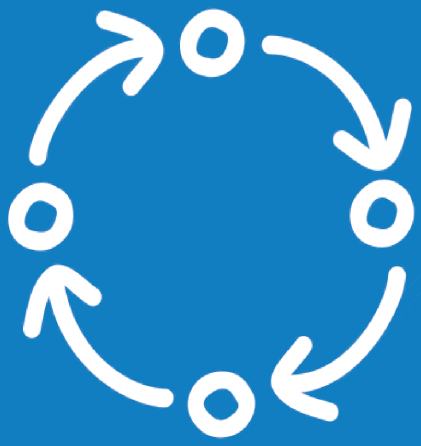
massDOT

Massachusetts Department of Transportation

2019 MassDOT RESEARCH PEER EXCHANGE



Implementing Transportation Research

June 12-14, 2019

Volpe National Transportation Systems Center, 55 Broadway, Cambridge, MA

Acknowledgements

It took the hard work of many people to organize this event, compile the data, participate in the 2 ½ day peer exchange and develop the findings presented in this report. In particular, it could not have happened without Steve Woelfel, DR. Lily Oliver, Nicholas Zavolas, Gabe Sherman, and Patrick McMahon of MassDOT; Luisa Paiewonsky, Terry Regan, Rachel Galton, and Saige Killion of the US DOT/Volpe Center; Dr. Michael Knodler Jr., Matt Mann, and Rebecca Cyr of University of Massachusetts Transportation Center; Jeff McEwen and Brandon Wilcox of FHWA; Lori Sundstrom and Sid Mohan of TRB; Dianne Kresich of Arizona DOT; Binh Bui of Georgia DOT; Megan Swanson of Illinois DOT; Dr. Hafiz Munir, of Minnesota DOT; Sue Sillick of Montana DOT and Dr. Cameron Kergaye of Utah DOT, all contributed to the success of the 2019 MassDOT Peer Exchange and body of work compiled in this report.

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DISCLAIMER

The contents of this report reflect the views of the MassDOT 2019 peer exchange participants, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the Massachusetts Department of Transportation or the Federal Highway Administration.

The purpose of this report is to serve as a technical memo rather than an original research document. Therefore, in some circumstances, materials from the references were included through direct quotation to preserve the accuracy, which would serve the best interests of the readers. The authors do not claim the originality of materials in this report.

Contents

Introduction

The Massachusetts Department of Transportation (MassDOT) conducted a peer exchange with transportation research peers from six other State Departments of Transportation (State DOTs) on June 12-14, 2019 in Cambridge, MA. The peer exchange was conducted in accordance with 23 CFR 420, which requires that agencies use a portion of State Planning and Research (SPR) Program funds to conduct periodic peer exchanges to share and enhance their respective research program activities. The 2019 MassDOT peer exchange included representatives from Arizona DOT (ADOT), Georgia DOT (GDOT), Illinois DOT (IDOT), Minnesota DOT (MnDOT), Montana DOT (MDT), and Utah DOT (UDOT). Representatives from the Transportation Research Board (TRB), the Federal Highway Administration (FHWA) Massachusetts Division Office, the University of Massachusetts—Amherst Transportation Center (UMTC). The U.S. Department of Transportation's Volpe Center hosted and facilitated the peer exchange.

Goals

This peer exchange brought together representatives from State DOTs, TRB, and the FHWA Massachusetts Division to identify innovative approaches and best practices in research, development, and technology transfer with a particular focus on three areas:

1. Management and delivery of an effective transportation research program;
2. Effective implementation of research results; and
3. Use of performance measures and communicating the value of transportation research.

Format

The peer exchange took place on June 12-14, 2019, at the USDOT Volpe Center in Cambridge, MA. The agenda is provided in Appendix A. The event featured opening comments from FHWA, MassDOT, and TRB representatives. Following these welcoming remarks, each State DOT representative gave an overview of their research program. The participants then focused on the three topics listed above in a series of presentations and roundtable discussions. The event also included on-site tours of Volpe research labs.

State Transportation Research Programs

This section contains a brief summary description of each of the participating State DOT's research programs. A more robust description of each State DOT's research program can be found in Appendix B.

Massachusetts DOT

The MassDOT Research and Technology Transfer Section is located within the MassDOT Office of Transportation Planning (OTP). OTP is a shared services office that serves four MassDOT divisions (highway, transit, aeronautics, and Registry of Motor Vehicles (RMV)), the Secretary of Transportation's Office, other shared services offices, and the Massachusetts Bay Transportation Authority (MBTA). The

research program, comprised of one manager and four full-time staff, is responsible for organizing and managing the annual research program; identifying research needs with the MassDOT Divisions, the shared service offices, and the MBTA; and supporting MassDOT technical training efforts for municipalities and the Highway Division. MassDOT has an interdepartmental services agreement with University of Massachusetts—Amherst Transportation Center for research and training support. UMTC maintains an affiliated network of approximately 140 researchers throughout the UMass university and college system that can be accessed through the agreement.

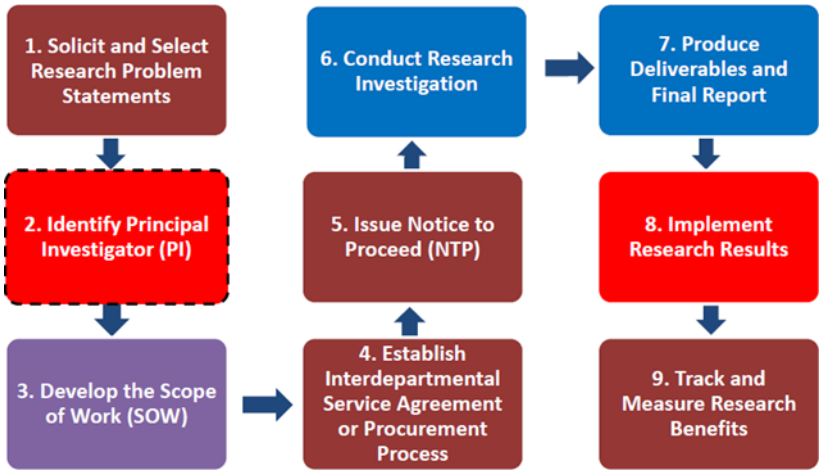


Figure 1. MassDOT's Research Process

Figure 1 above provides a simplified overview of MassDOT's research process. The nine steps set the framework of the research program to ensure that research goals are completed and implementation is successful.

MassDOT conducts a variety of research projects based on the needs of the Massachusetts transportation system.

Below is an outline of MassDOT's FY2019 research projects:

Current FY2019 – 15 active projects

Completed in FY2018-2019 – six projects

Planned FY2020 – new 2020 research project solicitation and selection process underway

Pooled Fund Study – MassDOT participates in six pooled-fund studies, including the New England Transportation Consortium

FY2019 SPR funding (FHWA) – $3,485,269

Arizona DOT

The Arizona Research Center is part of the Arizona Department of Transportation (ADOT) Multimodal Planning Division. The Multimodal Planning Division Director reports to the Deputy Director of Transportation/State Engineer. The Research Center employs eight full-time staff, including the Center's

manager, three senior project managers, one technical editor, and three staff who manage ADOT's Product Evaluation Program (one supervisor and two specialists).

ADOT contracts out all of the research conducted under the research program. Although contractors complete the projects, an ADOT research center project manager directs and evaluates the research to ensure that the product meets ADOT's goals and needs.

Most ADOT research activities are highway-oriented, with approximately 90% focused on highway topics and 10% focused on other modes). About 80% of the research is technical in nature; the remaining 20% is tied more closely to administration, policy, and planning.

Below is an outline of the FY2019 research projects:

Current FY2019 – approximately 20 active research projects

Planned FY2020 – approximately 10 new projects expected

FY2019 SPR funding (FHWA) – $4,600,000 ($2,500,000 for projects)

Georgia DOT

The GDOT Office of Research is part of the agency's Office of Performance-Based Management and Research. In addition to its focus on research, the Office of Research supports the agency's performance measurement and strategic planning activities. The Office of Research employs six staff, including the Research Implementation Manager who also oversees the GDOT Library.

Research ideas are accepted from staff across all of GDOT using a "grassroots" approach, soliciting ideas from GDOT staff. Research staff then present ideas to GDOT's Research Technical Advisory Groups (RTAGs) for discussion and recommendation to GDOT's Research Advisory Group for final review and approval. Research activities are organized around four strategic goal areas—Safety, Asset Management, Mobility, and Workforce/Policy. These goal areas align with GDOT's FY2018-FY2021 Strategic Plan. Examples of research efforts resulting from GDOT's research program include structural, materials, and policy and planning research.

Below is an outline of the FY2019 research projects:

Current FY2019 – approximately 80 active research projects

FY2019 SPR funding (FHWA) – $7,891,178

Illinois DOT

The Illinois DOT Research Office is located within the Office of Planning and Programming. The office has one full-time staff member. The primary customers for research are the offices within IDOT. The goal of IDOT research is to implement transformative solutions for the state of Illinois. IDOT has eight Technical Advisory Groups (TAGs) that meet to discuss ideas, needs, and problems that can be addressed through research. The TAG group topics are: construction; environment; pavement design, management and materials; planning; public and multi-modal transportation; safety; structures, hydraulics and geotechnical; and traffic operations and roadside maintenance.

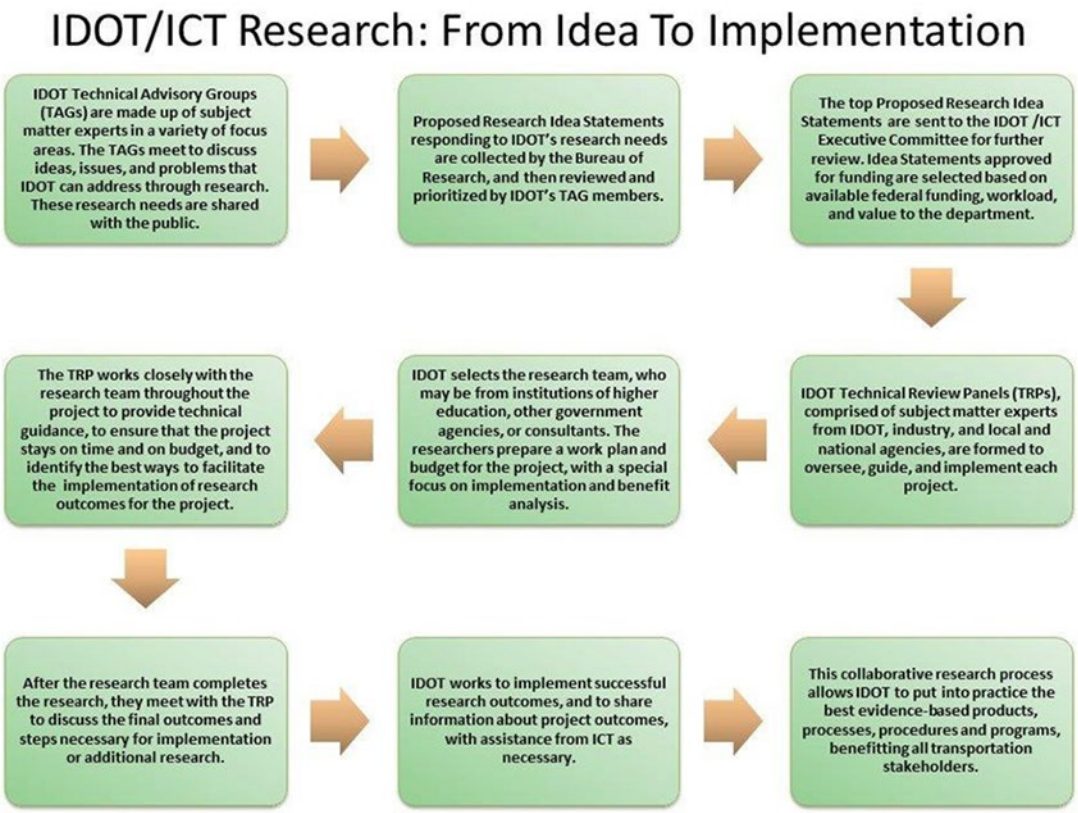


Figure 2. IDOT's Research Process

Figure 2 provides a simplified overview of IDOT's research process. IDOT designed the process to give the agency the best chance to implement meaningful research that address the needs of the state transportation system.

IDOT annually allocates about $6 million in research funds to the Illinois Center for Transportation and about $1.5 million to the National Cooperative Highway Research Program (NCHRP). The department also allocates roughly $1.5 million to various pooled fund studies and almost $200,000 to AASHTO technical service programs.

Below is an outline of the FY2019 research projects:

Current FY2019 – approximately 40 active research projects

Planned FY2020 – more than 10 new projects are expected

FY2019 SPR funding (FHWA) – $8,419,832

Minnesota DOT

The MnDOT Office of Research and Innovation leads the agency's research and innovation efforts. The office resides within the Modal Planning and Program Management Division. Within the Office of Research and Innovation, there are four units—Research Management, Finance and Contract Services, Library Services, and Marketing and Communications.

MnDOT has two governing boards, which oversee the agency's research efforts—the Local Road Research Board and the Transportation Research and Innovation Group. These governing boards follow defined processes and guidelines for reviewing and prioritizing research needs and projects.

MnDOT emphasizes research that can be successfully implemented. Requiring proposers to describe implementation plans in advance has led to a significant improvement in research proposals and implementation rates.

Below is an outline of the FY2019 research projects:

Current FY2019 – approximately 200 active research projects

Planned FY2020 – approximately 35 new projects are expected

FY2019 SPR Part 2 funding (FHWA) – $3,464,692

Montana DOT

The MDT Research Program is located within the Engineering Division. The office has three full-time staff and one contract employee. Research solicitation through MDT involves completing a research idea form and research topic statement form. Both forms create a clear and concise layout of important research project details that can be easily read by MDT's Research Review Committee (RRC). The RRC meets at most once a month to determine the department's high priority research needs, approves research projects, and reviews implementation recommendations and progress.

The research program is primarily highway focused, with some work in the aeronautics, transit, and policy modes.

Below is an outline of the FY2019 research projects:

Current FY2019 – 17 active projects, six projects pending award of contracts

Planned FY2020 – five new projects

Pooled Fund Study – MDT oversees a multi-year pooled fund study with 13 other states on traffic safety

FY2019 SPR funding (FHWA) – $2,552,990

Utah DOT

The UDOT Research and Innovation Division is located within the Office of Technology and Innovation. In addition to managing the SPR program, the office is involved in tracking, identifying, and sharing innovation with the rest of UDOT.

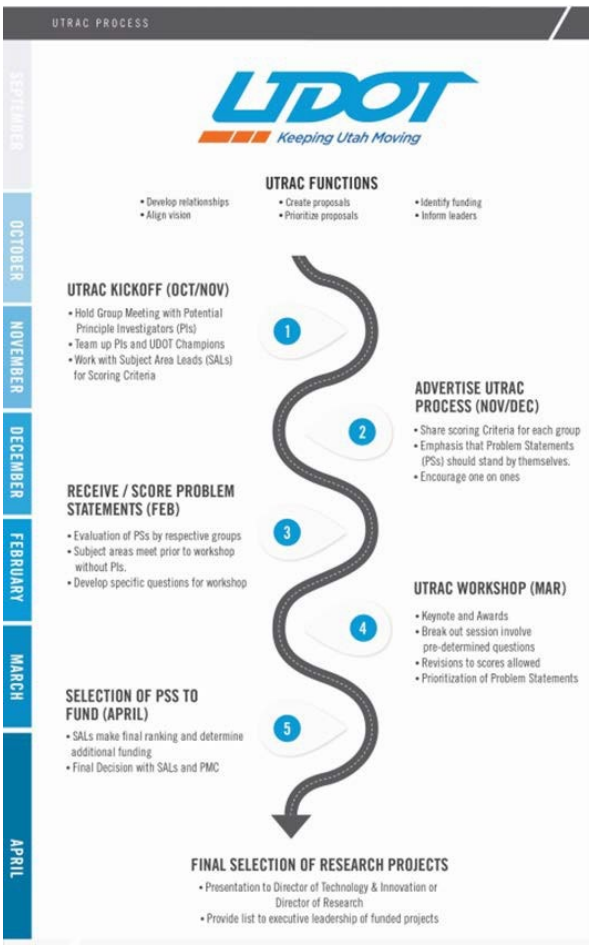


Figure 3. UTRAC Process

UDOT advances through five principal stages in the solicitation and selection process. Figure 3 details these stages.

To better measure and track the progress of research and implementation, UDOT uses a decision-based tool and dashboard they refer to as a Decision Lens. In addition to tracking the outcomes of research, the team understands the benefits of a project by conducting a return on investment analysis.

The research program is principally focused on highway research, but also has public transit and aviation research projects. Most of the research, approximately 80%, is technical in nature with the balance focusing on policy and planning.

Below is an outline of FY2019 research projects:

Current FY2019 – approximately 100 active research projects

Planned FY2020 – approximately 25 new projects are expected

FY2019 SPR funding (FHWA) – $2,148,353

Topic 1: Managing and Delivering an Effective Transportation Research Program

This topic area included an introduction from MassDOT, presentations from ADOT and MnDOT, and a roundtable discussion.

