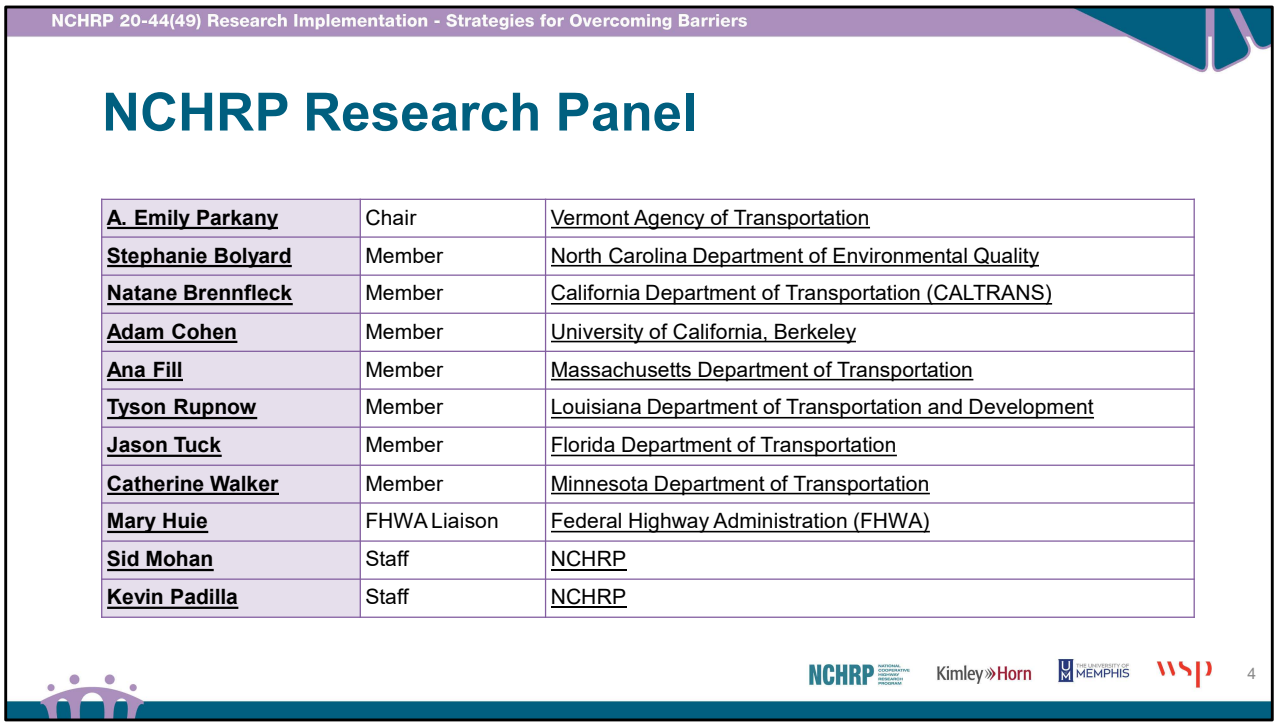

NCHRP 20-44(49)
Research Implementation –
Strategies for Overcoming Barriers
AASHTO RAC Summer Meeting
July 15, 2025
NCHRP
Kimley»Horn
THE UNIVERSITY OF MEMPHIS
WSP

Agenda

- The Team
- Project Background
- Research Objectives and Tasks
- Research Findings
- Implementation Toolkit
- Q&A

Research Team

- **Britton Johnson, Ph.D., P.E** | Principal Investigator (KH)
- **Stephanie Ivey, Ph.D.** | University Research Lead (UM)
- **Regina Nguyen, E.I.** | Research Analyst (KH)
- **Dallas Hammit, P.E.** | DOT Operations Advisor (WSP)
- **Anthony Dontoh** | University Research Analyst (UM)


