

TECHNICAL MEMORANDUM:
IMPLEMENTATION OF RESEARCH FINDINGS AND PRODUCTS

for

Project 02-25

of the

**NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM
(NCHRP)**

**Workforce 2030 – Attracting, Retaining, and Developing the
Transportation Workforce: Design, Construction, and Maintenance**

LIMITED USE DOCUMENT

This Technical Memorandum is furnished only for review by members of the NCHRP project panel and is regarded as fully privileged. Dissemination of information included herein must be approved by the NCHRP.

July 2021

From

ICF

**9300 Lee Highway
Fairfax, Virginia 22031**

This Technical Memorandum was developed in association with *NCHRP Research Report 1008: Attracting, Retaining, and Developing the 2030 Transportation Workforce: Design, Construction, and Maintenance*, available on the National Academies Press website (www.nap.edu).

NCHRP 02-25: Workforce 2030—Attracting, Retaining, and Developing the Transportation Workforce: Design, Construction, and Maintenance

Overview of Research Project

As stated in the initial solicitation, “Agencies are increasingly challenged by the availability and preparedness of the design, construction, and maintenance workforce. Despite the growing demand for new and replacement staff, budget challenges will mean that state [departments of transportation] DOTs will likely be working with a significantly smaller workforce than desired. Looming retirements will also put additional demands on staffing as many new workers will require significant training to meet present and future demands.

To manage the dynamics of meeting tomorrow’s design, construction, and maintenance demands with a smaller workforce, state departments of transportation need robust human capital programs that can attract and train engineers, technicians, and maintenance workers needed to maintain the U.S. highway infrastructure. The workforce shortage among state transportation agencies has evolved over time, and state DOTs recognize that challenges cannot be overcome without significant changes in workforce recruitment and training practices.”

The purpose of NCHRP Project 02-25, “Workforce 2030-Attracting, Retaining, and Developing the Transportation Workforce: Design, Construction, and Maintenance” was to gather information to solidify the current industry trends and demands that will impact workforce needs for state DOTs into the future, particularly in the occupational areas of design, construction, and maintenance. Further, the project is aimed at developing practical resources to improve how state DOTs recruit, select, train, and sustain a capable workforce over the next 10+ years in light of significant labor-market shifts, competitive forces, and industry changes. These practical resources are provided in the form of a Guide that is available to all DOTs. The project also provides guidelines at an industry level to help unite stakeholders in building workforce capacity across the industry, especially for jobs deemed mission critical and at great risk due to shortages in the talent pipeline.

Research Products

The following deliverables have been created to support dissemination and implementation of the research findings:

- **Workforce 2030 Report** – This report looks at the mission critical jobs within design, construction, and maintenance fields; workforce capacity challenges for the mission critical jobs including insights from labor-market analysis; and likely future states of the three major occupations of emphasis and the workforce challenges projected over the next 5–10 years based on those possible future states.
- **Industry Framework** – This framework outlines ways transportation partnerships could be cultivated among key stakeholders to focus on workforce capacity-building more holistically.
- **The Guide** – The primary deliverable of this study is a guide that details developed workforce capacity-building strategies and their associated action plans, which provides information on how to implement each strategy. The Guide is intended to serve individual state DOTs as they seek to plan for increased challenges in maintaining a stable, skilled workforce in design, construction, and maintenance occupations.
- **Executive Summary** – The Executive Summary outlines the research findings and recommendations and includes a high-level overview of the Guide and Roadmap.

- **Presentation Slides:** The Presentation Slides (i.e., Microsoft PowerPoint slides) summarize the contents of the Guide and showcase why the Guide and supporting materials are helpful and how they will be used.

The Guide, arguably the most robust deliverable from this research, outlines easily implementable, practical strategies that are supported by scientific research and have been applied by many transportation agencies. These strategies are designed to help DOTs address current and projected workforce gaps. Specifically, the strategies and action plans within the Guide are intended to attract, retain, and develop the transportation workforce in the occupational areas of design, construction, and maintenance. While the bulk of the Guide is focused on individual workforce capacity-building strategies and associated implementation steps within each strategy action plan, it also provides a Roadmap to help inform decision steps for DOTs and to aid a given DOT in determining which strategies might be best suited for that DOT based on its specific needs. To support implementation of the strategies within the Guide, in addition to providing descriptive information, each action plan contains a list of step-by-step instructions for implementation and identifies Implementation Lead(s), who are the individuals most suited to implement the actions plans. Each action plan also presents a list of resources needed to implement the strategy, potential barriers to implementing the strategy, and metrics that may be used to measure the effectiveness of the strategy. Where possible, examples of how the strategies have already been implemented within actual DOTs have also been provided. Each strategy comes with one to three ready-to-use tools that can be used by DOT leaders and Implementation Leads to support the implementation of the strategy.