MassDOT's introductory presentation focused on four guiding areas:

- Program Capability—funding size, research prioritization, staff skill sets, engagement of senior leadership and subject matter experts
- Program Management—assessment of research needs, coordination across divisions, and accessibility of research results
- Program Quality—completion of projects on time and under budget, quality control reviews within and outside the agency, templates and guidelines to ensure quality
- Program Value—targeted audience, implementation of results, assessment of implementation, link between performance and funding

Arizona DOT

Dianne Kresich's presentation focused on ADOT's philosophy of conducting research for the benefit of the agency and its internal stakeholders. While the research may produce ancillary benefits to researchers, students, and others, the main focus of the research is to support ADOT's mission and provide solutions to some of ADOT's major challenges. She stated that the goal of the research program is to provide quality customer service to ADOT staff and to deliver products worth implementing. ADOT is working to improve program quality, though challenges remains. She noted that program quality depends, among other factors, on its contracts. ADOT holds contractors accountable by issuing payments at a fixed price and by deliverable following the department's approval of the deliverable.

The ADOT research program has taken a less structured and more flexible approach to enable research staff to respond nimbly to shifting agency priorities. Rather than issuing a formal call for proposals, the ADOT research team identifies potential research by inviting ADOT staff to discuss agency challenges and meeting with potential customers for particular research topics. In order to avoid having a strategic plan that is too specific to remain relevant or too broad to have meaningful impact, the team seeks to adjust to address rapidly shifting priorities. Based on ongoing communication with their ADOT colleagues, research staff prepare problem statements, which are evaluated with two criteria: 1) whether it truly is an agency problem, and 2) whether it can be effectively addressed by research that will produce implementable recommendations. The research team develops and presents problem statements on six-month cycles. The ADOT Research Advisory Committee approves new topics by consensus.

Ms. Kresich noted that these changes were a response to past practices of having problem statements largely developed by principal investigators outside of the agency. Because these proposals did not necessarily have a sponsor within the agency, they were often not implemented. The team now follows up with project managers six months after the conclusion of a study, tracks studies for about 1.5 years following completion, and completes a more comprehensive assessment of the value of the research program as a whole every five years. The team also publishes a straightforward, informative research report written for practitioners.

Ms. Kresich said ADOT would like to learn from other State DOTs about their research philosophy, relationships with universities, methods of payment, alignment with strategic plans, and research quality.

Minnesota DOT

Hafiz Munir described MnDOT's high-level research strategic plan. His team developed the plan to support the agency's broader strategic operating plan, strategic investment plan, and multimodal transportation plan. The plan resulted in five strategic priorities: innovation and future needs; advancing equity; asset management; safety; and climate change and environment. While the team does not require an equal percentage of projects for each priority area, members are encouraged to consider priority areas that may not be in the current mixture of projects. The team also prioritizes projects that address multiple strategic priorities.

The MnDOT team has a Research Steering Committee with voting members and support staff who prioritize research projects, provide guidance for the use of research funds, and support implementation. The research team collects ideas for both research and implementation through a [MnDOT research collaboration site] open on a year-round basis. Staff throughout the agency submit 1-2 paragraph descriptions of their ideas, and the research team can further develop ideas with potential. A significant portion of funding is allocated to projects identified by MnDOT district staff. The committee considers projects on an annual funding cycle, as well as off-cycle funding requests, pooled fund requests, and participation in Federal research programs. The steering committee uses the collaboration site to share information, provide input, and work with project

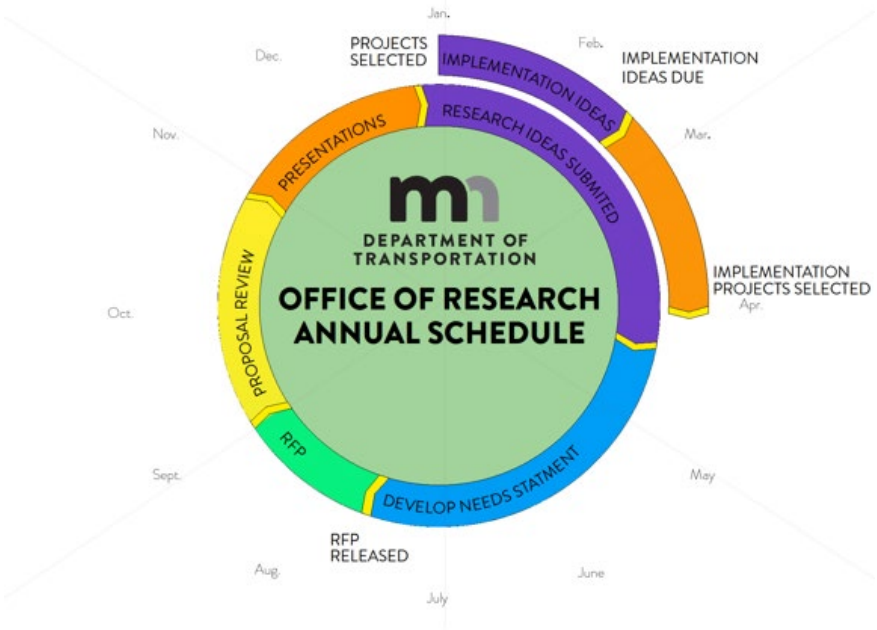


Figure 4. MnDOT Annual Research Cycle

champions on developing more detailed needs statements for prioritized ideas. MnDOT also has an annual cycle for identifying transportation research needs of cities and counties through the Local Road Research Program.

Finally, MnDOT tracks projects from start to finish using an Automated Research Tracking System (ARTS). This allows the agency to manage the contract, project progress, schedule, reports, funding, implementation plans, and other information. The agency has also worked to quantify the benefits of completed research in ARTS. Researchers are now required to provide key expected benefits of projects and whether they can be quantified. Each project has a benefit and implementation summary report. MnDOT has found that about 75% of funded research resulted in some form of implementation, such as changing an existing process or policy, influencing legislation, changing a tool or equipment, and sharing knowledge.

Roundtable Discussion

In the roundtable discussion following the individual State presentations, several common themes emerged.

Identifying and Selecting Research

Agencies identify and select new transportation research projects in similar ways. Most regard internal agency staff as their customers; thus, research teams mostly solicit initial research ideas internally from staff across the agency. Most State DOTs require a designated project champion within the organization for each research project to ensure the project is tied to the agency's goals and can be implemented within the organization. Most agencies use committees comprised of agency staff and stakeholders to review, select, and prioritize new research projects on an annual cycle. These committees are most successful when they include or have senior management involvement.

ADOT's research team makes a concerted effort to identify projects for underserved customers within the agency. The team tries to connect with people at the agency they have not worked with frequently. MnDOT identifies needs based on strategic priorities, though participants agreed it was important not to constrain research with a too narrow a list of priorities.

GDOT ensures that research cycles align with the academic year to support university contracts. As a notable practice, when using university researchers, they emphasized that it is important to plan in advance in order to hire student research assistants. MnDOT accommodates universities' academic calendars by informing them by December of the prior calendar year whether proposed research projects will be funded. Thus, university faculty can solicit students in the spring to work during the following fall. Contracts typically start in July.

State DOTs want to focus on research questions that are innovative and have not already been studied. To avoid redundant efforts, they often complete a literature search and review, though there is variation on responsible parties and scheduled completion dates. Most agencies complete at least a preliminary literature search during the problem statement phase and require a more in-depth literature review once a new research project, project champion (PC) and principal investigator (PI) have been selected. One best practice shared during the roundtable discussion requires PIs to update the literature review at

the end of the project in order to evaluate how the state of the practice has changed, particularly for multi-year projects. This step helps ensure that the research remains current and relevant.

Quality of Research Deliverables

State DOT participants shared their experiences working with contractors from consulting firms and universities. Rather than put out a full request for proposals (RFP), some agencies noted that they have interagency agreements with State universities and "pre-qualified" consultants with whom they can contract work more efficiently. This can improve the quality of work, given an ongoing relationship with the contractor that understands agency needs. For example, MDT occasionally will issue a request for information (RFI) or qualifications (RFQ) to the Council for University Transportation Centers, stating that only public universities may apply. MDT can then narrow the pool through the RFI/RFQ, conference calls, and research proposals, and only issue a full RFP if the research team is not satisfied with the responses received thru the RFI/RFQ process. Having an open RFP may also be appropriate when the DOT is looking for new ideas, perspectives, or expertise.

All of the participants described challenges pertaining to the quality of research project deliverables received and identified specific issues regarding the organization, readability, methods, communication styles, and other facets of written work product deliverables including project final reports. To address these challenges, Professor Knodler of UMTC uses a final report template that mirrors a TRB paper in order to promote consistency and quality. There may be different perceptions between universities and DOTs in what comprises a quality report, including difference in scope (theoretical vs. implementable) and customer-oriented approach. Despite these challenges, participants agreed there are mutual benefits for DOTs and universities.

Participants offered several strategies to help ensure higher quality research products. There are additional opportunities for DOTs to give both positive and negative feedback to university researchers and their deans. MDT includes a plan for quality control in its proposal template, including for interim products. State DOTs can require task reports, use evaluation forms, return poor quality products, delay funding, or decline proposals for additional work if researchers do not deliver quality products on schedule. The peer review process can be a useful tool to incentivize the quality of final reports for State DOT research projects.

Project Costs and Method of Payment

Participants discussed the average cost of a research project and identified an average range of $100,000-$200,000 per research project.

Participants discussed their method of payment for contracted research. Several agencies pay by deliverable, and thus cost is not dependent on the number of labor hours a contractor may use. This approach allows agencies to ensure work quality, since they do not pay fully until the contractor revises the product to the agency's satisfaction. The agency also does not have to pay for additional hours expended on revising poor quality work. However, Professor Knodler pointed out that universities are sometimes responsible for paying employees by the hour, so by-deliverable contracts can create financial and legal challenges. UDOT stressed the importance of having a good working relationship with universities, particularly on small contracts funded initially through overhead, in order to have leverage

on the project. If a researcher's payment is not linked to delivery or quality of work, the DOT could lose leverage over the project.

Other agencies use maximum contract amounts or require reports to be delivered as tasks are completed. IDOT is not able to pay by deliverable, so the agency pays the university, which contracts researchers. MDT pays on a monthly basis, based on progress reports. Some agencies withhold a percentage of payment if contracts must be modified for the schedule of deliverables. ADOT used to withhold 20%, but now does not withhold. MDT withholds 15%, and MassDOT used to withhold 10%. In some cases, agencies will not pay for incomplete or poor quality work. Other agencies, citing longstanding professional relationships, avoid being "too tough" on their contractors without considering the full circumstance of poor work performance.

Research Team Capacity

State DOTs face different challenges in managing their respective research programs. With limited staff, IDOT has difficulty spending all of the available funding for research. However, this allows the agency to provide funding up front, rather than estimate how much will be spent over the course of the year. In this way, IDOT can avoid reaching the end of the year, and having only a few weeks to decide how to obligate a large amount of remaining funding. MassDOT faced similar staffing challenges in the past. Now, the MassDOT team is larger, and the research team works closely with the FHWA Division Office to plan and implement research projects via an annual project solicitation cycle. Conversely, other agencies struggle with funding, rather than staffing, shortfalls.

Publishing and Sharing Results

The completed product of State DOT-sponsored research is often a final report. The participants noted that these final reports can often be overly long, difficult to read, and opaque, despite containing practical information. While this information is useful to document on a technical level, most readers will not read the entire report. ADOT's team addresses this problem by publishing a shorter, more readable version that is posted publicly, while retaining the full version for the use of practitioners interested in having more details. MDT publishes approximately four-page project summary reports as well as performance measures reports that quantify the benefits of the research. TRB's NCHRP is considering 1-2 page executive summaries to make the material more accessible. MDT produces a final report for documentation, though the report is less of a focus than the actual implementation products of the research.

Participants discussed the value of having State DOT research projects published in academic professional and industry journals. Typically, research contractors, rather than the State DOT, pursue this type of publication opportunity. State DOTs are beginning to recognize the value and visibility that comes with their research being published in high-impact publications. TRB will help pay some costs for researchers to present NCHRP-sponsored work at meetings, supporting increased visibility of their research results.

Implementing Research Results

Participants discussed the implementation of research results as an important component of managing an effective research program. Participants estimated that 50-75% of research project results are

implemented in some form. Many State DOTs follow up after a project is completed to check on the status of implementation of the research results (short term) and how implementation has impacted the agency's operations (long term). Some agencies require an implementation plan to be included as part of the research proposal, or with the final research product. Some agencies, such as MnDOT, have made efforts to quantify the benefits of projects, but it is often difficult to quantify completed or proposed project results given the lack of baseline data.

Topic 2: Effective Implementation of Research Results

This topic area included an introduction from MassDOT, presentations from TRB's representative, IDOT, and UDOT, and a roundtable discussion. MassDOT's presentation focused on how to define research implementation and whether all State DOT research should be implemented. Guiding focus areas included:

- Tangible vs. intangible impacts of implementation;
- Stages of implementation and responsible parties for each step; and
- Funding for implementation.

TRB

Sid Mohan presented on the NCHRP's approach to implementation, with a focus on five framing principles: implement, monitor, evaluate, sustain, and communicate.

The NCHRP Implementation Support Program supports implementation of completed and in-development NCHRP projects, often in the form of education (training, workshops, and peer exchanges), technology transfer, demonstration, and facilitation. These projects are selected based on readiness, viability of the implementation plan, and potential impacts. Applications for NCHRP's implementation support are only open to current NCHRP panels, State DOTs, or AASHTO committees and councils, and generally support implementation within one or more states. This can allow research to be implemented in other states as well as the in the state where the research was originally conducted. This partnership allows the NCHRP program to support research implementation at the state level, or in collaboration with MPOs and states. Rather than distributing the funding directly to a state, TRB hires the contractors and manages the work.

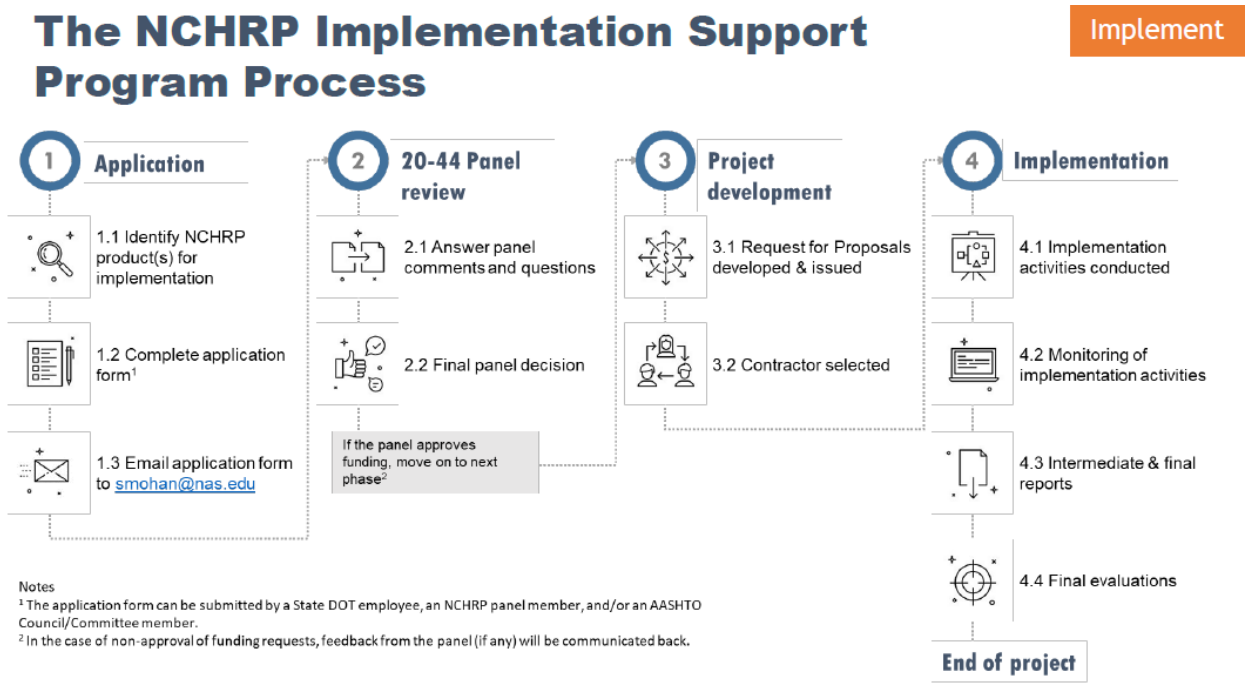


Figure 5. NCHRP Implementation Support Program Process

Since January 2018, TRB has received 38 implementation-related inquiries, resulting in 17 requests funded, with an average duration of 1.5 years, and a cost of $110,000. TRB noted that they can offer presentations to individual states or as a part of larger committees.