NCHRP 20-44(49) Research Implementation - Strategies for Overcoming Barriers
NCHRP Research Panel
A. Emily Parkany | Chair | Vermont Agency of Transportation
Stephanie Bolyard | Member | North Carolina Department of Environmental Quality
Natane Brennfleck | Member | California Department of Transportation (CALTRANS)
Adam Cohen | Member | University of California, Berkeley
Ana Fill | Member | Massachusetts Department of Transportation
Tyson Rupnow | Member | Louisiana Department of Transportation and Development
Jason Tuck | Member | Florida Department of Transportation
Catherine Walker | Member | Minnesota Department of Transportation
Mary Huie | FHWA Liaison | Federal Highway Administration (FHWA)
Sid Mohan | Staff | NCHRP
Kevin Padilla | Staff | NCHRP
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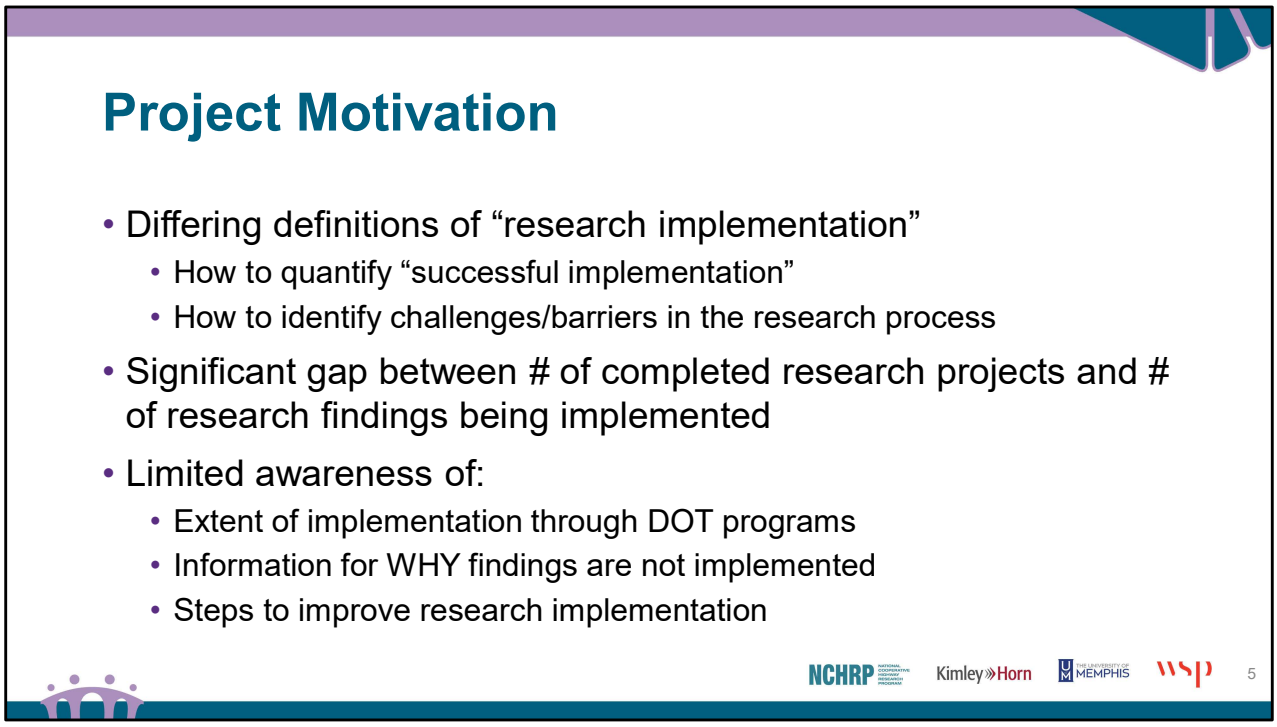
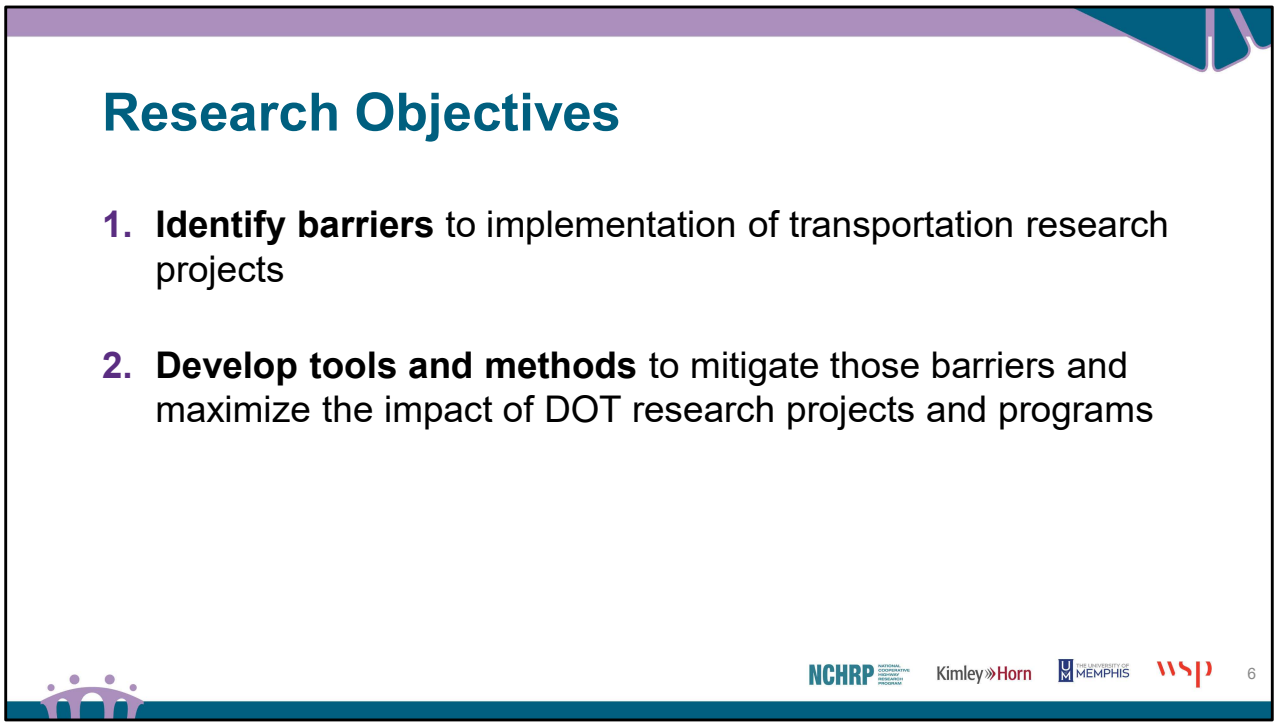


State departments of transportation (DOTs) define research implementation differently, which leads to inconsistent definitions for quantifying successful implementation and different methods used to identify challenges. Even with a broad definition of implementation and despite efforts to improve implementation of research outcomes across state DOTs, there are still significant implementation gaps relative to the number of research projects completed. Currently, we have a limited understanding of the extent research projects are implemented at state DOTs, lack enough information about why some research projects are not implemented, and lack knowledge on the steps that can be done to improve implementation of research relative to existing state DOT practices.



Research is needed to understand the specific roadblocks to research implementation across the United States and the extent that state DOT research programs are impacted.

The objective of this project is to identify barriers to implementation of transportation research projects and develop tools and methods to mitigate those barriers. Specific strategies will be developed and offered to stakeholders to improve implementation of research outcomes, and to maximize impact.

"Successful Implementation"

