An Overview of U.S. DOT’s Multi-modal Research

Santiago Navarro
Technology Transfer Program Manager
Office of the Assistant Secretary for R&T,
Office of Coordination

18th Annual NJDOT Research Showcase
The Conference Center at Mercer
1200 Old Trenton Road
West Windsor, NJ 08550
Wednesday, 3:30 p.m.
September 22, 1965

TO: THE PRESIDENT

FROM: Joe Califano

I have just been over the first cut of the proposals and ideas in the area of transportation for the 1967 legislative program. The proposals are not imaginative enough and will not give you the opportunity to orient a

meeting with Secretaries Connor and Boyd on Saturday morning to consider and prepare papers on the following ideas:

Unless you have some objection, therefore, I am planning to have a

meeting with Secretaries Connor and Boyd on Saturday morning and ask

them to consider and prepare papers on the following ideas:

1. A Department of Transportation (or some reorganization of the executive transportation functions).

2. Reorganization of the regulatory transportation functions.

3. Program of deregulation to make transportation rates more competitive and rational.

4. A major highway safety program (present projections are that...
Overview

- The Office of the Assistant Secretary for Research and Technology (OST-R) coordinates the Department’s research portfolio
- Operating Administrations (agencies – modes)

- Office of the Secretary (OST)
- National Highway Traffic Safety Administration (NHTSA)
- Federal Aviation Administration (FAA)
- Federal Highway Administration (FHWA) – Intelligent Transportation Systems Joint Program Office (ITS-JPO)
- Pipeline and Hazardous Materials Safety Administration (PHMSA)
- Federal Motor Carrier Safety Administration (FMCSA)
- Federal Railroad Administration (FRA)
- Federal Transit Administration (FTA)
- Maritime Administration (MARAD)
- Office of the Inspector General (OIG)
- Saint Lawrence Seaway Development Corporation (SLSDC)
- Surface Transportation Board (STB)
Overview: https://www.transportation.gov/

**DOT Agencies** fund various research programs supporting our mission and their individual agency goals
Overview continued

• Our mission:

“Serve the United States by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future.”
FAST Act

Fixing America’s Surface Transportation (FAST) Act
• Signed by President Obama on December 4, 2015
• First law enacted in over ten years that provides long-term funding certainty for surface transportation
• Authorizes $305B (all modes) over FY 2016-2020
Today’s Presentation

- FAST Act includes a range of mandates pertaining to U.S. DOT research:
  1. 5-year U.S. DOT RD&T Strategic Plan
  2. Annual Modal Research Plans
  3. Consolidated Research Database
  4. Research and Development Programs
  5. Technology Deployment and Transfer (on-going)
1. DOT RD&T Strategic Plan... 2021

- Five-year RD&T strategic plan to address the long-term trends identified in "Beyond Traffic 2045," the Department’s 30-year framework for the future [https://www.transportation.gov/BeyondTraffic](https://www.transportation.gov/BeyondTraffic)

- Strategic plan highlights cross modal research areas

- Plan to be published in December 2016

- **R&D Strategies:**
  - Promoting Safety
  - Improving Mobility
  - Improving Infrastructure
  - Enhancing the environment

- **Overarching themes:**
  - Policy research,
  - Emerging technology,
  - Strengthening research coordination, and
  - Big data
2. Annual Modal Research Plans (AMRPs)

• AMRPs
  – Due May 1st of each year for review and approval
  – Provide comprehensive research plan for the upcoming and subsequent fiscal years
  – Align with U.S. DOT RD&T strategic plan
  – AMRPs in progress are to be published online in January 2017

• Review process designed to identify and improve collaborative research activities across the Department
3. Consolidated Research Database

- FAST Act requires a public facing database of U.S. DOT research project records:
  - Describes research objectives, progress, findings, and funding
  - Identifies multimodal projects (more than one agency involved)
  - Specifies dissemination plans to improve stakeholder collaboration and transportation efficiency, effectiveness, and safety

- Current U.S. DOT Research Hub will be the platform for this requirement
4. University Transportation Centers (UTC) Program

- UTCs granted ~$377M over the next five years in support of solution-oriented transportation research at academic institutions
- New: Two-year institutions of higher education eligible to participate
- FY 2016 funding totaling ~$73M
- We received 212 proposals this year, the most applications submitted in the history of the UTC Program, evaluations in progress
- 35 grants to be awarded by December 4, 2016
4. Smart City Challenge

- Using innovative technologies to help communities solve urban challenges
- DOT working with DOE, private sector partners
- 78 proposals, 7 finalists
- Total Budget: $140M, ($40M DOT, $10M Vulcan, $90M private sector)
- Initiative underway

City of Columbus, OH, winner in June 2016
5. Technology Deployment

- Technology Transfer Program
- Technology Transfer Principles
- Technology Readiness Level Assessments
Technology Transfer Program

- **U.S. DOT T2 Annual Performance Report**
  - Agency/Federal Labs & Partners, metrics and success stories

- **Lab to Market Activities**
  - Sharing best practices and Personnel Exchange, Facility access
  - Federal Laboratory Consortium

- **Best Practices**
  - Technology Transfer Primer and others
Technology Transfer Principles

1. Understand Adopter Needs
2. Understand Technology
3. Address Barriers to Adoption
4. Communicate Value
“My team has created a very innovative solution, but we’re still looking for a problem to go with it.”
Create a T2 Plan

• Assess the market
• Stakeholder Engagement Plan
• Secure necessary resources to foster adoption
• Execute and manage plan

T2 Process

R&D Process

Define Need

Research and Development

Integrate

T2 Process

• Create a T2 Plan
• Engage Stakeholders

• Secure Resources
• Execute and Manage

Principles: Understand Adopter Needs, Address Barriers to Adoption, Understand the Technology, and Communicate Value

Technology

Adopt

Deployment
Technology Readiness Level Assessments – FHWA

• Technology Readiness Levels (TRLs)
  – 1-9 scale to assess maturity of a technology
  – How complete was the technology when it was tested?
  – How representative was the test environment?