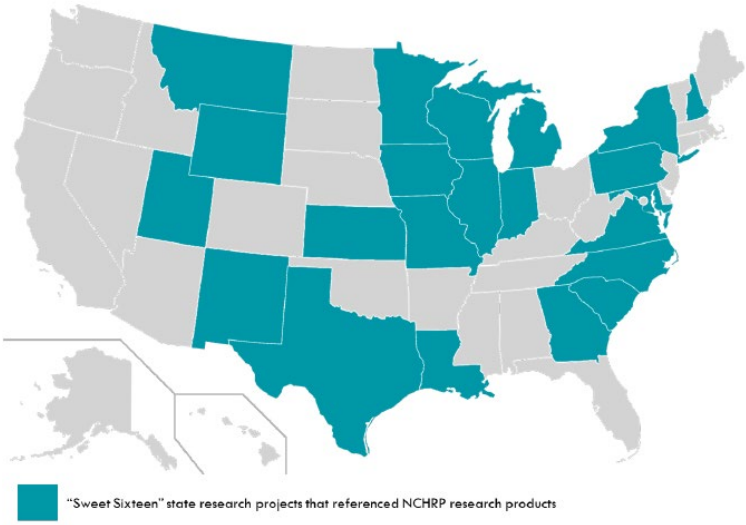


Figure 6. States with "Sweet Sixteen" High Value Research Projects awarded before 2019 that had cited NCHRP reports

TRB has studied the impact of NCHRP projects. The team has assessed and collected survey responses about state projects to understand where NCHRP research products have been referenced and used. The team developed a project specifically focused on quantitative and qualitative methods for capturing the impacts and value of its projects, in order to determine the effectiveness of NCHRP research products in:

- Changing practices and/or standards,
- Informing policy decisions,
- Educating the transportation workforce, and
- Ultimately generating benefits to society.

The NCHRP published an impact report documenting the value of application of NCHRP research results. Moving forward, the NCHRP would like to improve processes by creating an implementation plan template for all projects, improving coordination with TRB, FHWA, and AASHTO programs, developing case studies of funded implementation projects and implementing new communications projects and strategies.

Illinois DOT

IDOT's Megan Swanson described the process of building an implementation focus into its transportation research program. In the past, projects did not always have clearly defined implementation goals or the right people involved to implement the research results.

Now, the research office considers implementation from the very beginning by meeting with each focus area group in the spring to identify problems that can be solved through research. The discussion includes identifying key stakeholders and challenges to ensure they are addressed before the project begins. This includes having all affected parties represented on the project's Technical Review Panel (TRP) of IDOT subject matter experts. IDOT starts every project assuming it can and will be implemented. Staff are trained to consider potential for implementation, potential barriers, necessary partners, and other factors when selecting research ideas to post and projects to fund. Despite initial pushback, these considerations are now a standard agency practice. In some cases, research validates an existing policy or procedure. This is still considered an implemented project, even when no change was needed. In other cases, research cannot be implemented due to financial or political reasons. However, the majority of projects are implementable in some way, and IDOT checks in on implementation opportunities throughout the research project as well as at every project closeout meeting.

IDOT uses implementation worksheets to ensure implementation is considered throughout the life of a research project. IDOT TRPs are responsible for completing these worksheets in consultation with the PIs and for making sure PIs complete interim reports, white papers, draft policies, or other necessary documents. There was some hesitation from IDOT's staff about the appearance of allowing academic partners to develop policies or procedures on behalf of the agency, but Ms. Swanson's team has reframed this as significant head start on agency needs that staff can modify with IDOT-specific language and technical needs.

IDOT emphasized the importance of consistency in including implementation as a part of every discussion. As a result, these conversations are now a regular part of agency practice, and both PIs and TRPs are more satisfied with project outcomes knowing the work will be used.

Utah DOT

Presenting for UDOT, Cameron Kergaye offered examples of implemented research projects at UDOT, including highway reconstruction, congestion pricing, diverging diamond interchanges, wrong-way driving detection, and accelerated bridge construction.

UDOT's approach is to empower technical groups to determine how they want to use designated funding and present implementation ideas to leadership. UDOT also seeks to ensure that research implementation teams have visibility and constant communication with staff and leadership on their projects. UDOT hired an implementation manager to help move projects forward. The agency subsequently concluded that this role was not effective unless the implementation manager was present from day one. UDOT also ensures that the research champion is someone in a technical division that will use the results of the research. Typically, this person is an experienced professional who has delegated authority to implement the research results. The combination of these various roles ensures projects consider implementation from the beginning and throughout the project.

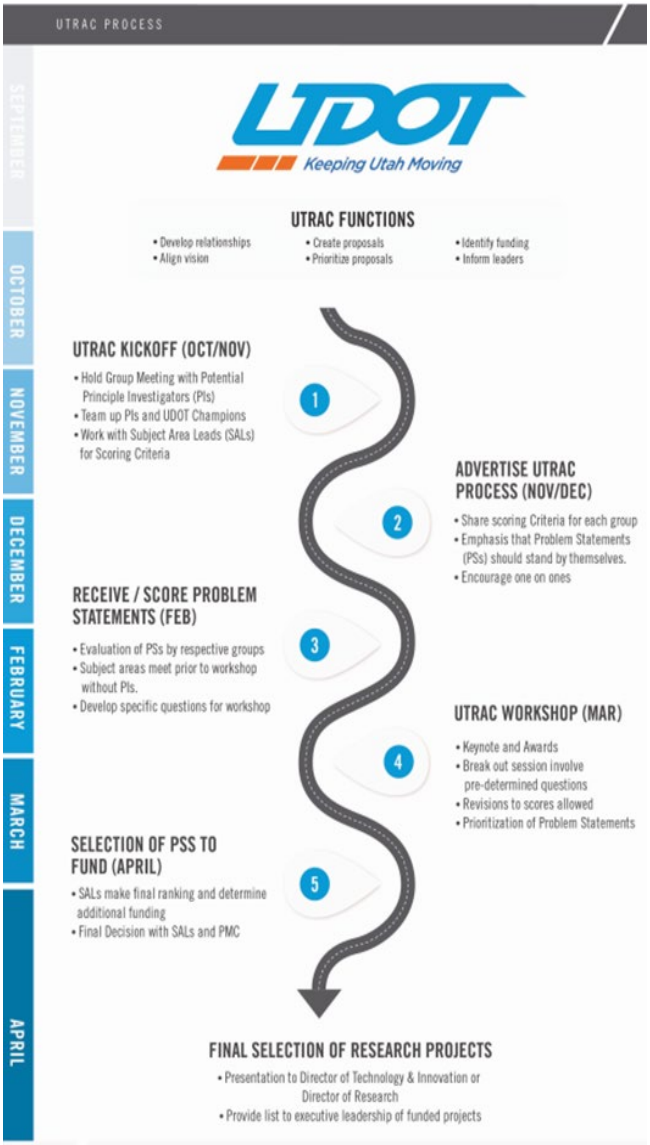


Figure 7. UTRAC Process

UDOT empowers a variety of stakeholders to contribute ideas for project in order to support implementation:

- UDOT has an innovation working group from across the agency that meets throughout the year and includes staff at all levels, including leadership.
- UDOT hosts TRB representatives as an effective way to support staff engagement and learn about ideas from across the country.
- UDOT gains new ideas by working with university students to address UDOT challenges through capstone projects.
- UDOT receives funding from localities, public transportation, and other agencies for mutually beneficial projects managed by UDOT.

$$\text{Benefit/Cost} = \frac{\text{Number x Value x Percentage}}{\text{Contract + TAC + PM costs}}$$

To measure research benefits, Mr. Kergaye offered an equation that includes the number of projects, quantified value of those projects, and percent implemented over the total costs of all projects. However, values such as number of lives saved or procedures changed can be more difficult to quantify.

Figure 8. UDOT Submitted and Implemented Ideas

To communicate results, UDOT has a standard research reporting format that offers a 1-2 page summary of research. UDOT summarizes the implementation of its research in an annual innovation and efficiencies report in order to support staff awareness, process improvement, and performance management. However, the team seeks to be able to provide this information more regularly than once a year. Through the UDOT Innovates Learning Portal, the agency is working to consolidate its data system to better gather and distribute information about implementation of projects across the agency. Of 362 ideas submitted for implementation, about 50% were implemented, with the highest implementation rates for projects in the regions.

Roundtable Discussion

Several key themes emerged from the roundtable discussion on this topic.

Defining Implementation

Research implementation does not always result in tangible products, but research may have the effect of validating an existing agency practice, or facilitating knowledge sharing across the agency. Participants discussed how to best define research implementation and the difference between research and innovation. Although these terms are often considered together, participants agreed that innovation can result from research, but this is not always necessarily true.

Successful Implementation

Agencies shared best practices to support successful implementation, including:

- Considering implementation from the beginning stages of project proposal and selection;
- Identifying one or more project champion(s) with the requisite knowledge, expertise, and leadership position to support and steward the implementation of research results;

- Clearly articulating benefits of research products to all stakeholders;
- Engaging and obtaining support from key agency staff, including upper management, throughout research and implementation processes;
- Ensuring a project remains "high priority" and avoiding slow-moving or standstill of work by having regular check-ins and evaluation of progress towards the original goal of research;
- Funding implementation and developing products to facilitate implementation either as part of the research project or as a separate implementation project;
- Developing incentives from leadership for risk-taking;
- Adopting quality management standards such as ISO 9001; and
- Identifying clear ownership of research products in order to avoid intellectual property disputes.

Implementation Plans

Some participants noted that they use implementation plans to ensure there is a clear path to implement the results from research projects. Implementation planning worksheets from IDOT include expected deliverables; potential implementation challenges and solutions; offices affected by implementation; and an expectation of benefits for factors such as policy, lifecycle costs, and safety. Example implementation planning templates are available from IDOT and MDT.

Need for Agency Support

The participants agreed that research teams need supportive staff and agency leadership who value transportation research in order to be able to implement research results. Research teams have gained "buy-in" across the agencies when agency leadership is willing to fund and prioritize the implementation of research results, and agency staff are willing to prioritize implementation efforts as part of their work. MassDOT representatives described some of the challenges they faced gaining buy-in for implementation, because some staff perceive it as additional work. To overcome these challenges in achieving buy-in, research teams must be persistent in helping agency staff and leadership to recognize the benefits of research implementation.

Participants also discussed the question of the role of the research staff in providing support to their agency staff during the implementation process. Although agency staff typically identify the challenges they would like research to address, they may not have time or want to be responsible for ensuring the implementation of research results as solutions to these challenges. Participants also identified a need to have a direct linkage between research problem statements and an implementation plan and project champion. Agencies also agreed on the importance of having agency stakeholders sign on to support an the implementation of research results at the beginning of a research project, not after, in order to promote responsibility and gain buy-in.

MDT addresses this by having researchers include implementation "recommendations" in their final report. The MDT research and technical panel then meets to discuss the recommendations, determine what is and is not feasible, and develop an implementation report that lists each of the researcher's recommendations with an MDT response. This report is signed off by the panel, which includes the champion and the sponsor, a high-level staff member ultimately responsible for implementation. Once signed, the team completes an implementation formal implementation plan, and presents a final presentation of the research and planned implementation to the high-level committee.

Participants also emphasized the need for agency leadership support in advancing the implementation of research results. IDOT's team continues to push ideas bottom-up, but works with agency leadership to promote these efforts from the top as well. TRB's presentation included a graphic showing "Sweet Sixteen" High Value Research Projects awarded before 2019 that reference NCHRP research products in their research projects. They noted that these types of graphics are effective in communicating to executives, who want their state to appear on the national map. Participants offered feedback to TRB about how to better connect with the right people at State DOTs to identify these references.

Sharing Implementation Results and Participating in National Committees

Participants noted that there are valuable benefits to implementing research results derived from research conducted by other State DOTs. They discussed the value of participation in national committees and groups such as the AASHTO Special Committee on Research and Innovation (RAC) and the AASHTO Innovation Initiative (AII). These committees host meetings and webinars to provide a platform for research managers and staff to learn from each other. The AII committee in particular is working to develop a repository of projects, and may have funding to support states in deploying research results identified in other states.

Participants discussed the overlap among AASHTO, FHWA, TRB, and other organized groups and how to best leverage participation and knowledge gained from participation. They also discussed the importance of having agency staff involved in national committee activities as well as encouraging new agency employees to participate in transportation research activities to ensure consistency and sustainability during agency turnover. Participants discussed the potential value of a national succession planning and mentorship program for DOT engineers involved in transportation research and development.

Topic 3: Performance Measures and Communicating the Value of Transportation Research

This topic area included an introduction from MassDOT, presentations from MDT, GDOT, and TRB, followed by a roundtable discussion.

MassDOT's presentation included suggestions from NCHRP on potential performance measures for implementation in the following categories:

- Outcomes—cost savings; safety impacts; environmental, health, and equity impacts
- Outputs—technical products; knowledge products; management/policy products; number of reports published
- Resource Allocation—funding distribution among topic/functional areas; contract distribution among contractors
- Efficiency—benefit-cost ratio; the percentage of administrative costs; the percentage of requests funded; the percentage of projects implemented; the percentage of projects on-time and within budget
- Stakeholder—participation level; the number of projects needs statements received; customer satisfaction

Montana DOT

MDOT's Sue Sillick described her research team's recent efforts to build performance measures into MDT projects in order to better align resources towards results. She noted the value of performance measures in communicating successes within and outside of the organization and retaining support for the program. She identified methods for collecting performance measures including surveys, feasibility methods, case studies, expert opinions, and anecdotal evidence.

The presentation primarily consisted of questions for the group on their approach to performance measures:

- What is measurable vs. what is useful?
- What constitutes program and project success?
- What are performance indicators vs. performance measures?
- Should agencies should measure things outside their control, such as implementation?
- How should agencies define program success, effectiveness, quality, and value?
- On what scale and over what time period should agencies measure and report performance measures?
- How should agencies set targets?
- How can agencies best present data visually in dashboards?

- How can agencies report evidence of research value without easily quantifiable results?
- How can agencies measure the value of research beyond the agency (to other DOTs, national organizations, etc.)?

She offered examples of performance measures in the following categories:

- Resource/input—funding, time, staff involvement, etc.;
- Output—on-time/budget, added value, meeting goals, the percentage of projects implemented;
- Types of Output—decision support tool, procedures, guidelines, materials, practices, products, technology transfer;
- Outcome, Results, and Impacts—aesthetics improved, congestion reduction, cost savings, efficiency gains, environmental gains, process improved, increased lifecycle, service improved, safety gains, system reliability gains, policy improvements, etc.; and
- Efficiency—time savings, cost/benefit, return on investment, overhead costs.

Georgia DOT

Binh Bui presented on GDOT's efforts to develop an agency tool to support research implementation management and evaluate research program impacts. One driving philosophy of the tool is that research can be managed similarly to an asset to promote performance. GDOT's primary strategies to support performance-based implementation include:

- Adopt a performance-based definition of research implementation;
- Develop a clear description of the agency's research implementation process and adopt it as a formal business process;
- Require project implementation plans as part of research proposals including objectives, deliverables, timelines, and performance measures;
- Require implementation progress reports for deliverables;
- Estimate and report on research value, including requiring PIs to specify quantitative and qualitative measures for assessing research value, as well as associated data sources;
- Allocate resources for research implementation, including appropriate staff and funding;
- Develop context-appropriate tools to support implementation; and
- Develop appropriate communication channels for internal and external stakeholders. GDOT's performance-based research implementation (PRI) tool allows GDOT to track pending deliverables, implementation timelines, offices responsible, research categories, and other factors. The PRI tool allows GDOT to analyze and visualize elements such as fund distribution, office involvement, implementation outcomes and types, and projects meeting expectations.

Despite the usefulness of these tools, Mr. Bui noted that successful research implementation does not relate to different strategies or tools, but rather a broader strategic framework and culture that supports innovation. Mr. Bui recommends agencies improve research implementation by adopting systematic approaches, hiring experienced professionals, and building capacity for implementation.

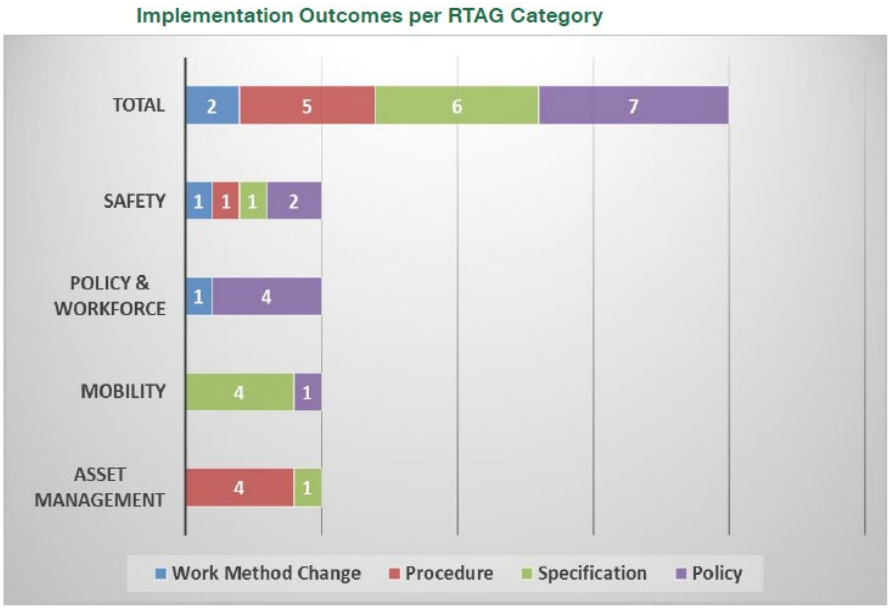


Figure 9. GDOT's Performance-Based Research Implementation Tool

TRB

TRB's Sid Mohan presented on NCHRP Project 20-44, *Quantitative and Qualitative Methods for Capturing the Impacts and Value of NCHRP Research*. The purpose of the project is to measure how NCHRP research results contribute to delivery of transportation goods and services at the state and national levels. Steps in the project include

- Gathering perspectives on methods for evaluating research impact through interviews with NCHRP, AASHTO, PIs, and State DOT staff;
- Testing feasibility and identifying barriers in the methods identified;
- Drafting guidance with relevant metrics, data elements to populate metrics, and mechanisms for data collection and analytics;
- Instructing evaluators on the methods and providing transparency to research sponsors and stakeholders; and
- Implementing each method with actual research results to test applicability and usefulness.