Successful Implementation

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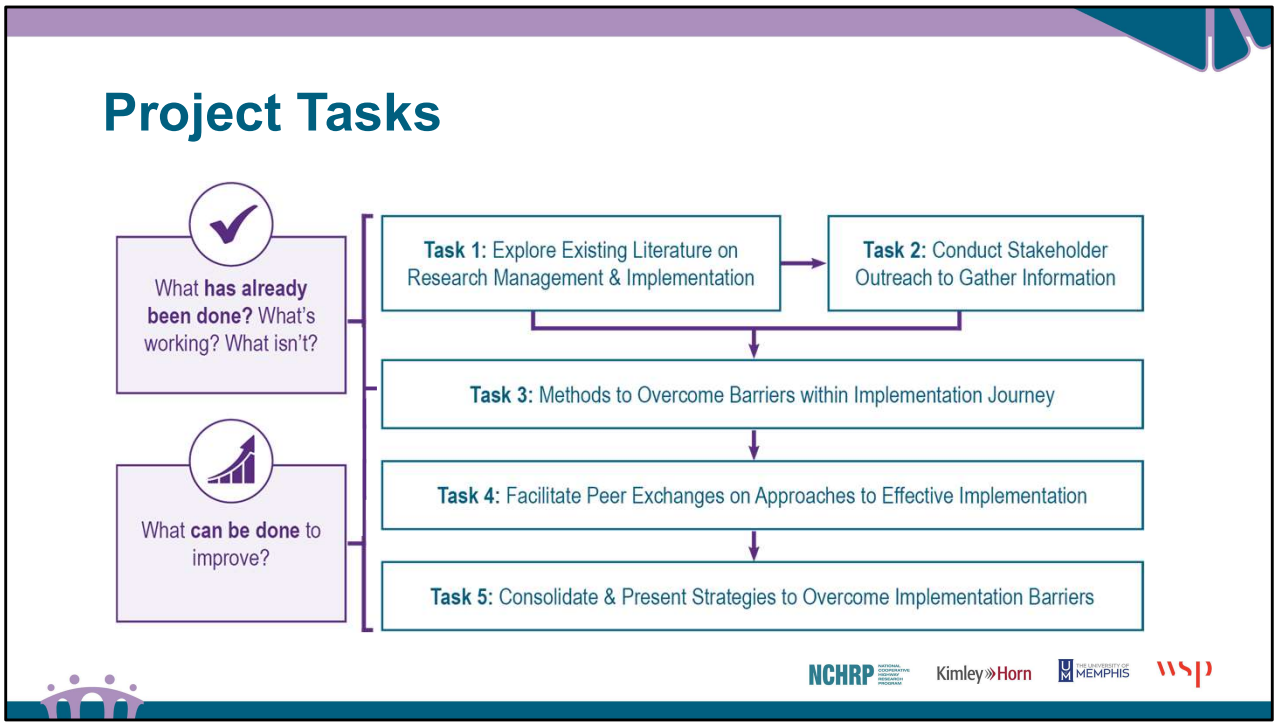
Successful Research Project

- MoDOT: If you're at 100% [implementation success], you're not taking risks and you're not doing your job.
- INDOT: Only some projects result in a calculable ROI, but the benefits of those few projects are able to pay for the entire research program.



Explain how Peer Exchanges inform final toolkit presentation

Literature Review Key Findings

- Common barriers to implementation
- Successful implementation practices
- Unified definition of research implementation
- Systematic and structured approaches to implementation
- Strong leadership commitment

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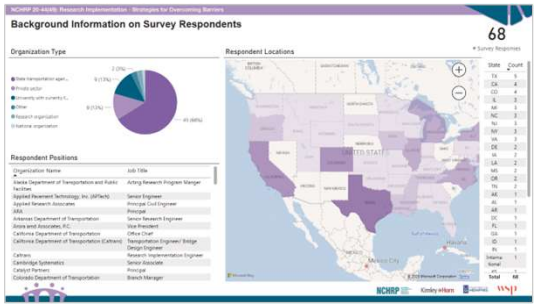
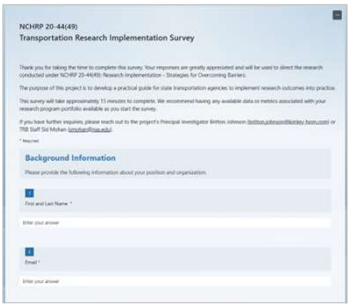
Stakeholder Outreach Key Findings

- 68 Responses | 45 State DOTs (39 States), 9 UTCs, 14 Other





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Out of the 68 total responses, 45 represented state transportation agencies, 9 represented UTCs, 9 represented private sector companies, and 5 represented other types of organizations.

Survey Identified Barriers

Rank	All Survey Respondents	DOT Respondents
1	Research sponsor/champion turnover or role transitions.	Research sponsor/champion turnover or role transitions.
2	Lack of organizational focus on research implementation.	**Duration of research results in end-user loss of interest.**
3	Funding unavailable or not allocated for implementing research. (Tie)	Lack of organizational focus on research implementation.
4	Next steps toward implementation not clearly conveyed. (Tie)	Next steps toward implementation not clearly conveyed.
5	**Research outcomes do not meet stated needs by practitioners.**	**Changes in organization leadership change priorities.**