• History
  – Developed by NASA in the 1980s
  – Adopted by DoD in the late 1990s
  – Adapted by many industries
Advantages

• Simple and easy to communicate
• Asks key questions in a structured framework
• Useful portfolio analysis tool
  – Is this project the right fit?
  – Is the research portfolio balanced appropriately?
Limitations

• Measure of technology maturity only
• Does not assess the risk, cost, feasibility of advancing to the next level
• Best used in concert with other assessment tools
## Technology Readiness Level Across R&T Programs

<table>
<thead>
<tr>
<th>Technology Readiness</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSF &amp; Other Federal Science Programs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FHWA Exploratory Advanced Research Program</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FHWA Research and Development Programs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Business Innovation Research (SBIR) Phase I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small Business Innovation Research (SBIR) Phase II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accelerated Innovation Deployment Grants</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Everyday Counts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCHRP IDEA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCHRP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Planning &amp; Research Program (generally)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation Pooled Fund Program</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Technology Readiness Levels

<table>
<thead>
<tr>
<th>TRL</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Research</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Basic principles and research</td>
<td>• Piezo electric energy harvesting in the roadway</td>
</tr>
<tr>
<td>2</td>
<td>Application formulated</td>
<td>• Agent-based modeling and simulations</td>
</tr>
<tr>
<td>3</td>
<td>Proof of concept</td>
<td></td>
</tr>
<tr>
<td>Applied Research</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Components validated in laboratory environment</td>
<td>• Cooperative adaptive cruise control</td>
</tr>
<tr>
<td>5</td>
<td>Integrated components demonstrated in a laboratory</td>
<td>• Fiber-reinforced concrete columns</td>
</tr>
<tr>
<td></td>
<td>environment</td>
<td></td>
</tr>
<tr>
<td>Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Prototype demonstrated in relevant environment</td>
<td>• Nondestructive testing for concrete bridge decks (SHRP2 R06A)</td>
</tr>
<tr>
<td>7</td>
<td>Prototype demonstrated in operational environment</td>
<td>• Software tools for sharing and integrating GIS data</td>
</tr>
<tr>
<td>8</td>
<td>Technology proven in operational environment</td>
<td></td>
</tr>
<tr>
<td>Implementation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Technology refined and adopted</td>
<td>• EDC technologies – warm mix asphalt, safety edge</td>
</tr>
</tbody>
</table>
Please visit

[Website Link]

http://www.grants.gov/

http://www.transportation.gov/research-technology

http://ntlsearch.bts.gov/researchhub/index.do
Thank You!

Questions?

E-mails: 
Santiago.Navarro@dot.gov
TechTransfer@dot.gov

TRLs: 
http://www.fhwa.dot.gov/advancedresearch/research/results.cfm

T2 Primer: 
Extra
Technology Transfer Primer

Target Audience

• Research directors, managers, researchers who:
  – support research projects, oversee research activities, and conduct research and development

• Adopters consider implementing technologies

• Technology Transfer coordinators perform non-research activities with researchers and decision makers, adopters

• And others
STEM – Transportation Disciplines

- Tutoring children at Headquarters
- Visiting local schools
- First Robotics
- Real World Design Challenge
Technology Transfer Background – extra

Authority

• Stevenson-Wydler, Bayh-Dole Acts
• Presidential Memorandum - Accelerating Technology Transfer and Commercialization
• Federal Technology Transfer Act of 1986
• Technology Transfer Commercialization Act of 2000
• National Science and Technology Council, Subcommittee on Lab-to-Market Commercialization of Federally Funded R&D
• Others
Principle 1: Understand Adopter Needs

• Functional
  – Involve adopters in research reviews to help guide technology development

• Decision Process
  – Gather information on adoption decision context
Principle 2: Understand the Technology

- Basically, what does it do and what problem does it solve?
- Understand research output/technology status at all times
- Monitor changes in the anticipated output to align T2 activities with changes
Principle 3: Address Barriers to Adoption

- Basically, what is the adoption process, what are the barriers, and how long will it take to build this?
- Include a section on **Intellectual Property (IP)** rights
- Assess options, initiate steps for mitigating barriers to adoption
Principle 4: Communicate Value

• Basically, how will you sell it?

• Develop stakeholder engagement plans with both ends (R&D and market), include how you intend to keep:
  – R&D personnel aware of end-user’s feedback
  – end-users aware of status and opportunities to collaborate

• Strategically exchange (receive and deliver) information with both parties throughout the R&D to increase the probability of adoption