At the conclusion of the project, TRB will develop an implementation plan that will outline how, when, where, when, and by whom these methods should be used. The plan will include recommended adaptations to NCHRP reports and processes, but can be relevant to other research programs more broadly.

Roundtable Discussion

Value of Performance Measures

Participants generally agreed that use of performance measures can be helpful to appropriately track and better communicate the value of their transportation research program activities. However, agencies vary in which research program activities they track and measure to communicate research performance in furtherance of the agency's transportation goals and objectives. Some participants suggested that their agency's goals and objectives were too broad to guide specific research performance measures, while others found value in associating research performance measures to broad transportation program categories in their communications with agency executives. Most participants would like to be able to track performance measures at the individual project level as well as the broader research program level.

Methods and Challenges for Measuring Performance

Participants agreed that surveying project champions, principal investigators, and internal agency staff (stakeholder surveys) can be a valuable tool in gathering research program performance data and information. However, gathering this data from staff and principal investigators can be challenging, as they may be hesitant to be critical of their own research, particularly if they are contractors. MnDOT completes a private evaluation of every research project following its completion, including a phone interview with PIs and internal staff. These evaluations are used to identify and support research program improvements and to promote better understanding of implementation processes and opportunities. Other agencies conduct annual research program surveys with agency staff, or interim surveys and evaluations with PIs to track progress.

In general, participants agreed that developing effective performance measures is a challenge given that many benefits of projects are intangible and difficult to measure quantitatively. Performance measures and targets may be difficult to compare across research projects, given that individual projects may have different goals and objectives. Selecting the appropriate measures for each project is important to ensure usefulness.

Communicating Research Value

Despite the challenges in developing appropriate performance measures, employing metrics to communicate research performance is important. Documenting measures of performance can be included in a project's final report or separate project performance report, as well as the research section's projects management system. GDOT uses its performance-based research implementation tool to describe these anticipated project performance outcomes. Montana and Minnesota both use their website, project presentations, and newsletters to communicate these results. Some agencies work closely with their transportation librarian to disseminate these outcomes.

Conclusions

Participants agreed that the 2019 MassDOT peer exchange helped participants identify common challenges and new ideas in the areas of 1) managing and delivering an effective transportation research program; 2) implementing research results; and 3) using performance measures and communicating the value of transportation research. The peer exchange participants looked forward to taking back ideas exchanged at the peer exchange to their respective agencies.

Practices and Challenges for Managing a Quality Transportation Research Program

The Topic 1 Roundtable Discussion focused on the transportation research program's noteworthy practices and challenges for managing a quality transportation research program that adds value to State DOTs. Participants shared how they identify transportation research needs, coordinate with contractors to conduct research, and ensure quality research outputs. Participants generally identify research topics by reaching out to staff across the agency to understand their needs, often through an online "one-stop shop" for collecting and evaluating proposals. Participants shared best practices for selecting and coordinating with university and private contractors for conducting research, such as developing interagency agreements or "pre-qualifying" contractors to support an ongoing relationship. State DOT research programs are continually working to improve the quality of their research products, such as ensuring through project agreements that PIs prioritize completion of final reports and consolidating final reports into more concise documents in order to ensure the readability and usability of research.

Promoting Project Implementation

The Topic 2 Roundtable Discussion focused on how to best promote project implementation throughout all stages of the project. Participants agreed that the implementation of research results should be considered during the new research project solicitation and selection process. Research project proposals should assume that research results can and will be implemented. Several strategies were shared for promoting implementation of research results, including requiring proposed research projects to include implementation plans, worksheets, and interim reports as a component of the project's deliverables. Participants also agreed that the successful implementation of research results is often determined by having the involvement and support of appropriate staff within the State DOTs to serve as project champions, and implementation stewards to help move the project results to implementation. Participants also identified the importance of agency leadership's involvement and support of is transportation research and the implementation of research results. Continued involvement from all these agency stakeholders can help ensure that implementation of research results remains "high priority." Implementation of research results may involve the adoption of new material selections or processing; adoption of new policy, guidance or regulation; or providing new knowledge. Participants agreed they wanted to continue to improve opportunities for sharing their respective implementation processes and results with others, including through participation in national committees and groups.

The Value of Performance Measures for Communicating Transportation Research Success

The Topic 3 Roundtable Discussion included a discussion of the value of using performance measures to communicate successes and gaining support for transportation research within and outside state DOTs . Many participants are still exploring the use of appropriate measures for evaluating the success of their respective research programs. They identified the need to balance the costs of gathering data to measure research performance and the usefulness of such data in measuring program performance. Given that it can be difficult to measure the impacts of research quantitatively and to compare meaningfully across projects, agencies also agreed that just because something can theoretically be measured does not mean that it should be included. Thus, it is important to identify the most appropriate performance measures to best evaluate and convey the results and benefits of their research program activities.

Participants agreed that they learned a great deal from sharing challenges and lessons learned during MassDOT's 2019 peer exchange, and will take this information back to their agencies with the goal of improving their respective transportation research programs.

Appendices

Appendix A: Agenda and Peer Exchange Participants

Massachusetts Department of Transportation 2019 Research Peer Exchange June 12-14, 2019 US DOT/Volpe Center 55 Broadway, Cambridge, Massachusetts		
AGENDA		
U. S. Department of Transportation Volpe National Transportation Systems Center Multi-Media Operations Center 55 Broadway, Cambridge, MA		
Wednesday, June 12, 2019		
Time	**Topic**	**Speakers**
8:00 a.m.	**Morning networking and refreshments**	
8:30 a.m.	**Welcome**	Jeff McEwen, FHWA Steve Woelfel, MassDOT
8:45 a.m.	**TRB Perspective**	Lori Sundstrom, TRB
9:15 a.m.	**State DOT Research Program Overviews**	MassDOT- Lily Oliver Arizona DOT - Dianne Kresich Georgia DOT - Binh Bui

		Illinois DOT- Megan Swanson Montana DOT - Susan Sillick Minnesota DOT - Hafiz Munir Utah DOT - Cameron Kergaye
10:30 a.m.	**Break with light refreshments**	
10:45 a.m.	**State DOT Research Program Overviews (continued)**	
11:45 a.m	**Working lunch**	
12:45 p.m.	**Topic #1: Managing and Delivering an Effective Transportation Research Program** • Introduction - MassDOT • State DOT presentations • Roundtable discussion with participants	Lily Oliver, MassDOT Diane Kresich, Arizona DOT Hafiz Munir, Minnesota DOT
2:45 p.m.	**Break with light refreshments**	
3:00 p.m.	**U. S. DOT/Volpe Center tour**: NextGeneration Air Transportation Systems Lab	
3:30 p.m.	**Topic #1 (continued)**	
	• Questions and comments from participants	All
4:30 p.m.	**Topic #1 Wrap-up and takeaways**	Rachel Galton, U. S. DOT/Volpe Center
5:00 p.m.	**Adjourn for the Day**	

AGENDA

U. S. Department of Transportation
Volpe National Transportation Systems Center
Multi-Media Operations Center
55 Broadway, Cambridge, MA

Thursday, June 13, 2019

Time	Topic	Speakers
8:00 a.m.	**Morning networking and refreshments**	
8:30 a.m.	**Recap of Day 1**	Rachel Galton, U. S. DOT/Volpe Center
8:45 a.m.	**Topic #2: Effective Implementation of Research Results** • Introduction - MassDOT • TRB/NHCRP Implementation Efforts and Results • State DOT Presentations	Lily Oliver, MassDOT Lori Sundstrom,TRB Sid Mohan, TRB Megan Swanson, Illinois DOT Cameron Kergaye, Utah DOT
10:30 a.m.	**Break with light refreshments**	
10:45 a.m.	**Topic #2 (continued)** • Roundtable discussion with participants	All
12:00 p.m.	**Working lunch**	
1:00 p.m.	**Topic #2: (continued)** • Questions and comments from participants • Topic #2 wrap-up and takeaways	All Luisa Paiewonsky and Rachel Galton, US DOT/Volpe Center

2:00 p.m.	**Break and U. S. DOT/Volpe Center tour**: Maritime Safety and Security Information Systems Lab	
3:00 p.m.	**Topic #3: Performance Measures and Communicating the Value of Transportation Research** • Introduction – MassDOT • NCHRP project overview: Quantitative and Qualitative Methods for capturing the Impacts and Value of NCHRP Research	Lily Oliver, MassDOT Susan Sillick, Montana DOT Binh Bui, Georgia DOT Lori Sundstrom, TRB
5:00 p.m.	**Adjourn for the Day**	

AGENDA		
U. S. Department of Transportation Volpe National Transportation Systems Center Multi-Media Operations Center 55 Broadway, Cambridge		
Friday, June 14, 2019		
Time	**Topic**	**Speakers**
8:00 a.m.	**Morning networking and refreshments**	
8:30 a.m.	**Topic #3: Performance Measures and Communicating the Value of Transportation Research** • Recap of Day 2 • Discussion of Day 3 agenda • State DOT Presentations • Roundtable discussion, questions, and comments	Lori Sundstrom, TRB Rachel Galton, U. S. DOT/Volpe Center Susan Sillick, Montana DOT Binh Bui, Georgia DOT All
10:45 a.m.	**Break with light refreshments**	

11:00 a.m.	**Topic #3 Wrap-up and takeaways**	U. S. DOT/Volpe Center
11:15 a.m.	**Peer Exchange Summary and Report Out**	Luisa Paiewonsky and Rachel Galton, U. S. DOT/Volpe Center
12:15 p.m.	**Closing remarks**	Steve Woelfel, MassDOT
12:30 p.m.	**Adjourn Peer Exchange**	

Peer Exchange Participants

- Dianne Kresich, Arizona DOT
- Brandon Wilcox, FHWA Massachusetts Division Office
- Binh Bui, Georgia DOT
- Megan Swanson, Illinois DOT
- Patrick McMahon, MassDOT
- Hongyan (Lily) Oliver, MassDOT
- Gabriel Sherman, MassDOT
- Elliott Sperling, MassDOT
- Steve Woelfel, MassDOT
- Nicholas Zavolas, MassDOT

- Susan Sillick, Montana DOT
- Hafiz Munir, Minnesota DOT
- Cameron Kergaye, Utah DOT
- Lori Sundstrom, Transportation Research Board
- Sid Mohan, Transportation Research Board
- Michael Knodler, UMass Transportation Center
- Rebecca Cyr, UMass Transportation Center
- Matt Mann, UMass Transportation Center

Appendix B: State DOT Transportation Research Profiles

Massachusetts DOT (MassDOT) – RESEARCH PROGRAM PROFILE

FY2019 SPR funding (FHWA): $3,485,269

Research Program Organization:

The MassDOT Research and Technology Transfer Section is located within the MassDOT Office of Transportation Planning (OTP). OTP is a shared services offices that serves the four MassDOT divisions (highway, transit, aeronautics, and RMV), the Secretary's Office and the other shared services offices. The research program has one manager and four full-time staff. The section is responsible for organizing and managing the annual research program, identifying needs with the MassDOT divisions and shared service units, and supporting MassDOT technical training efforts for municipalities and the highway division. There is an interdepartmental services agreement with UMTC for research support. UMTC maintains an affiliated network of approximately 140 researchers throughout the UMass university and college system that can be accessed through the agreement.

Research Solicitation:

The first step in the solicitation process involves the announcement of a problem statement solicitation to all MassDOT and MBTA staff and research affiliates. This typically occurs in early May. Later in May, MassDOT holds research roundtables around the state to allow researchers and MassDOT staff to discuss agency needs and researcher's interests. They have found that this results in better problem statements. Problem statements are then due in early June. MassDOT and MBTA staff serve as project champions (PCs) who complete the research problem statement

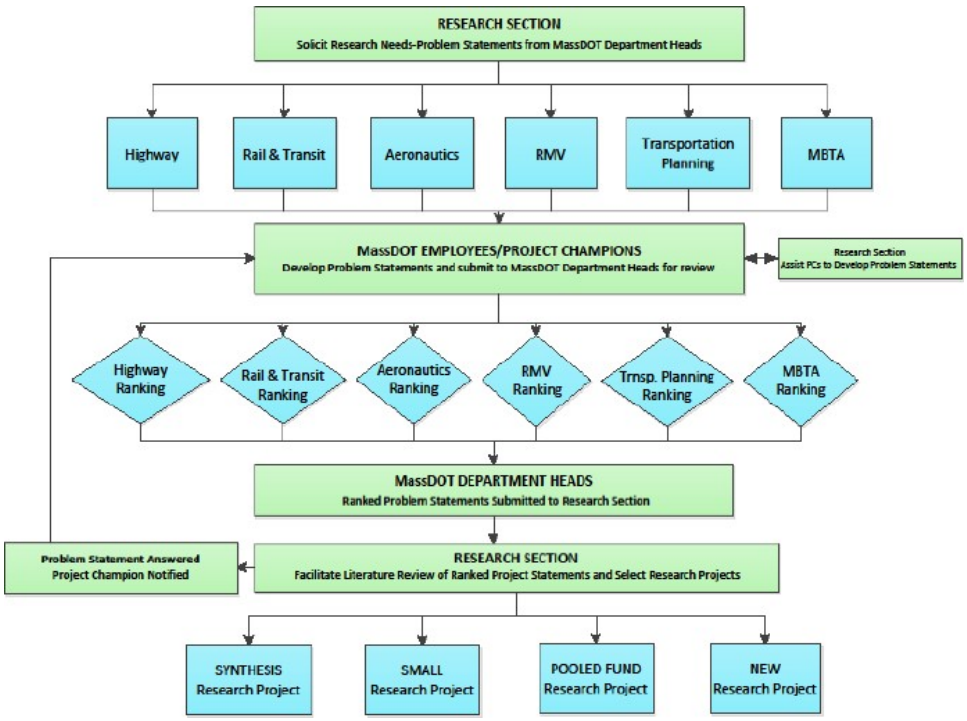


Figure 10 MassDOT Research Section Solicitation Process

solicitation form. The solicitation form includes fields for anticipated products, identification of benefits to MassDOT, and implementation strategy.

At the conclusion of the problem statement solicitation period, research staff conduct a literature search of the problem statements received to determine if the research problem has been previously researched either by MassDOT or nationally.

During July, MassDOT division directors and directors from shared services are asked to review and prioritize the problems statements submitted by their respective staff. The research section, in consultation with the division directors and the OTP Director, develop a draft list of proposed research projects and projected overall funding ability. The FHWA division office is sent a list of proposed research projects for funding eligibility review. The draft final list is then submitted to the Secretary of Transportation for review and approval. In September, the research section notifies the PCs for approved research projects and assists them in identifying potential PIs (step 2 in chart). The PC and PI, with the assistance of the research section, will develop an amplified scope of work (SOW) for the project (step 3 in the chart). Typically, in October, upon completion of the procurement process (step 4), a notice to proceed is issued (step 5).

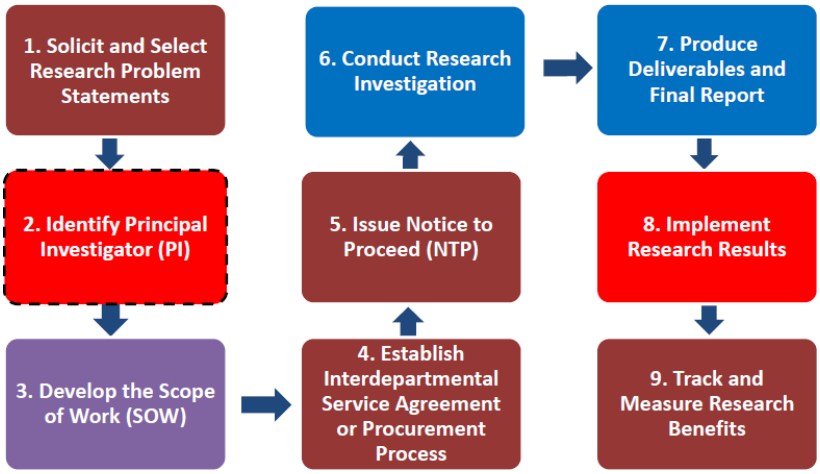


Figure 11. MassDOT's Research Process

Research Implementation:

The final research report is required to include an implementation plan. Components of the implementation plan should include: a description of the expected research results, anticipated applications or potential use of the expected research results; identification of potential implementation benefits to be derived by MassDOT; cost of implementation; potential risks and barriers to implementation and potential technology transfer methods to be used, and a description of the anticipated implementation process.