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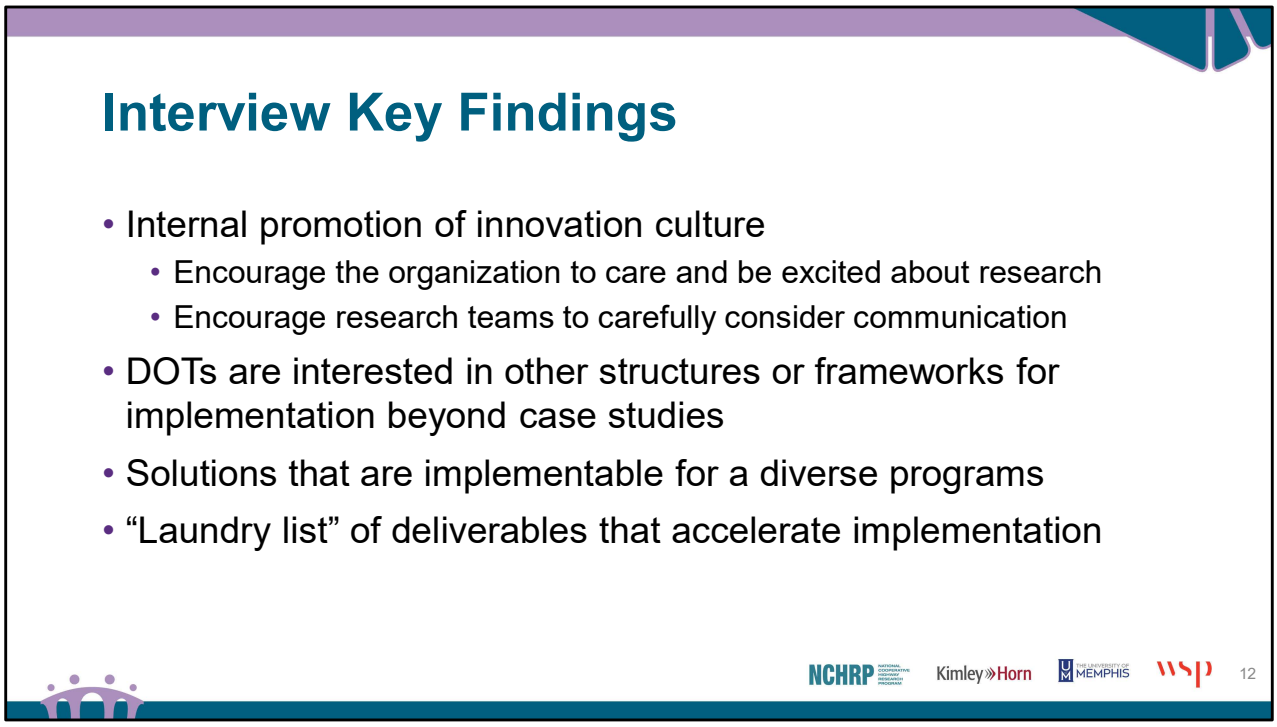
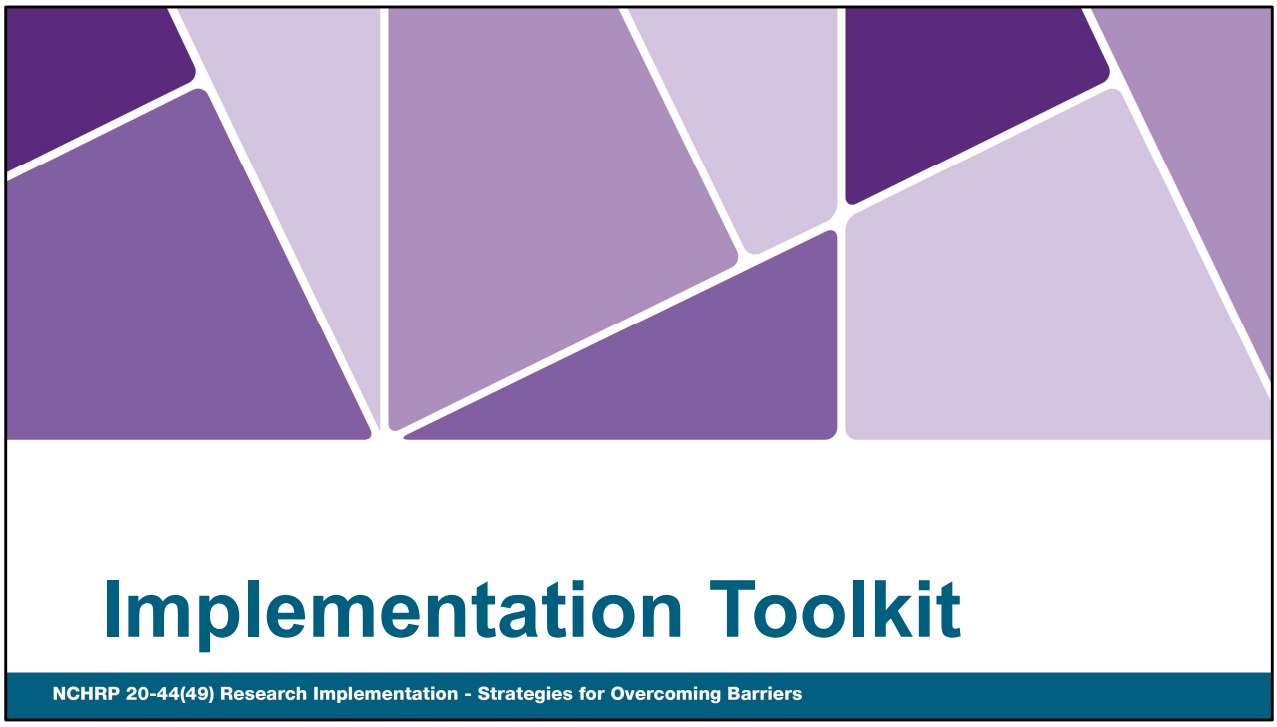
Stakeholder outreach findings are consistent with literature review.



Explain that findings from Tasks 1-3 informed development of the first draft of the Toolkit. Input from the panel and peer exchange participants is being used to finalize it and ensure it is presented in a way that is most useful to agencies.


Implementation Toolkit
NCHRP 20-44(49) Research Implementation - Strategies for Overcoming Barriers

Objectives

1. Introduce a **common language** for which to describe research and research implementation
2. Describe **frameworks** that demonstrate the overlap between research and implementation efforts
3. Propose **strategies** for overcoming the most commonly cited barriers to implementing research outcomes

