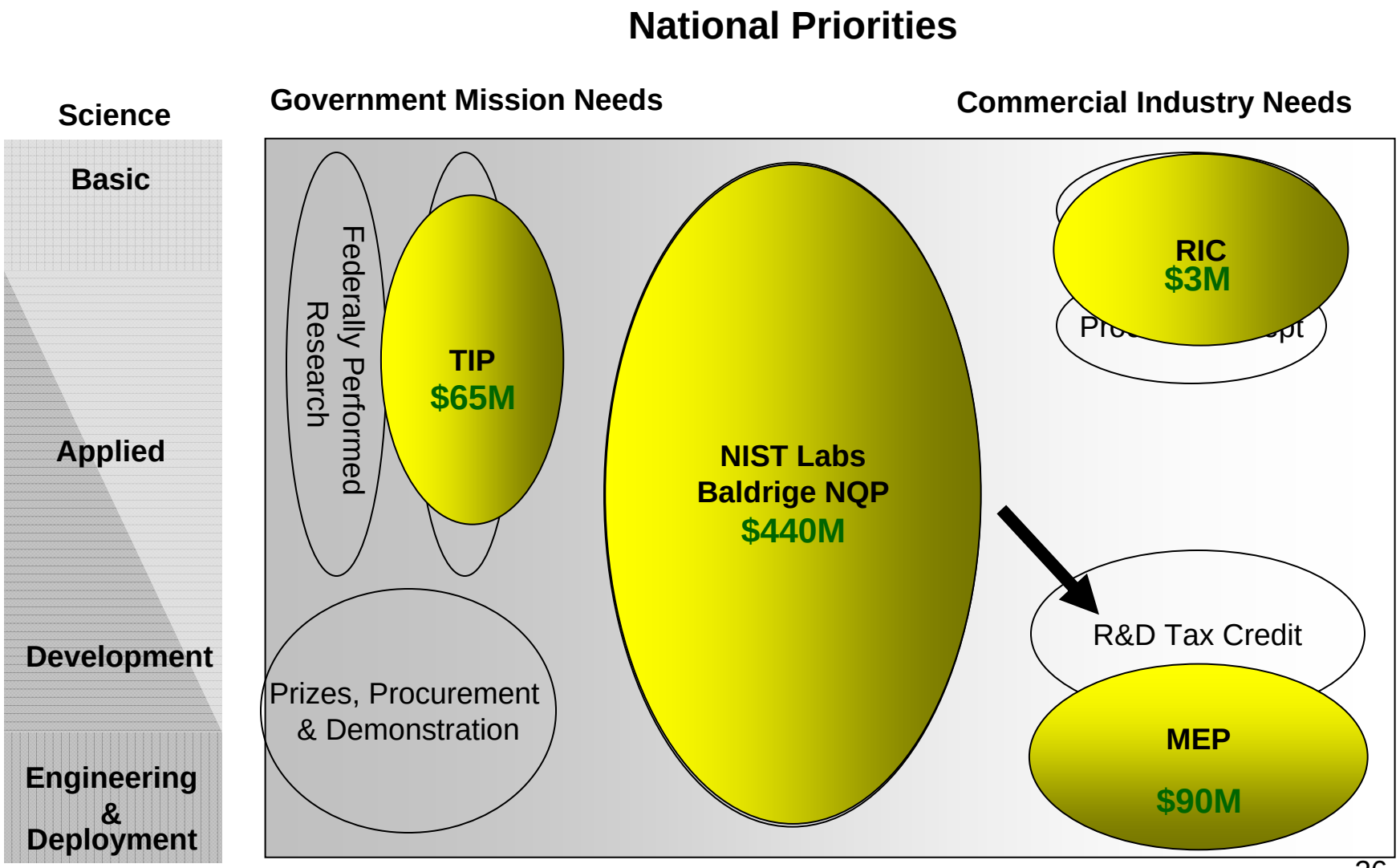

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NIST: What are we known for/ what is our brand?

- What should we be known for?