Currently, MassDOT is planning to make a more concerted effort to improve its research implementation process and success rate. A main objective of MassDOT is to learn from other states about their implementation process and key factors for successful implementation. Questions include:

- What is your definition for implementation?

- When does the implementation come into play in the project process?
- How do you balance the potential risks of research and implementation needs?
- Who is responsible for developing implementation strategies and plan?
- Who is responsible for carrying out the implementation plan?
- Do you have designated funding and staff for implementation?
- Do you track whether implementation plans are carried out?

Current and Planned Research

The research program is multi-modal in nature depending on the needs of the modes and other offices within MassDOT. The research efforts are a mix of short-term projects (less than a year), mid-term (up the 1.5 years), and long-term (more than 1.5 years).
Current FY2019 – 15 active projects
Completed in FY2018-2019 – six projects
Planned FY2020 – solicitation process underway

Pooled Fund Study – MassDOT participates in six pooled-fund studies, including the New England Transportation Consortium.

The list of active, pending, and recently completed projects are at:
https://www.mass.gov/lists/current-and- completed-research-projects#current-research-projects-

Recent Publications: MassDOT Research Peer Exchange Report (2014)**.**

Performance Management and Communicating Value of Research:

MassDOT is interested in learning from the other State DOTs about how they evaluate the results of each research project using the following selection criteria:

- Improved process or methods to reduce cost or improve safety;
- Improved or increased information for management decision-making and policy formulation;
- Cost savings.

MassDOT is interested in learning from the other State DOTs about how they measure performance, conduct performance management and communication. Questions include:

- What performance measures are being used or being considered for future evaluations? Are they at the program level or project level?
- Are the performance measures administrative in nature (time, budget, quality, etc.) or focused on impact (did it get implemented, etc.) or both. Does the model below serve as a good starting point for research performance measures (from 2008 NCHRP performance measure tool box)?
- What are the key determinants of having research results successfully implemented?
- How do other states convey research activities and results and how often do you do this?
- What type of performance measures are you communicating?

Key Contact:

Lily Oliver, MassDOT Research Section Manager, MassDOT, 857-368-9025; Hongyan.oliver@dot.state.ma.us Website: https://www.mass.gov/research-and-technology-transfer

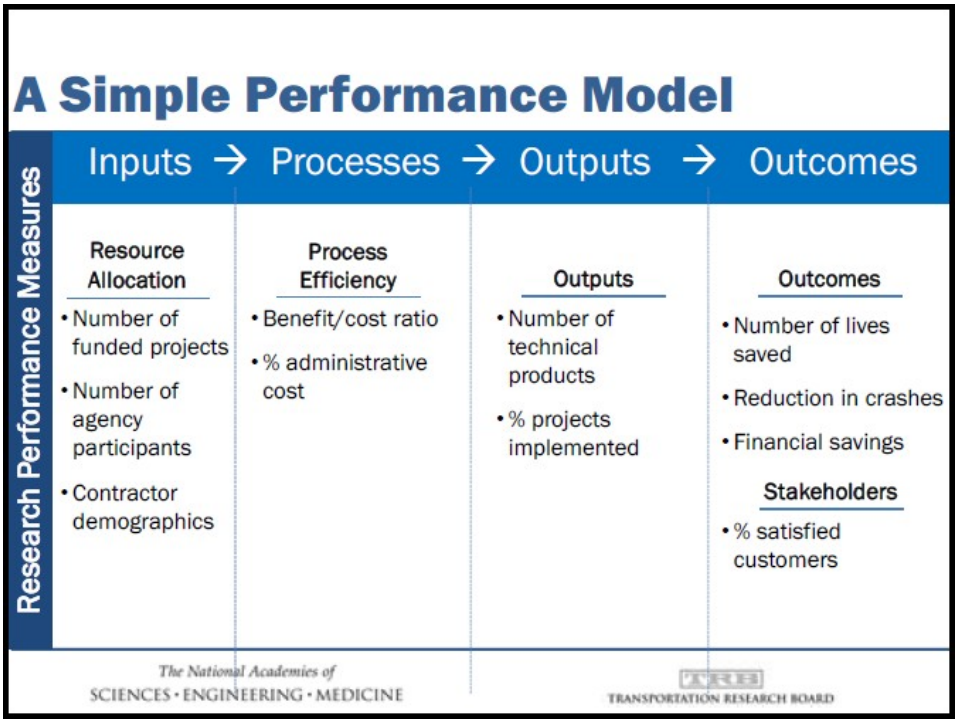
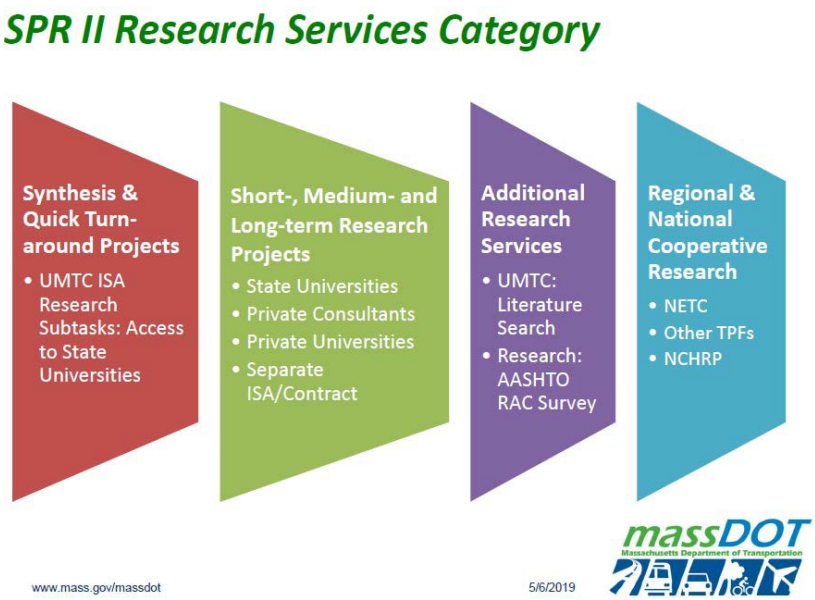


Figure 12. TRB Research Performance Measures

MassDOT SPR II Research Services Category



MassDOT Organization Chart (Research resides within Planning/Administrative Services)

Figure 13. MassDOT SPR II Research Services Category

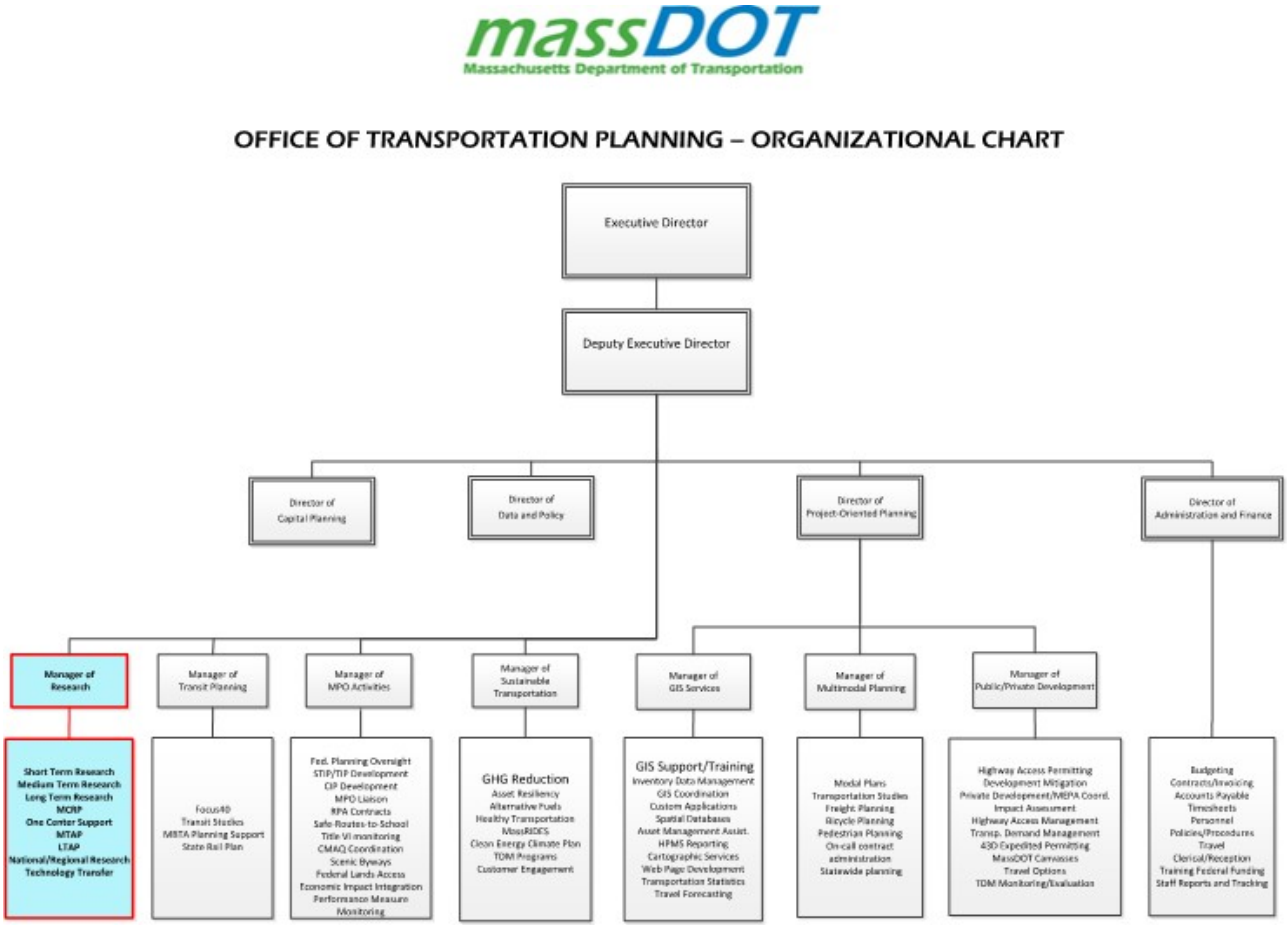


Figure 14. MassDOT Office of Transportation Planning Organizational Chart

Arizona DOT – TRANSPORTATON RESEARCH PROGRAM PROFILE

FY2019 SPR funding (FHWA): $4,600,000 ($2,500,000 for projects)

Research Program Organization:

The Arizona Research Center fits within the Arizona Department of Transportation (ADOT) Multimodal Planning Division, under the Multimodal Planning Division Director, who reports to the Deputy Director of Transportation/State Engineer. The Research Center resides within the technical arm of the agency as opposed to being part of administrative functions. The Research Center employs eight full-time staff, including the Center's manager, three senior project managers, one technical editor, and three staff who manage ADOT's Product Evaluation Program (one supervisor and two specialists).

The Research Center leads ADOT's research activities, focusing its efforts on the delivery of research studies as well as administration of the product evaluation program (PEP). The PEP maintains the approved products list, which identifies products that ADOT has evaluated and approved for potential use according to its specifications.

Additional information on the Research Center is available at:
https://www.azdot.gov/planning/research- center.

Research Solicitation:

Research Center staff begin the research solicitation process by engaging ADOT colleagues to discuss the problems they are facing in the field. This is an informal process in which the Research Center solicits feedback through meetings with ADOT staff, who may also initiate discussions of information needs. From this outreach, Research Center staff develop problem statements to identify the issues and proposed next steps.

The Research Center coordinates with ADOT staff regularly throughout the year; there has been no formal annual call for research needs in recent years, but a call is planned for 2019.

The Research Center presents problem statements to the internal Research Advisory Committee (RAC), which consists of ADOT upper management and group managers from all technical and administrative areas. The RAC meets semi-annually but may meet more frequently if needed. Every six months, or when the Research Center has a significant number of problem statements, the RAC convenes to review the problem statements. Prior to these meetings, the Research Center thoroughly vets the research needs and identifies a sponsor, the ADOT manager with the authority to implement anticipated recommendations, for each potential new study. The RAC then determines by consensus the problem statements to approve, considering research needs holistically across all of ADOT. Through this process, the Research Center promotes a quality-driven, collaborative approach, confirming all problem statements are fully developed before being presented to the RAC and encouraging staff to work together rather than consider their research needs in competition with each other. The Research Center does not have a separate process for "fast track" projects or urgent research needs; if these types of needs arise, the Research Center works directly with ADOT leadership to determine next steps.

Additional information on ADOT's research solicitation process is available at:
https://www.azdot.gov/planning/research-center/research/faq.

Research Implementation:
ADOT contracts all of the research conducted under its research program. While contractors directly conduct the research, the Research Center's senior project managers play a critical role in analyzing and directing this research to ensure the highest possible quality of products.

The Research Center previously used pre-qualified entities but now uses an open procurement process; this transition is currently underway. ADOT chose to move forward with open procurement, as it was not satisfied with the limited expertise and number of pre-qualified entities and wanted to expand the pool of entities that could conduct research. ADOT does not have pre-set arrangements with universities and sees benefit in a broad range of choice in selecting consultants for its work. There are no in-state university contracts, and universities are contracted in the same manner as private consulting firms.

Current and Planned Research:
Most ADOT research activities are highway-oriented (about 90% focused on highway topics, and 10% focused on all other topics). About 80% of the research is technical in nature, and the remaining 20% is tied more closely to administration/planning. The Research Center views its role as serving all of ADOT and is currently working to develop more customers among transit, aviation, and other under-served stakeholders. In addition to the technical transportation topics, the Research Center manages studies on other related topics, such as for human resources or on disadvantaged business enterprise firms.

Current FY2019 – approximately 20 active research projects

Planned FY2020 – approximately 10 new projects expected

The number of active projects has varied over time but is typically around 25 projects annually. The Research Center has lost staff over the past few years, which has limited the number of projects the Center can support. In addition, the Research Center has faced challenges with its procurement process and the length of time it has taken to initiate projects; no new projects have started in over a year. The Research Center's transition to an open procurement process is part of its effort to enhance research implementation and delivery. The Research Center has also re-envisioned its final research products to serve practitioners who are responsible for implementation. Final reports, which are 20-50 pages in length, use clear language and visualize data to the extent possible.

Recent Publications: For a full list of recent research reports, see: https://www.azdot.gov/planning/research- center/research/research-reports.