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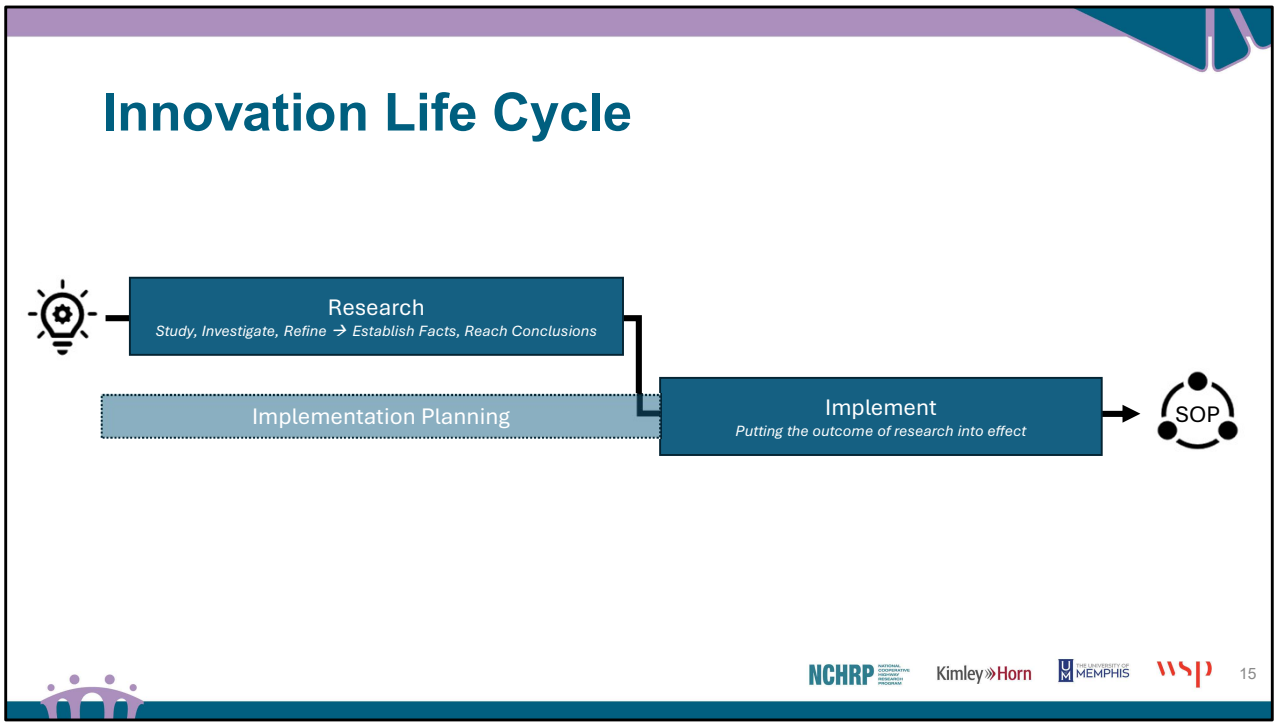


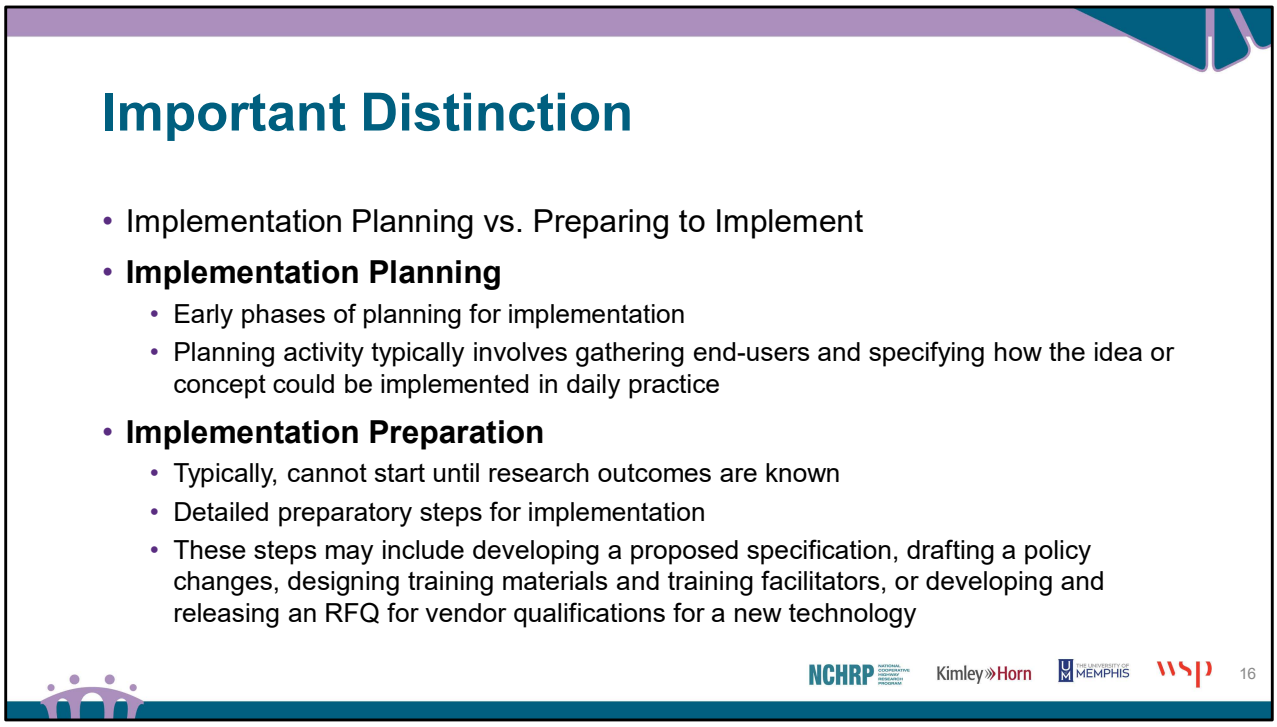
CAVEAT: Presenting as defined/presented in the draft toolkit. Will touch on changes from the panel and peer exchanges. For the purposes of this Toolkit, we define the Innovation Lifecycle as starting with an "idea" and ending with an "SOP" (standard operating procedure). In other words, innovation is the process through which an idea is explored, refined, and ultimately implemented such that it can become part of daily practice.

An important aspect of the Innovation Lifecycle is the distinction between the Research and Implementation efforts. *In most cases*, research outcomes are needed prior to launching the implementation of those outcomes (i.e., writing a new specification, updating a policy, or introducing a new technology). This distinction is important for identifying strategies to enhance the research

implementation. However, this differentiation does not mean that planning for implementation has to wait until the Research phase is completed. As shown in Figure 2, Implementation Planning can occur before, during, and/or after the research phase. In order to effectively plan, in many cases one does need to understand what the outcomes are going to be. There are varying levels of specificity in implementation plans, but the most effective ones are likely the most detailed ones.

Further – we can introduce structure within the somewhat nebulous "Implementation Phase" by introducing substeps of: Prepare to Implement, Pilot Deployment, Monitor/Evaluate Effectiveness.

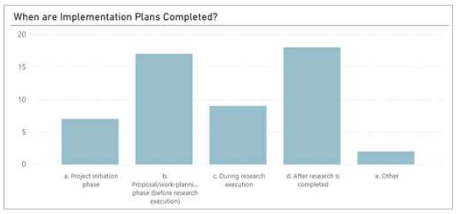
In this case, Implementation Planning and Preparation are different – planning = high level workplanning, resource planning, what will be done in order to implement the research outcomes. Whereas "Preparation" is essentially checking off the first few tasks in that workplan.