Recommendations for Dissemination of the Guide

The Guide should be shared, promoted, and discussed both within and across DOTs to increase awareness and garner buy-in. NCHRP Implementation Support Program¹ suggests that active implementation can be achieved through effective products, effective implementation, and enabling context (see Exhibit 1 below for a visual model). Because the products have been developed and submitted to NCHRP, this memorandum focuses on the Effective Implementation and Enabling Contexts that support the application of those products (i.e., Industry Framework; Guide with Roadmap).

Exhibit 1. NCHRP Implementation Support Program's Active Implementation Model



A precursor to promoting implementation is ensuring industry-wide awareness and successful dissemination of the products developed. As a baseline step, the Guide will be housed on the Transportation Research Information Documentation (TRID) and made available to DOTs at no additional cost. Next, the Guide should be actively distributed to points of contact (POCs) within state DOTs (e.g., Human Resources [HR] Directors; Training and Development Leads; Policymakers). These POCs should then further distribute the Guide appropriately to Implementation Leads and other key individuals (e.g., Division Directors, Department Heads, managers of Implementation Leads, HR Managers) for them to keep as a local resource. Content from the Guide can be tailored and presented to

¹ Dekelbab, W., C. Hedges, and L. Sundstrom. 2017. Active Implementation at the National Cooperative Highway research Program: Frameworks for Moving Research into Practice. *TR News* 310, July–August 2017. http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-44_ActiveImplementation-TRNews.pdf

DOT staff using appropriate channels within the DOT (e.g., newsletters, discussions during a Town Hall, staff meetings, leadership meetings, webinars, and by distributing it to managers and HR representatives). Furthermore, state DOT HR departments should house the Guide and related products in an internal portal or intranet site that is easy to navigate and presents the content up front via a simple link that users can readily access. Highlights from the Guide, including descriptions of some of the “plug and play tools,” should be presented on the intranet page and distributed frequently via memoranda so DOT leaders can easily access the content within the Guide.

Second, in addition to sharing the Guide with the DOTs, the Guide should also be shared with representatives of the Federal Highway Administration’s (FHWA) Regional Transportation Workforce Centers, some of whom were participants on this project. Communications regarding the utility of and information about the Guide can be broadcast to them so that they can further promote and share the Guide with state DOTs in their region. As DOTs consider their FHWA Region Transportation Workforce Center a hub for information, workforce advocates, and industry collaboration, this channel can be particularly effective for reaching DOTs and end-users.

Third, similar to the previous dissemination approach, the Guide should be shared with the American Association of State Highway Transportation Officials (AASHTO), and specifically with relevant AASHTO committees, including the Committee on Design, the Committee on Construction, the Committee on Maintenance, the Committee on Human Resources, and the Agency Administration Management Committee given their focus on transportation workforce strategy. Because the relevant AASHTO committees continue to be a national voice and source of guidance for transportation design, construction, maintenance, and workforce issues, they work on educating the public and key decision-makers about important transportation workforce capability building needs. As these committees have an assigned responsibility to serve as champions for implementation of NCHRP results,² these committees can be an advocate for these workforce capacity-building strategies and help demonstrate how they contribute to the sustainability and success of DOTs across the country. These committees can help track implementation and impacts of NCHRP research over time, present NCHRP work during meetings, and work to encourage DOTs and other AASHTO committees to participate in NCHRP research.

Fourth, in addition to collaborating with the previous two entities, it is important to engage in general outreach and marketing for the Guide with other partners. The *Industry Framework for Building the 2030 Transportation Workforce in Design, Maintenance, and Construction*, developed as part of this project, provides a list of both traditional and nontraditional partners to DOTs; partners who could be leveraged to help spread awareness of the research findings and bolster its application. Because many of the partners listed in the Industry Framework will have natural incentives to collaborate with DOTs on the strategies provided (e.g., to work toward shared goals, to overcome common workforce challenges), the involvement of external partners will further facilitate strategy implementation and enhance the strategies’ impact. See “Opportunities for Industry Stakeholders to Support DOTs” in Chapter 5 of the Guide for more information. Engaging in these parallel methods of distributing the Guide will ultimately increase awareness of its content and value and subsequently promote increased interest in implementation of the action steps within.

Recommendations for Implementation of Research Findings

DOTs are encouraged to use the Guide in four primary ways to achieve effective implementation and

² AASHTO Standing Committee on Research (SCOR) Implementation Planning Task Force. 2015. *NCHRP Implementation Facilitation Plan 2015–2020*.
<http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRPImplementationPlan-Dec2015.pdf>

make optimal use of the contents within. These include: (1) using the Action Plan Decision Tree and Roadmap to assist in the selection of strategies for application, (2) applying individual strategies within specific DOT divisions/departments/functional areas as guided by identified DOT Implementation Leads, (3) developing new agency-wide attraction, retention, and development processes and procedures that align to the strategies within the Guide, and (4) sharing and promoting the use of the Guide across the industry by sharing the Guide contents with other state DOTs, transportation associations and membership organizations, and other transportation peers across the industry.