Key Contact:
Dianne Kresich, Research Center Manager, Arizona Department of Transportation, DKresich@azdot.gov; 602- 712-3134; https://www.azdot.gov/planning/research-center

Arizona DOT Org Chart

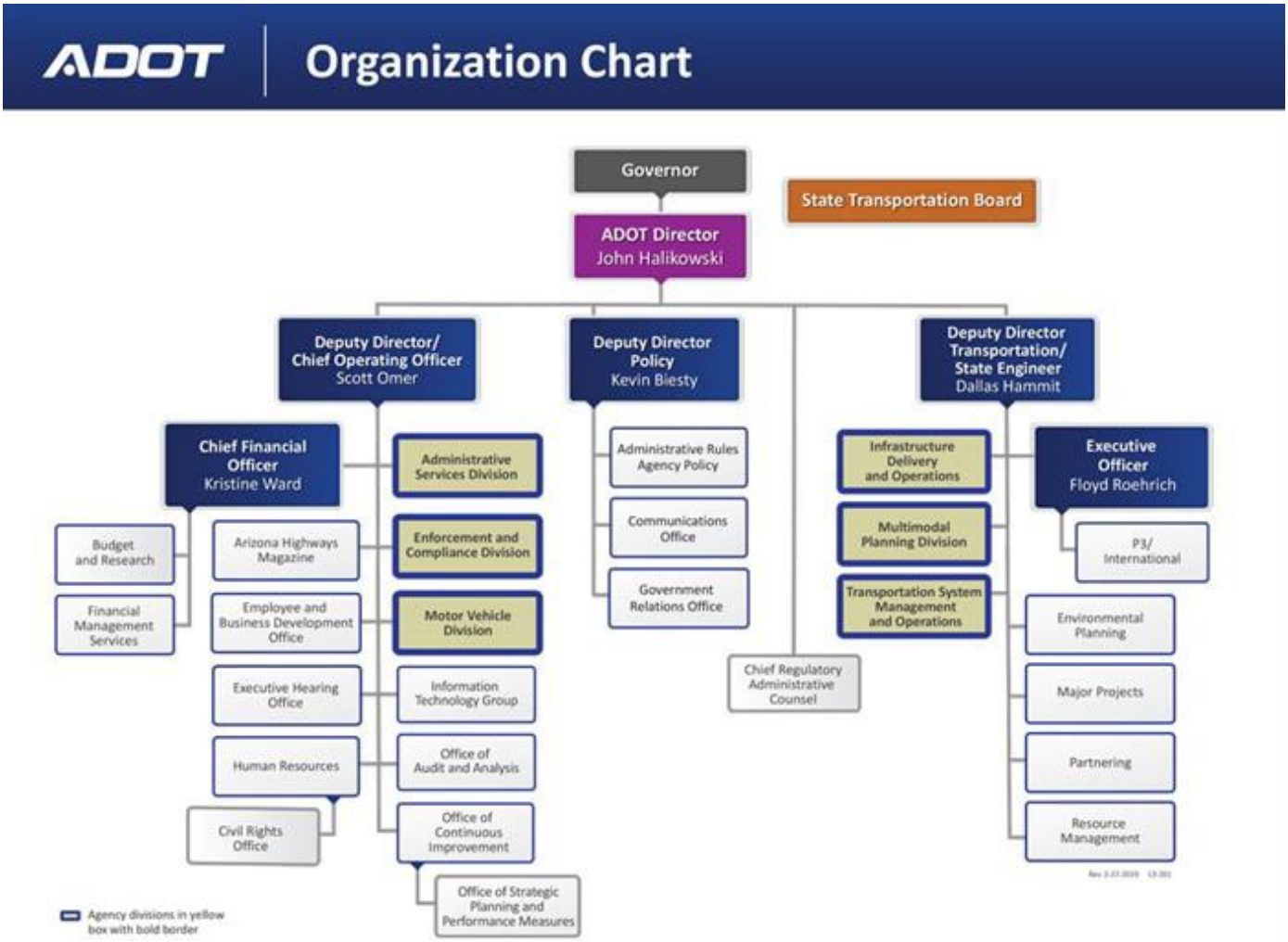


Figure 15. Arizona DOT Organization Chart

Arizona DOT Research Center Org Chart

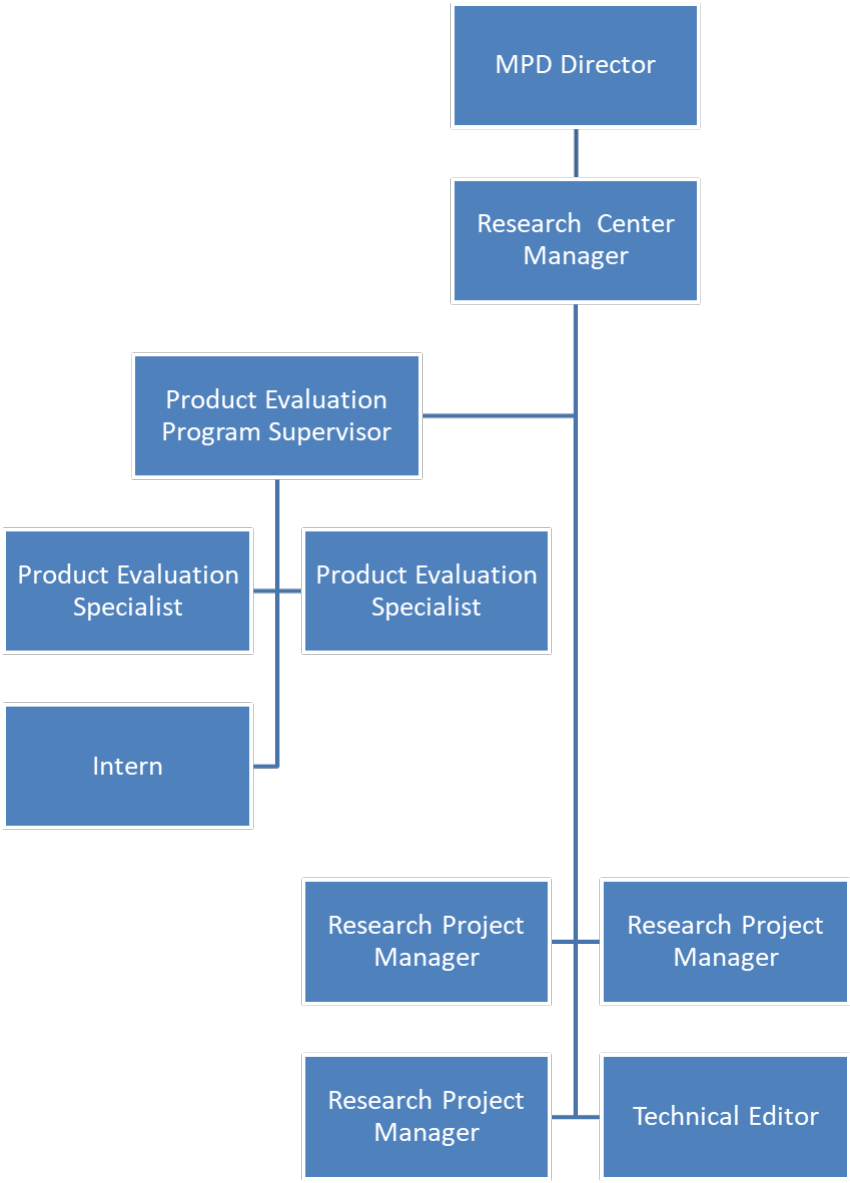


Figure 16. Arizona DOT Research Center Organization Chart

Georgia DOT – TRANSPORTATION RESEARCH PROGRAM PROFILE

FY2019 SPR funding (FHWA): $6,600,000

Research Program Organization:

GDOT's Office of Research fits within the agency's Office of Performance-Based Management and Research. In addition to its focus on research, the Office of Research supports the agency's performance measurement and strategic planning activities. The Office of Research has undergone various organizational structure changes over the years; previous structures included two separate branches—the Research and Development Branch and the Mechanistic-Empirical Design Guide Implementation Branch.

The Office of Research employs six staff, including the Research Implementation Manager who also oversees the GDOT Library.

Additional information on the Office of Performance-Based Management and Research is available at: http://www.dot.ga.gov/AboutGeorgia/Offices/Pages/OfficeDivisionDetails.aspx?officeID=36.

Research Solicitation:

The Office of Research accepts research ideas from staff across all of GDOT on a rolling basis, using a "grassroots" approach. The Office manages an email account to collect these ideas. Office of Research staff conduct a preliminary review before such ideas are presented formally to GDOT's Research Technical Advisory Groups (RTAGs) for final review and approval.

The Office of Research engages GDOT subject-matter experts to participate in the RTAGs, which are organized around four strategic goal areas—Safety, Asset Management, Mobility, and Workforce/Policy. These goal areas align with GDOT's FY2018-FY2021 Strategic Plan. The RTAGs meet at least twice a year to discuss research needs and activities.

In addition to staff input, the Office of Research solicits research ideas from local universities in Georgia. Universities may submit problem statements directly to the Office of Research for consideration. These problem statements are typically due in November. The Office of Research finalizes the problem statements to be pursued in May.

If funding is limited, the Office of Research will work with the RTAGs to prioritize research needs. GDOT also sets aside $600,000 annually for "fast track" projects, which it calls "special research studies," to address urgent research needs. Special research studies have a budget of $100,000 or less; otherwise, they are considered regular research projects and must go through GDOT's formal review and prioritization process.

For more information on GDOT's FY2018-FY2021 Strategic Plan, visit: http://www.dot.ga.gov/PartnerSmart/Public/Documents/publications/StrategicPlan/StrategicPlan- FY2019.pdf

Research Implementation:

GDOT typically contracts all of its research; however, there may be limited instances in which GDOT conducts research in-house (e.g., for a white paper or study). The Office of Research has

basic order agreements with most of the local universities in Georgia, which are tied into a broader master contract. If GDOT has a research need that can be accommodated by a subject-matter expert at a local university, it will develop a task order for this researcher under the Master Contract. However, GDOT has the flexibility to issue an RFP to solicit responses from different researchers if needed.

Most of the contracted research work is conducted by public universities in Georgia. GDOT has recently had more private universities partner with it as sub-contractors. There is also a small percent of projects (about 5%) that are performed by private contractors through open procurement.

GDOT's university partnerships allow it to expedite approvals for research projects. The agency partners with the National Center for Transportation Systems Productivity and Management, the University Transportation Center led by the Georgia Institute of Technology (GT), as well as the Texas A&M Transportation Institute (TTI), of which GT is a consortium member. The TTI partnership has been in place for about 15 years. GDOT renews the basic order agreements with the local universities every four years.

It takes GDOT about three months from receiving research needs to issuing a Notice to Proceed for in-state university contracts. RFPs circulated to the TTI consortium typically take about five months to collect responses and select the preferred candidate. For other outreach nationally, it can take about six months to complete the solicitation and selection process; GDOT rarely uses this method given the length of time needed and instead primarily relies on its in-state university and TTI partnerships for conducting research efforts.

Current and Planned Research:

GDOT organizes its research activities around the agency's four strategic goal areas. The Office of Research prioritizes research using these goal areas to ensure that its efforts improve safety, manage assets better, enhance mobility, and develop and maintain a robust workforce within the agency. In the past, GDOT allocated funding by mode but no longer takes this approach. Having this flexibility allows GDOT to program any project as the need arises. Examples of research efforts resulting from GDOT's research program include structural, materials, and policy and planning research. The number of projects varies year to year, but, on average, the Office of Research manages around 80-100 projects.

Current FY2019 – approximately 80 active research projects

Planned FY2020 – approximately 17 new projects are expected

Recent Publications: For a full list of recent research projects and reports, visit: http://www.dot.ga.gov/BS/Research.

Key Contact:

Binh Bui, Research Implementation Manager and GDOT Library Supervisor,
Georgia Department of Transportation, bbui@dot.ga.gov; 404-347-0617;
http://www.dot.ga.gov/BS/Research

Georgia DOT Org Chart

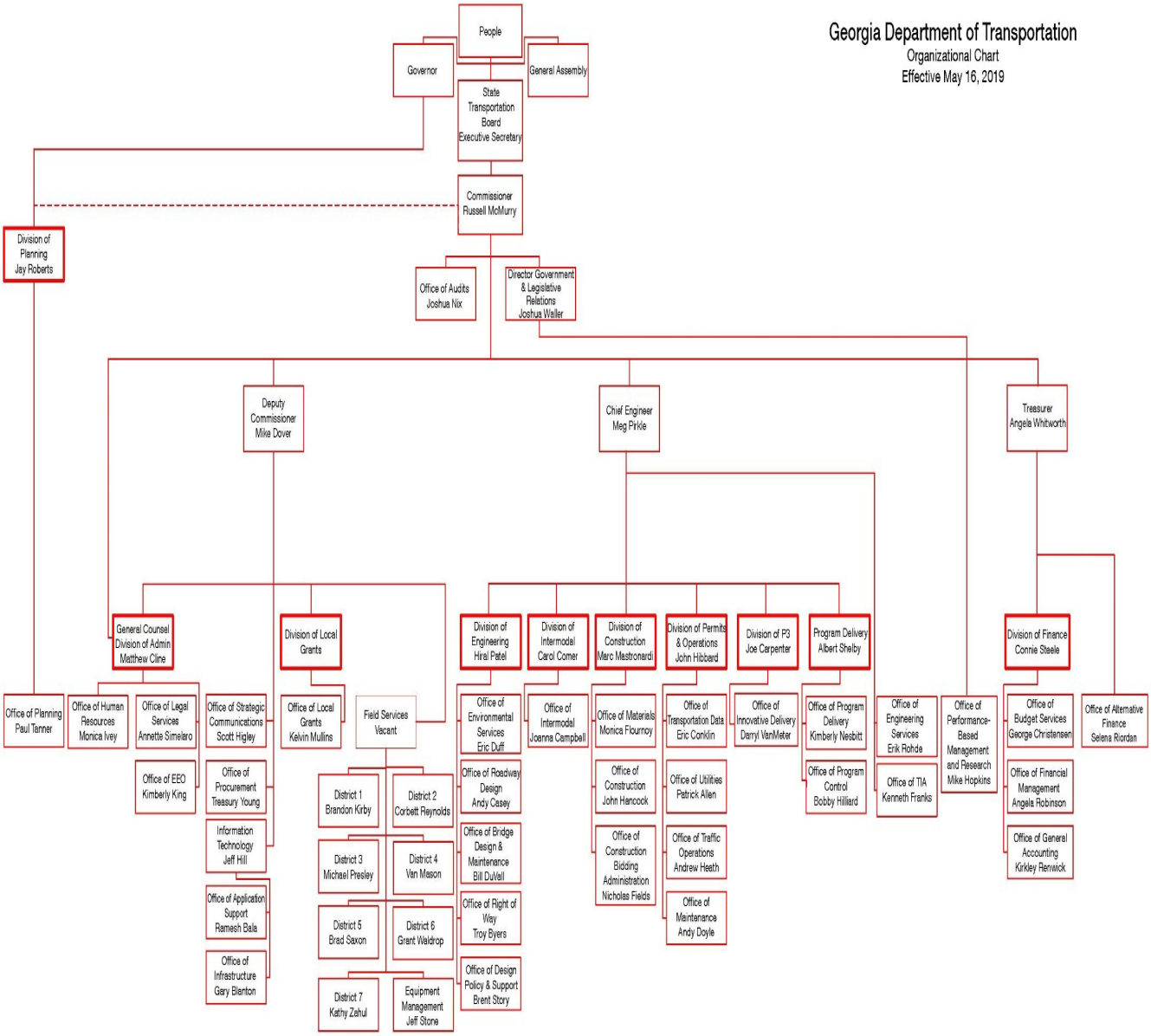


Figure 17. Georgia DOT Organization Chart

Illinois DOT – TRANSPORTATION RESEARCH PROGRAM PROFILE

FY2019 SPR funding (FHWA): $8,419,832

Research Program Organization:

The Illinois Research Office is located within the Office of Planning and Programming. The office has a full-time staff of one. For the project administration of the research program, IDOT contracts with the University of Illinois at Urbana-Champaign to operate the Illinois Center for Transportation (ICT). The overview of the program is at: http://idot.illinois.gov/transportation-system/research/index. The primary customers for research are the offices within IDOT. The goal of IDOT research, ultimately, is to implement transformative solutions for the state of Illinois.

Research Solicitation:

Identification of research topics and needs by IDOT. IDOT has eight Technical Advisory Groups (TAGs) that first meet to discuss ideas, issues, and problems that IDOT can address through research. These ideas are then shared with the public. The TAG groups are: construction; environment; pavement design, management and materials; planning; public and multi-modal transportation; safety; structures, hydraulics and geotechnical; and traffic operations and roadside maintenance. The TAGs are composed of IDOT personnel, and ICT academic representatives, industry or outside agency representatives and FHWA division office staff.

Proposed Research Idea Statements. Building upon the identified research topics by IDOT, anyone is able to submit proposed research idea statements which are then reviewed by the TAGs. The committee reviews and selects contract research projects for further review and approval by the IDOT/ICT Executive Committee. Once approved, the research projects are referred to ICT to administer the research projects.

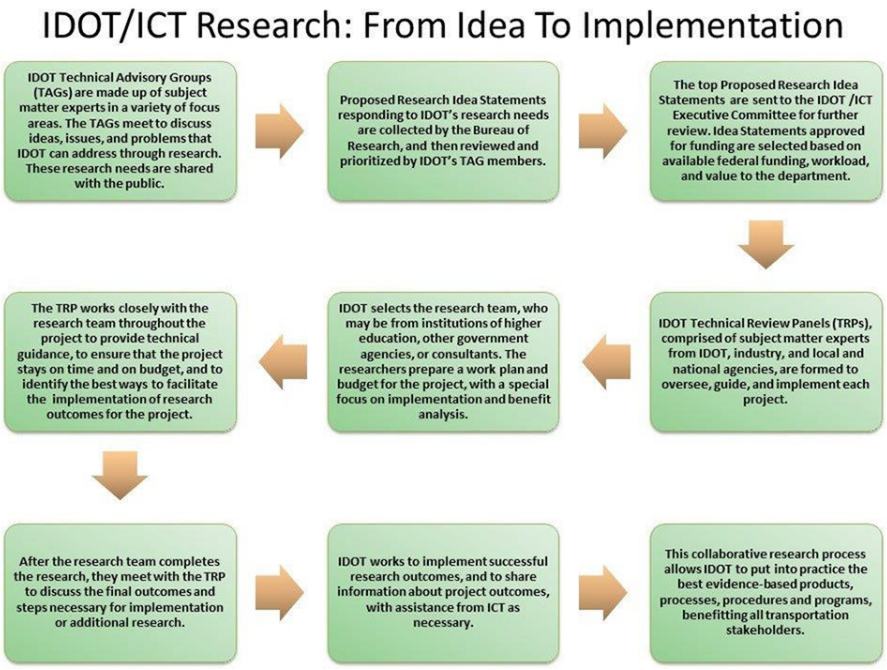


Figure 18. IDOT/ICT Research Process

Additional information can be found at: Research Development and Technology Transfer Manual of Procedures.

Research Implementation:

To ensure that implementation remains a central focus of the research efforts, an Implementation Planning Worksheet (BR RC001) is part of each project's early planning and is regularly updated through the life of the research project. It identifies tasks specific for implementation, as well as the identification of offices and staff who will be affected by the implementation of the research.