It is important to note the distinction between the early phases of implementation planning and the actions taken immediately in advance of an implementation pilot, denoted on Figure 4 as Prepare to Implement. The three frameworks presented here in this toolkit are distinguished by when the initial implementation planning effort begins. This planning activity typically involves gathering end-users and specifying how the idea or concept could be implemented in daily practice. Once research outcomes are known, detailed preparatory steps for implementation can be taken. These steps may include developing a proposed specification, drafting a policy changes, designing training materials and training facilitators, or developing and releasing an RFQ for vendor qualifications for a new technology.

What Causes Fluctuations in Duration?

- **Original Hypothesis**: Agency dynamics, size, organization, funding mechanisms, etc.
- **Synthesis Findings**: Wide variability, unclear "groupings" of agencies following similar frameworks
  - For example, timing of implementation plans as one indicator
  - Not only was there broad representation of respondents who developed implementation plans before, during, and after a research project, but there were differences in how members of the same agency responded.



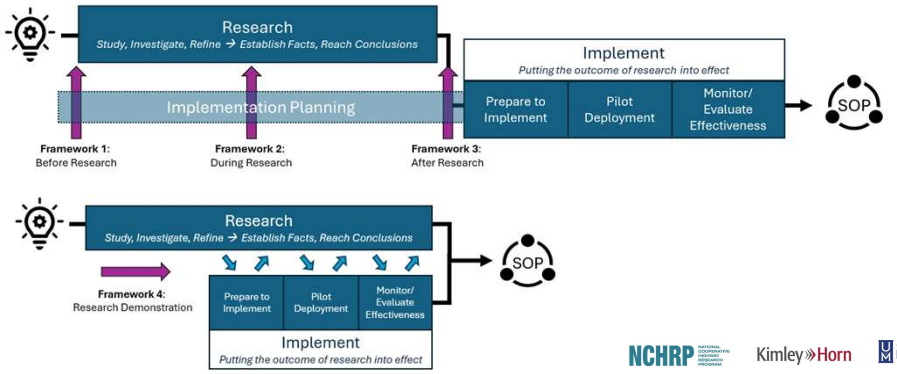
17

What Causes Fluctuations in Duration?

- **New Hypothesis**: Research project characteristics are more impactful than agency-specific characteristics
  - Basic research vs. applied research (maturity of the topic)
  - Topic area – safety vs. pavement vs. technology (typical implementation practices, risk involved, etc.)
- While agency factors certainly influence the duration and approach to implementation planning, evidence suggests **implementation success stems from the agility to plan for implementation of different topics with different approaches**.

Implementation Frameworks

- Implementation Frameworks demonstrate **four alternative approaches** for implementation planning



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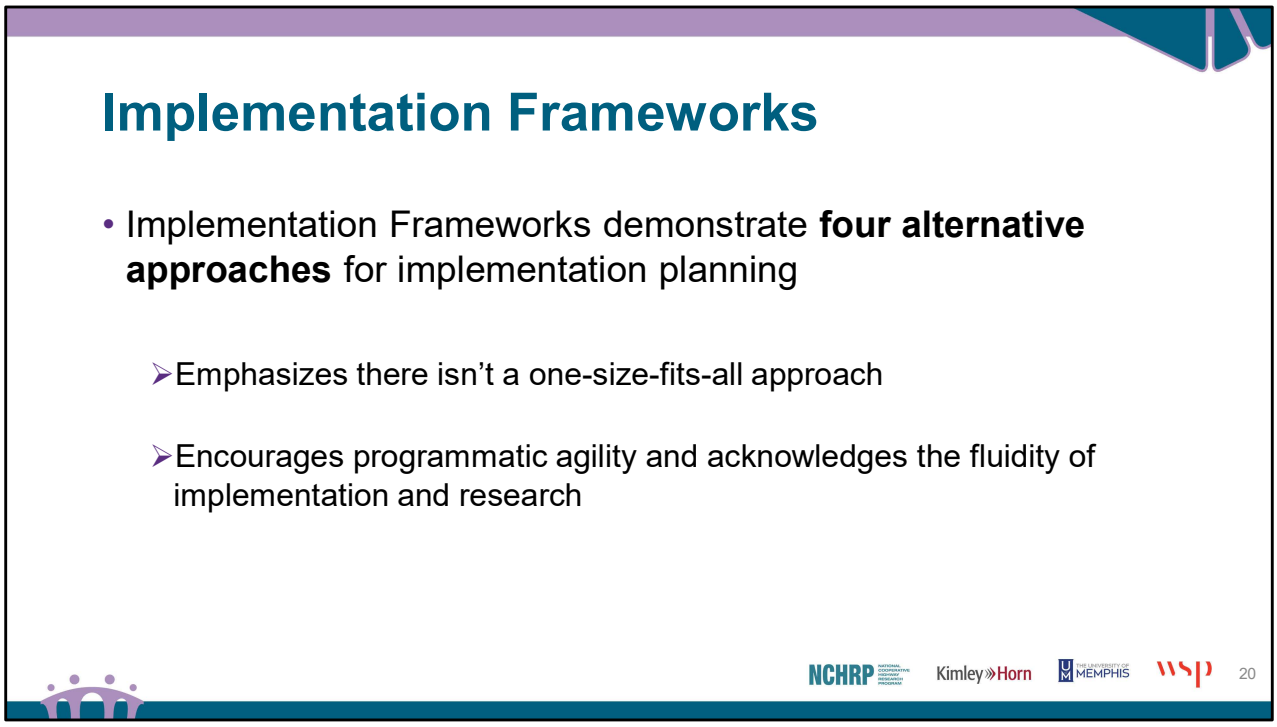
Our development process resulted in 3 distinct implementation frameworks that vary based on when the implementation process is initiated.

Agencies are highly varied
- Difficult to bucket program structures based on stakeholder outreach data

Major barriers manifest while managing individual projects
- Strategies are framed based on what is controllable by the toolkit's audience

Encourages programmatic agility and acknowledges the fluidity of implementation and research



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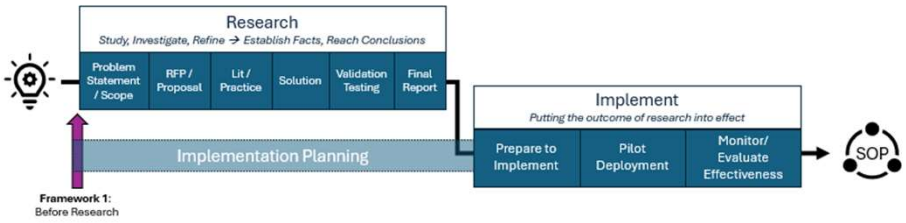
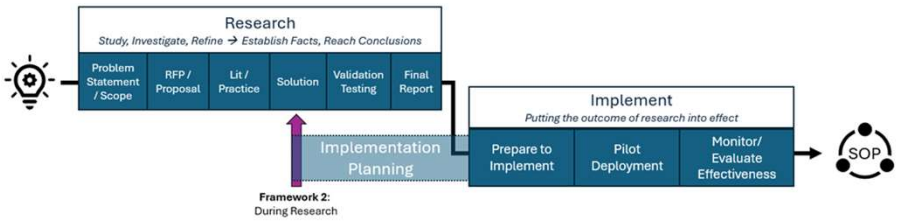
FW 1: Before Research



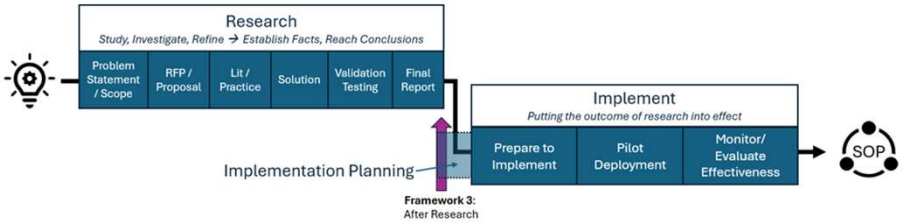
When approach is most effective	Common challenges associated with approach
• Short-duration projects • Projects where funding for implementation is complex and may take significant time to program in agency budgets • Applied research with clear implementation outcomes (such as changes to specifications)	• Too prescriptive too early – may hinder research effort • Idea is too ambiguous to plan early – need research findings to understand direction for implementation • May encounter significant turnover of project champions, stakeholders, or agency leadership • Requires investment of staff resources over the longest period of time

FW 2: During Research



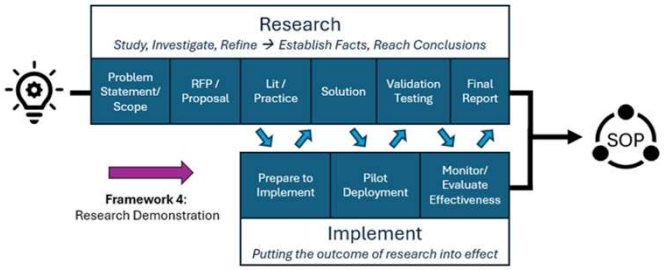
When approach is most effective	Common challenges associated with approach
• Mid to longer-duration projects • Projects where funding for implementation is complex and may take significant time to program in agency budgets • Projects that are less applied and where more understanding is required of research concepts before implementation planning can be effective	• Duration of time between needs assessment/ problem statement and implementation planning may result in dissociation with end-users. • Depending on project length may still encounter significant turnover of project champions, stakeholders, or agency leadership • Requires investment of staff resources over a longer period of time than Framework 3

FW 3: After Research



When approach is most effective	Common challenges associated with approach
• Limiting investment in implementation until outcomes can be evaluated in terms of practicality, affordability, feasibility • Longer duration research projects where staff turnover is likely • Short duration projects where research is well-defined • Projects where implementation is uncertain, such as for high-risk/high-innovation projects • Frequent cycles for agency administration changes	• May conclude research without having fully conceptualized what the end-goal or implementation reality really looks like, leading to mismatch between agency needs and research outcomes • Delays encountered in implementation due to time it takes to obtain funding • Difficulty in engaging research team in the implementation effort as research project has concluded

FW 4: Research Demonstration Programs

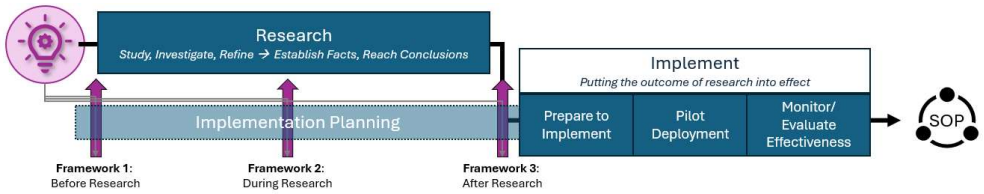


When approach is most effective	Common challenges associated with approach
• High-impact, real-world applications requiring immediate scalability and technology transfer	• Requires complex coordination and project management across researchers, funding agencies, and end-users.
• Projects where research and implementation need to occur simultaneously with real-time feedback	• High resource intensity and need for flexible funding mechanisms to support concurrent activities
• Programs with strong stakeholder collaboration and secured funding support	• Risk of misalignment between research and implementation goals if stakeholder collaboration is weak
• Initiatives focused on emerging technologies requiring rapid deployment	• Potential difficulty distinguishing between research findings and implementation efforts

24

Summary of Frameworks

- Each framework can lead to successful implementation
- A single agency will likely benefit from **adopting multiple frameworks** on the basis of the goals and objectives of an individual project
  - In other words, **the "idea" itself should dictate the framework** that is adopted, rather than a blanket approach for all projects



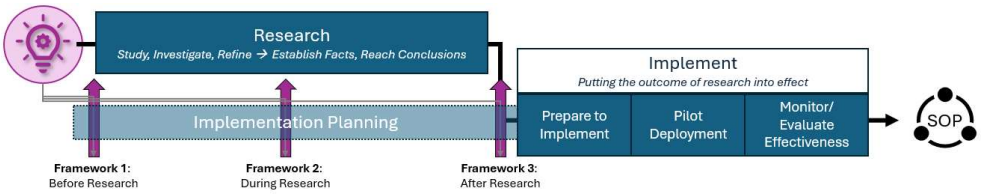
25

While each of the presented implementation frameworks have its challenges, all can lead to successful implementation of research. Each of these frameworks are currently in use by multiple DOTs, and all have resulted in effective research implementation efforts.