Current and Planned Research:

Typically, IDOT allocates about $6 million in research funds to ICT and about $1.5 million to NCHRP pooled fund studies. Special projects can also be undertaken. These are projects that are limited to $36,000 in funds and 10 month time frame.

Current FY2019 – approximately 40 active research projects

Planned FY2020 – approximately 10 new projects are expected to start in fall 2019

Recent Publications: IDOT Research Peer Exchange Report (2017).
https://research.transportation.org/peer- exchange-reports/#

Key Contact:

Megan Swanson, Technical Research Coordinator, Bureau of Research, megan.swanson@illinois.gov; 217-782- 3547; http://idot.illinois.gov/transportation-system/research/index

Illinois DOT Org Chart

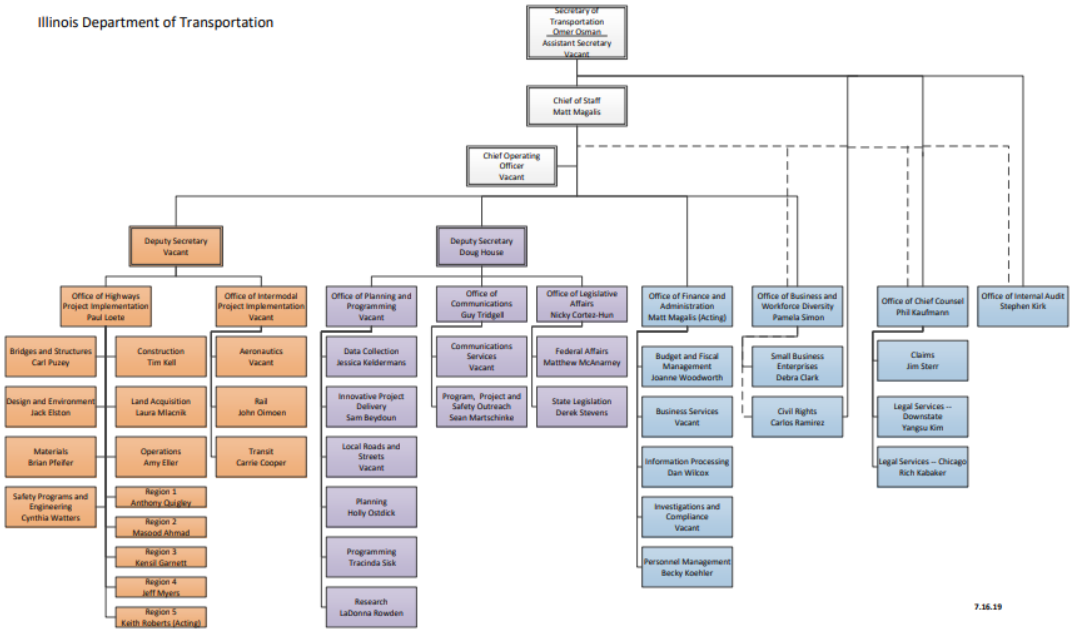


Figure 19. Illinois DOT Organization Chart

Minnesota DOT – TRANSPORTATION RESEARCH PROGRAM PROFILE

FY2019 SPR Part 2 funding (FHWA): $3,464,692

Research Program Organization:

The MnDOT Office of Research and Innovation leads the agency's research and innovation efforts. The Office resides within the Modal Planning and Program Management Division. In addition to its focus on research and innovation, the Office promotes knowledge transfer through the development of marketing and communications materials.

Within the Office of Research and Innovation, there are four units—Research Management, which leads research product development and benefit quantification through research implementation; Finance and Contract Services, which is responsible for the contracting aspects of research activities; Library Services, which manages the MnDOT library; and Marketing and Communications, which promotes information dissemination on research findings.

A director oversees the entire Office of Research and Innovation, which has a total staff of 27. Each of the four units has its own supervisor and staff. Ten staff (including the supervisor) serve in the Research Management unit, five in Finance and Contract Services, six in Library Services, and five in Marketing and Communications. MnDOT also added a new position recently for program performance/implementation, which reports directly to the Office of Research and Innovation Director.

Additional information on the Office is available at:
http://www.dot.state.mn.us/research/index.html.

Research Solicitation:

The Office of Research and Innovation works closely with MnDOT staff and researchers to identify project ideas. The Office uses an IdeaScale platform, called the Minnesota Transportation Research Collaboration Site, to solicit these ideas from MnDOT staff as well as locals. While the site is continuously available, MnDOT takes an annual approach to collecting research needs. The Office also works, in collaboration with the MnDOT State Aid for Local Transportation Division ("State Aid Division"), to encourage idea submissions from local and city engineers. The State Aid Division typically first collects ideas from local/city engineers and other representatives through its own pre-screening, board meeting process. The State Aid Division shares feedback on the ideas with the Office of Research and Innovation, which is responsible for processing and managing final, approved ideas for research implementation.

MnDOT has two governing boards, which oversee the agency's research efforts—the Local Road Research Board (LRRB) and the Transportation Research and Innovation Group (TRIG). The LRRB, led by a 10-member board, governs county state-aid highway and municipal state-aid street funding for research activities.
Representation on the LRRB is primarily city/county engineers but also includes MnDOT and the University of Minnesota representatives. TRIG membership is primarily internal to MnDOT, with 16 current voting members who represent various offices and districts within the agency. Both the LRRB and the TRIG meet quarterly at different time to make funding decisions.

The LRRB and the TRIG follow their own processes for reviewing and prioritizing research needs; however, ideas are shared across both groups. There are instances where the LRRB and the TRIG co-fund projects, particularly if both governing boards see mutual benefits in

moving ideas forward. Such projects use MnDOT and LRRB funding.

Pre-qualified, in-state or national universities may also propose projects. MnDOT has nine pre-qualified universities that can propose ideas to MnDOT or the LRRB. MnDOT further partners with Minnesota State universities using a joint power agreement. In addition, MnDOT allows for "fast track" projects (both research and implementation), which are categorized as "off-cycle" requests; these requests may arise at any time. TRIG board members must sponsor off-cycle requests. All other projects need a MnDOT staff "champion" but do not need to be directly sponsored by a TRIG board member. However, these projects are championed and supported by the sponsoring offices for the research work.

Information about the LRRB is available at: https://lrrb.org/. Information about the TRIG is available at: https://www.dot.state.mn.us/research/TRIG.
MnDOT's Office of Research and Innovation uses pre-qualified universities to conduct its research. Consultants may be involved in research, but this only occurs if a university partners with a consultant for a particular effort. MnDOT's Requests for Proposals (RFPs) are open only to universities.

The Office of Research and Innovation confirms the universities through an RFP process. The universities submit qualifications according to a prescribed scope. The Office reviews and scores the universities' proposals before determining final selections. Upon approval, a university would become "pre-qualified" and sign a contract, under MnDOT's master contract, to provide research services as they become available. The Office negotiates these contracts with the universities during the pre-qualification process. As research projects become available, the universities compete with each other for these opportunities. Based on their proposals, the Office will determine which university will receive a contract, which will be issued as a work order under the master contract. The master contract is five years in length, and MnDOT has reestablished this master contract for over 10 years.

Research Implementation:

Research implementation projects save MnDOT time, money or resources by helping put new ideas and technology into practice. They might solve a long-time problem or improve how the agency does business. MnDOT funds pilot projects of new technology or research that can set the stage for future full deployment. Implementation projects must demonstrate, test or advance a new practice. Preferably, they build on completed national, state or local research. Proposers should indicate how the project could lead to full deployment and whether there is a commitment to support implementation statewide. A MnDOT staff person must serve as the project manager, and it is helpful to identify a management champion at the District Engineer, Assistant District Engineer or Office Director level.

All applications for implementation projects must be made by a MnDOT employee, who submits a brief summary of research implementation idea on the MnDOT-LRRB Ideascale solicitation platform. Although the implementation program idea solicitation is done in spring every year, proposals can be submitted any time throughout the year as off-cycle request for consideration if funding allows.

Implementation projects are completed using a prequalified list of consultants under the MnDOT Transportation Research Assistance Program (TRAP) certified list, or by MnDOT staff, or jointly by consultant and MnDOT staff. Firms that have been pre-approved to provide Transportation Research Assistance to MnDOT are available on line.
https://www.dot.state.mn.us/consult/documents/certified-lists/trap.pdf

Current and Planned Research:

The Office of Research and Innovation produces an annual report, which describes the research conducted in a given fiscal year. For FY2018, MnDOT expenditures ranged from 17% of expenditures for its dedicated programs (e.g., Local Technical Assistance Program [LTAP]) to 5% for policy and planning activities (Figure 1). In FY2018, MnDOT had $14 million available for its research program, which included SPR funds (approx. 25%), State funds (approx. 30%), LRRB funds (approx. 40%), and other funds (approx. 5%). MnDOT provides funding to the University of Minnesota for managing the LTAP (as part of the 17%). In addition, MnDOT uses a portion of the administration expenditures (7% total) to support AASHTO and TRB research activities and pooled fund studies.
Administration-related efforts have also included the development of MnDOT's research program strategic plan and content management for its website.

Current FY2019 – approximately 200 active research projects

Planned FY2020 – approximately 35 new projects are expected

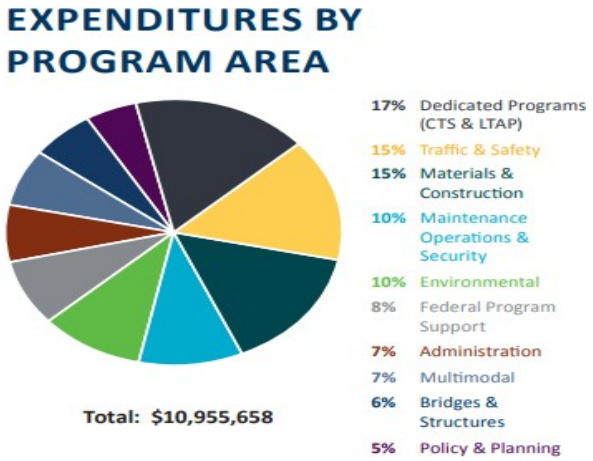
The number of active projects varies year to year but is typically more than 200 projects annually. To continue to advance its research program, the Office of Research and Innovation has developed a five-year research program strategic plan. The Office is currently modifying its processes, forms, and templates to align its research work with the strategic priorities of MnDOT as a whole.

Additional information about research projects is available at: http://dotapp7.dot.state.mn.us/projectPages/pages/homepage.jsf. To view the MnDOT Research Program Strategic Plan 2017-2022, visit: http://dot.state.mn.us/research/reports/2017/201712.pdf.

Recent Publications: For a full list of recent research reports, technical summaries, transportation research syntheses, and other materials, visit: www.dot.state.mn.us/research/publications.

Key Contact:

Hafiz Munir, Ph.D., P.E., Research Management Engineer (Supervisor), Minnesota Department of Transportation, hafiz.munir@state.mn.us; 651-366-3757; http://www.dot.state.mn.us/research/index.html



Minnesota DOT Org Chart

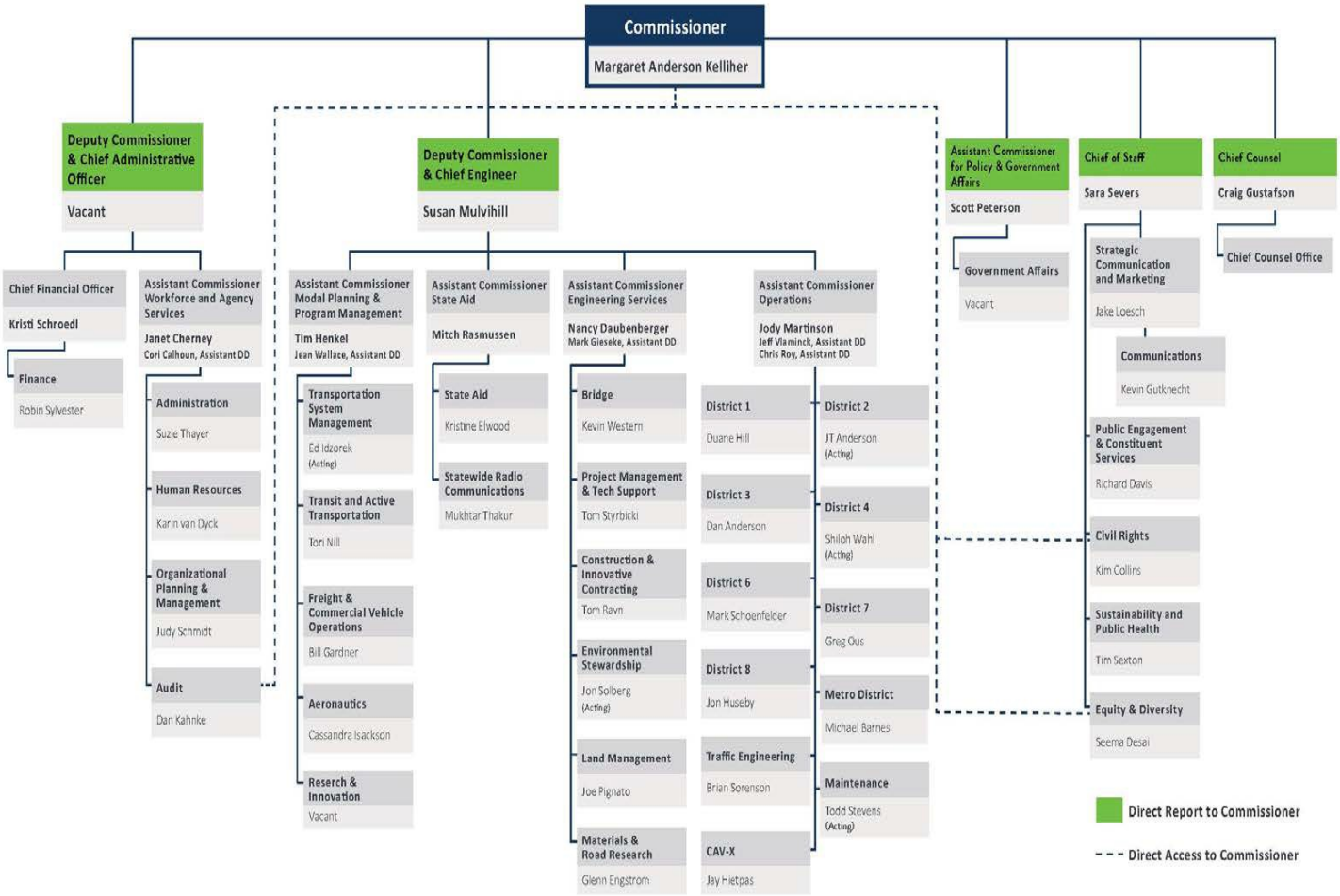


Figure 20. Minnesota DOT Organization Chart

MONTANA DOT (MDT) – TRANSPORTATION RESEARCH PROGRAM PROFILE

FY2019 SPR funding (FHWA): $2,552,990

Research Program Organization:

The MDT Research Program is located within the Engineering Division (see org chart on page 3). The office has a full-time staff of three and one contract employee. The overview of the program is at:
https://www.mdt.mt.gov/research/projects/res_overview.shtml

Research Solicitation:

Two-stage process for new research solicitation:

Stage 1 involves the completion of a *Research Idea Form*. This is a relatively short form that provides MDT with enough information to identify a project champion and conduct a literature search on the topic. Stage 1 Idea Forms are due March 31.

Stage 2 involves completion of a *Research Topic Statement Form*. Stage 2 forms are due by April 30. The MDT's Research Review Committee (RRC) meets in late May to hear from the champions. Between late May and late July, the RRC determines which projects move forward to technical panels to be funded in the next FFY, beginning October 1.

Research Review Committee MDT's Research Review Committee (RRC) is composed of the FHWA-MT Division Research Representative and the following MDT staff: Director, Deputy Director, Research Manager, and Division Administrators from Administration, Aeronautics, Highway and Engineering, Information Services, Maintenance, Motor Carrier Services, and Rail, Transit and Planning. The RRC meets at most once a month and determines the Department's high priority research needs, approves research projects, and reviews implementation recommendations and progress. Additional information can be found at:
https://www.mdt.mt.gov/research/research_review.shtml

Research Implementation:

Performance Management: MDT has begun work on incorporating performance management into the transportation research and implementation process and is working to formalize research performance measures. An example of an individual performance measures report can be found at:
https://www.mdt.mt.gov/other/webdata/external/research/docs/research_proj/rest_area/pm_report.pdf

Current and Planned Research:

The research program is primarily highway focused with some work aeronautics and transit aspects, but there needs to be an intermodal connection for this work. All of the FY2019 work was technical in nature with no planning and policy efforts. The office has a robust experimental features program, focusing on test deployment of new materials and methods. Since funding is from FHWA, the research program is primarily highway focused with some work aeronautics and transit aspects, but, as per CFR, there needs to be an intermodal connection. All of the FY2019 work was technical in nature with no planning and policy efforts.
Current FY2019 – 17 active projects, 6 projects pending award of contracts

Planned FY2020 – 5 new projects are expected
Pooled Fund Study – MDT oversees a multi-year pooled fund study with 13 other states on Traffic Safety Culture: https://www.mdt.mt.gov/research/projects/trafficsafety.shtml and the page for the driving under the influence of cannabis (DUIC) is https://www.mdt.mt.gov/research/projects/trafficsafety-duic.shtml.