A key finding that emerged from surveying representatives across state DOTs and other stakeholders engaged across the innovation lifecycle is that a single agency would likely benefit from

adopting multiple frameworks on the basis of the goals and objectives of an individual project. In other words, **the "idea" itself should dictate the framework that is adopted**, rather than a blanket approach for all projects.

Summary of Frameworks



- While the timing for implementation planning is important, the key to successful implementation following any frameworks is to **anticipate potential challenges and take steps to proactively address them**.

While the timing for when implementation planning is initiated is important, the key to successful implementation following any of these three frameworks is to anticipate potential challenges and take steps to proactively address them. The following section provides tools and guidance that can be used to select an appropriate framework and address frequently encountered barriers to implementation.

Strategies for Common Barriers

- **Most Frequently Identified Barriers**
  - A. Turnover or role transitions of key stakeholders/champions/staff result in stalling of research
  - B. Unclear goals/direction for implementation upon conclusion of research
  - C. Research outcomes do not meet end-user needs
  - D. Final research deliverables leave too wide a gap/too much effort to get to implementation
  - E. Next steps towards implementation are unclear
  - F. Duration of research projects result in end-user loss of interest

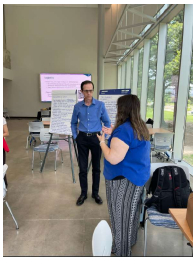
Strategies for Overcoming Barriers

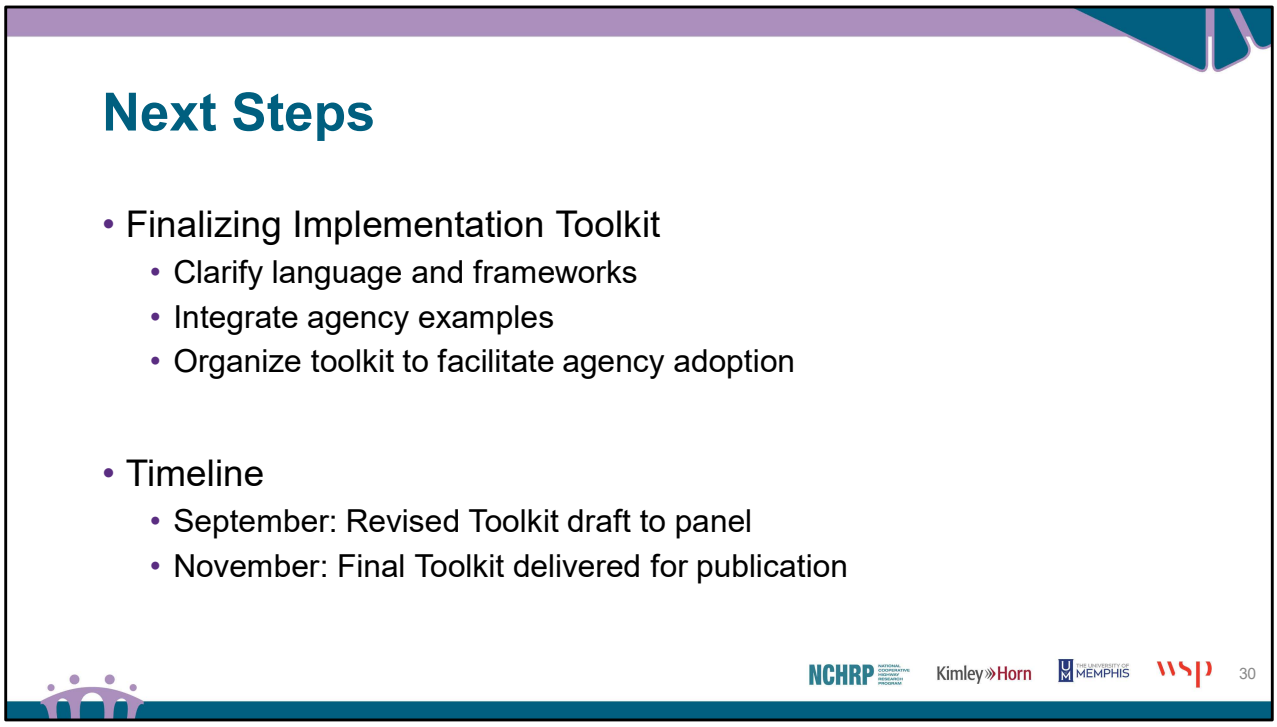
Strategy	Barriers Addressed
Revamp Implementation Plans in the format of Mockup Press Release	• Unclear goals/direction for implementation upon conclusion of research • Research outcomes do not meet end-user needs • Turnover or role transitions of key stakeholders/champions/staff result in stalling of research
Adjusting Research Project Scope to include Specific Deliverable Formats	• Final research deliverables leave too wide a gap / too much effort to get to implementation • Next steps towards implementation are unclear
Leverage Technical Advisory Committees and Establish Protocols for Ownership Transitions	• Turnover or role transitions of key stakeholders/champions/staff result in stalling of research • Research outcomes do not meet end-user needs • Duration of research projects result in end-user loss of interest
Conversation Guide for Communicating the Value of Research Implementation	• Research outcomes do not meet end-user needs • Changes in organization leadership priorities.

Peer Exchanges

- 2 Peer Exchanges hosted in Memphis, TN
  - May 14-15, 2025 – 6 DOT, 3 Academia, 2 industry participants
  - June 11-12, 2025 - 11 DOT, 2 Academia, 1 industry participants
- Goal: Provide input for final Implementation Toolkit







Here I will go in more depth about some of the changes, but will emphasize that it is providing clarity, changing organization (concise report with links to tools in appendix), and addition of examples garnered from agencies who participated in the peer exchanges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