The list of active, pending, and recently completed projects are at: https://www.mdt.mt.gov/other/webdata/external/research/docs/act_research_proj.pdf.

Recent Publications: MDT Research Peer Exchange Report (2017). https://www.mdt.mt.gov/other/webdata/external/research/docs/peer/2017_report.pdf

Key Contact:

Susan Sillick, *Research Programs Manager*, Montana Department of Transportation | Engineering Division 406-444-7693 ssillick@mt.gov, 2701 Prospect Avenue P.O. Box 201001, Helena, MT 59620
Web: http://www.mdt.mt.gov/research/

MONTANA DOT - Research Program - Agency Organization

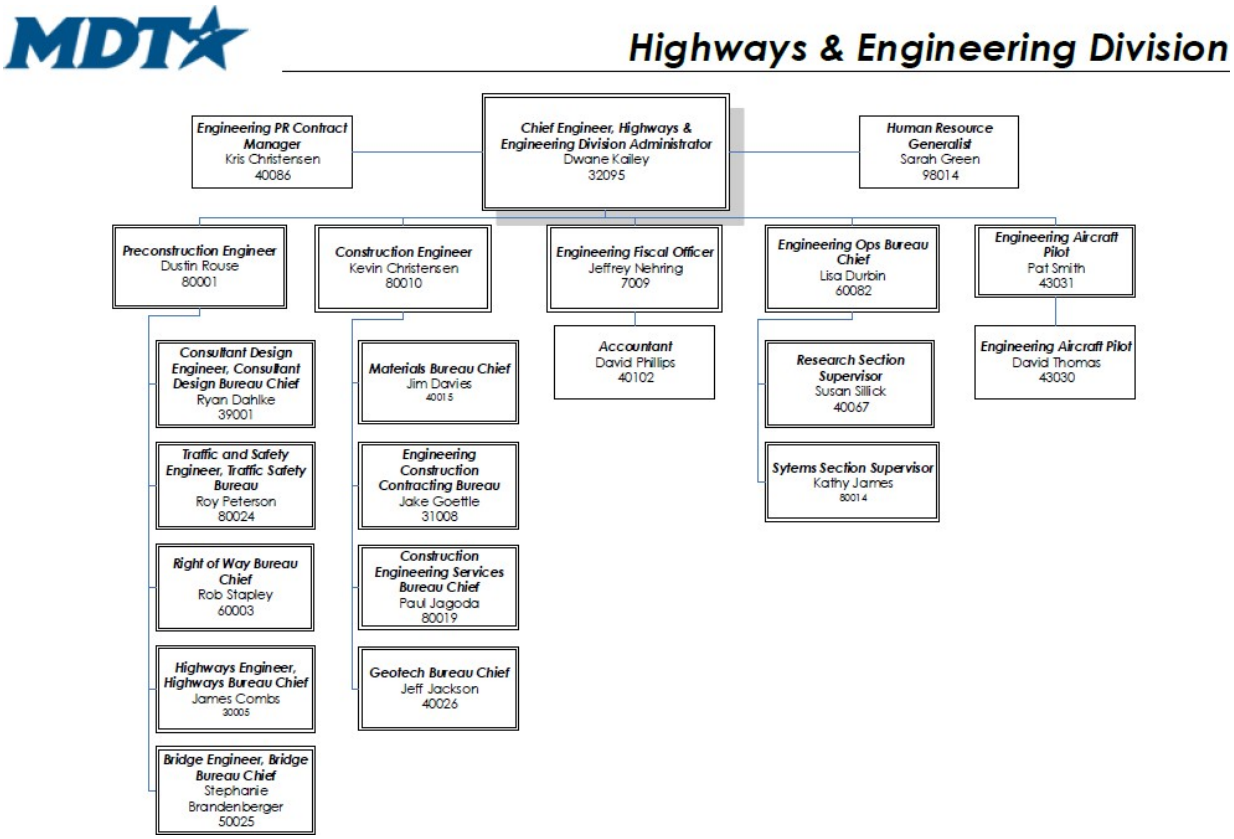


Figure 212. Montana DOT Highways & Engineering Division Organization Chart

MONTANA DOT - Research Solicitation Process

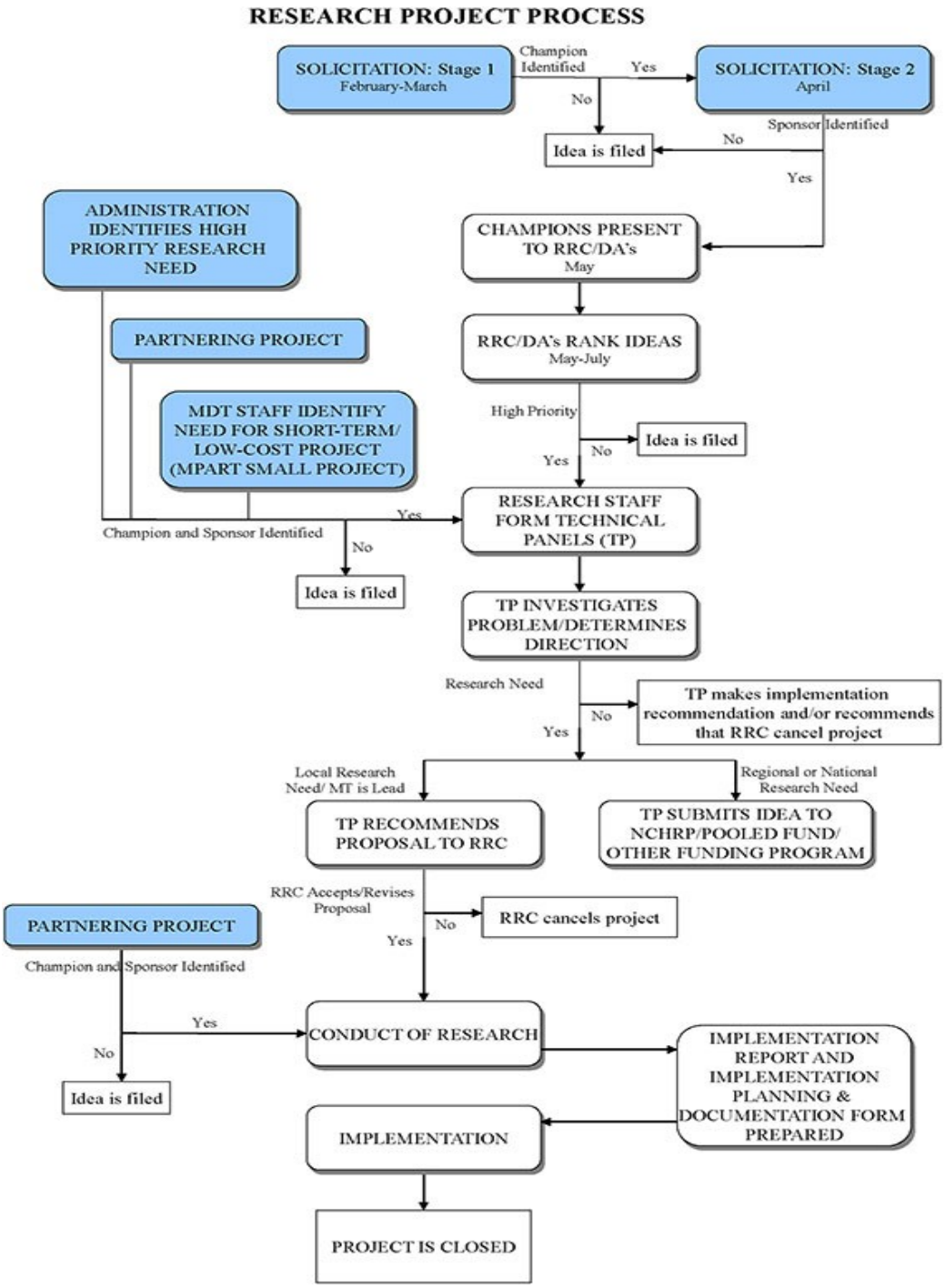


Figure 22. Montana DOT- Research Solicitation Process

Utah DOT – TRANSPORTATION RESEARCH PROGRAM PROFILE

FY2019 SPR funding (FHWA): $2,148,353

Research Program Organization:

The Utah DOT Research and Innovation Division is located within the Office of Technology and Innovation. In addition to managing the SPR program, the office is involved in tracking, identifying, and sharing innovation with the rest of UDOT.
The office has a full-time staff of 7. The overview of the program is at:
https://www.udot.utah.gov/main/f?p=100:pg:0:::1:T,V:195,

Research Solicitation:

There are five principal stages in the solicitation and selection process:

Stage 1
UDOT will then hold a series of sessions with potential research submittors to meet with UDOT staff to discuss research need topics for the coming year. UDOT holds several different sessions depending on topic area (for 2019: materials & pavement; maintenance; traffic management & safety; structures and geotechnical; planning; performance management & data analytics; and public transportation). After this, people can submit their problem statements to UDOT. This allows the potential researchers to discuss ideas with UDOT project champions.

For UDOT's research prioritization process, in advance of the annual research workshop, most of the subject area groups participating that year prepare sub-criteria under the main problem statement evaluation criteria of Importance and Implementation and assign weights for each.

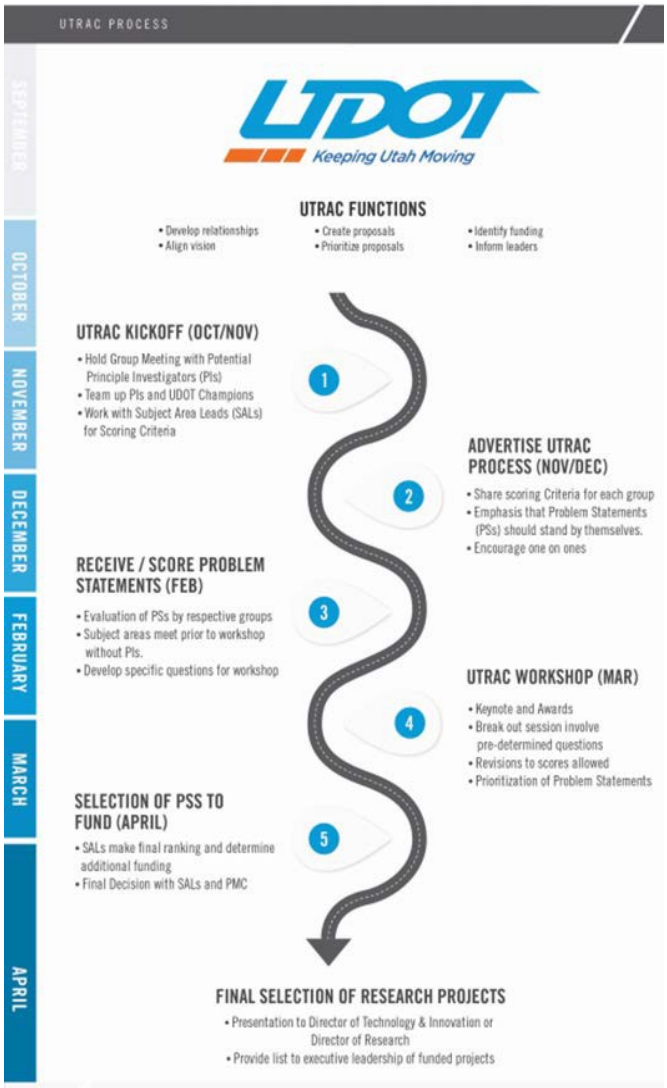


Figure 23. UTRAC Process

The subject leader for each group chooses a number of UDOT voters to participate in the problem statement evaluation process.
Stage 2 involves the advertising of the process and the sharing of scoring criteria developed by each of the UDOT groups.
Stage 3 involves the receipt and scoring of problem statements.

Stage 4 is the holding of a UTRAC workshop where participants from UDOT, FHWA, other government agencies, universities, and private organizations gather to review, evaluate, and prioritize research needs for UDOT. At the workshop, each group meets to hear short presentations from the problem statement authors. Then at the workshop most of the groups use Decision Lens to revise and complete their scoring of the statements and to discuss and update the prioritization results as a group.

Stage 5 is the prioritization and matching of funding for the selected projects.

Research Implementation:

UDOT has implemented a decision based tool and dashboard (Decision Lens) to help it measure project and research needs for the department. This tool is used throughout the process to track the research as well as implementation. Return on investment analysis is done on the research projects to better understand the benefit of undertaking the research.

Current and Planned Research:

The research program is principally focused on highway research but also has public transit and aviation research projects. Most of the research is technical in nature with some work in policy/planning (80/20%). About 95% of the research is contracted out with about half of the work being awarded to public state universities and the other half to private researchers and private universities.

Current FY2019 – approximately 100 active research projects

Planned FY2020 – approximately 25 new projects are expected

The list of active research projects are at:
https://www.udot.utah.gov/main/uconowner.gf?n=12835913852004603
The list of 2019 submitted problem statements are at:
https://www.udot.utah.gov/main/f?p=100:pg:0:::1:T,V:3305,

Recent Publications:

UDOT Research Peer Exchange Report (2016). https://research.transportation.org/peer-exchange-reports/# Research and Innovation Division fact sheet (2018): https://research.transportation.org/wp-content/uploads/sites/31/2018/03/UtahDOTFactSheet2018.pdf
Research and Innovation Manual of Instruction: https://www.udot.utah.gov/main/uconowner.gf?n=9805417978678989 Innovation and Efficiencies Report (2018): https://www.udot.utah.gov/main/uconowner.gf?n=5990536908657200

Key Contact:

Cameron Kergaye, Director of Research and Innovation, Research and Innovation Division, ckergaye@utah.gov; 801-633-0359;
https://www.udot.utah.gov/main/f?p=100:pg:0:::1:T,V:195,

Utah DOT – Research/Innovation Program Org Chart

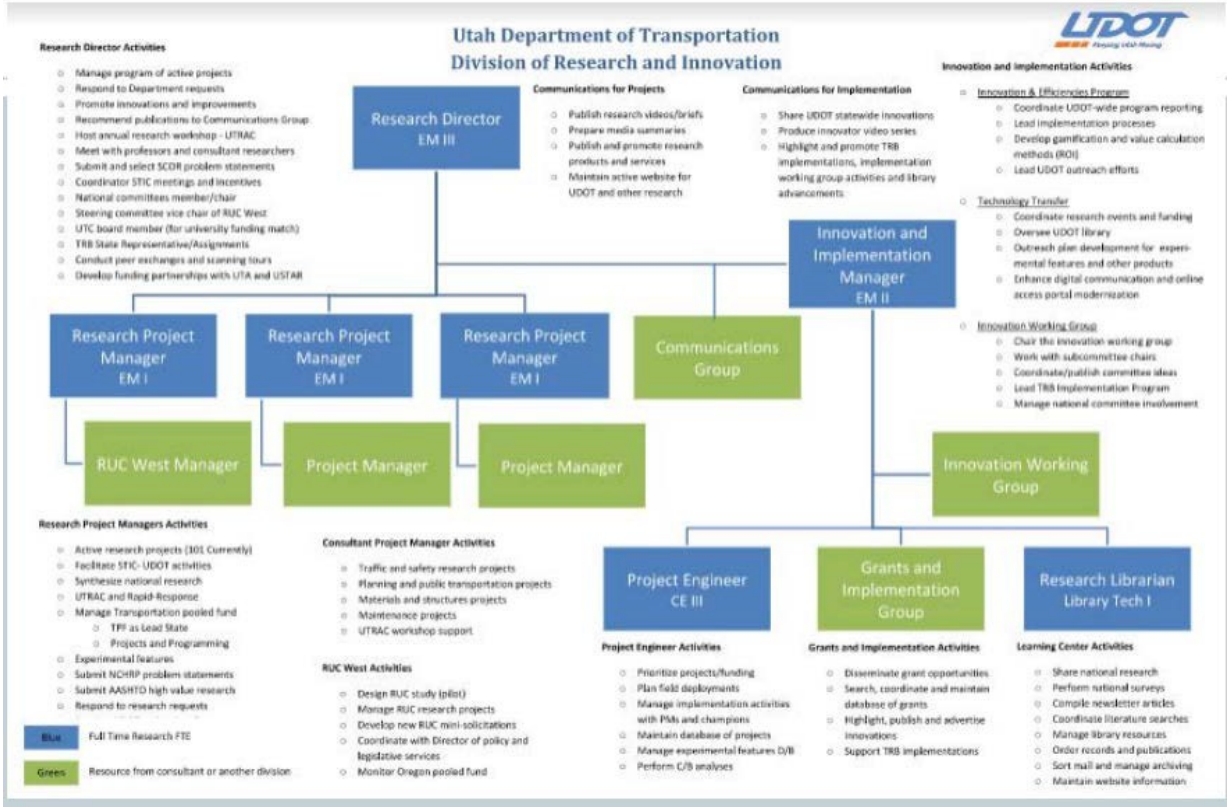


Figure 24. Utah DOT Division of Research and Innovation Organization Chart