While DOT leaders and managers may use the Guide to find a single action plan that addresses a specific challenge they face, users of this Guide are encouraged to mix-and-match action plans to best fit their specific challenges and agency context. It is important for DOT leaders to recognize how actions taken within one area of a human capital system (e.g., talent recruitment, development, and retention), impact every other system and outcome. Thus, while the action plans are organized according to specific talent management categories—recruitment, development, and retention—the action plans within the Guide are designed to complement one another to aid the DOT in achieving multiple goals. For example, an action plan in the section about developing and reskilling employees is likely to be an effective strategy for retaining employees.

Assistance in the Selection of Strategies for Implementation

To help prioritize strategies for immediate implementation, the Guide's Action Plan Decision Tree presents questions for DOT Implementation Leads to consider as they are trying to resolve a particular talent issue or concern. The decision tree walks the reader through a step-by-step process of narrowing down what the issue might be and highlighting relevant strategies to address each potential issue. This resource can be an initial checkpoint for DOT Implementation Leads for guidance in further defining their needs based on their situation and to better understand the breadth of strategies contained in the Guide.

The Guide also contains a Roadmap, which is designed to showcase the interaction between the human capital initiatives for building a qualified design, construction, and maintenance workforce. The Roadmap highlights the challenges that have been identified by transportation organizations and the recommended solutions for addressing those challenges (i.e., strategies). This Roadmap may be used to help clarify how to best navigate the strategies and action plans within the Guide and identify critical areas to heed caution as well as milestones that indicate when progress is being made in the implementation of project recommendations. See the Guide for the Decision Tree and Roadmap as well as more information on each.

Application of Individual Action Plans

Action Plans will be applied by individuals who can impact the workforce issue being addressed by the strategy. The individual may include Implementation Leads (as identified within each action plan); managers at the division or department level; HR personnel; or employees in other roles depending on their degree of decision-making, planning, and programmatic authority to allocate resources and implement changes. Without an existing DOT-wide process or procedure for the desired focus area, Implementation Leads, with the help of the Decision Tree and Roadmap contained within the Guide, can pinpoint specific strategies that, when applied, may enhance workforce capacity building within their division or department.

Furthermore, the strategies within the Guide are designed to be used as either stand-alone techniques or combined with other strategies to enhance workforce capacity building depending on the needs of the department. As mentioned previously, Guide users may combine elements of action plans to address their challenges as many action plans are targeting similar workforce challenges. Additionally, Implementation

Leads are encouraged to review the specific implementation steps and adapt them as needed to fit their agency context before applying them.

DOT-wide Attraction, Retention, and Development Processes and Procedures

DOT-wide attraction, retention, and development processes and procedures may be developed using the action plans in this Guide as a baseline and expanding the scope and stakeholders involved as necessary. Such policies can define the goals and objectives of workforce capacity-building efforts over time. Developing overarching processes and procedures allows strategies around workforce capacity-building to be applied consistently across the organization and does not exclude any divisions, departments, or employees that might be unable to implement the strategies on their own due to lack of resources or authority. This approach provides all employees the same opportunities to expand their careers within the DOT and affects applicants across different areas of the DOT in a consistent way.

Sharing and Promoting the Guide

Transportation industry organizations, such as the ones described in the next section, can encourage the use of the research findings and Guide by sharing it through social media publication materials, blogs, webinars, conference presentations, and even less formal exchanges (e.g., email messages). Promoting the Guide through these means will increase awareness throughout the industry and improve the likelihood that DOTs or DOT managers may leverage the Guide as a valuable resource for workforce capacity building. Further, because these workforce capacity needs and skill deficits in the occupations of focus span the industry, DOTs will benefit from engaging in resource sharing and knowledge exchange with other stakeholders. As a concrete example, a DOT might consider partnering with another DOT in applying one of the strategies on developing talent. The two DOTs might work collaboratively to identify and share material for a training initiative that aligns to the strategy guidance provided. With much of the training occurring virtually, some organizations have created joint academies where staff across the two organizations can be in cohorts together, share knowledge gained, and even participate in capstone action learning projects together.

Organizations to Lead Application of Research Findings and Products

It is essential to identify influential organizations and individuals within the industry who will be champions of the results of this research. In addition to DOT division or department managers implementing the Guide strategies, both traditional and nontraditional industry stakeholders can serve as effective champions of the Guide. Traditional stakeholders typically partner with DOTs due to their emphasis on transportation-related issues, while nontraditional stakeholders are entities whose support might be valuable in growing workforce capacity for the target occupations. The nontraditional partners may represent worker populations that typically pursue jobs in design, construction, and maintenance, or they may provide more generalized workforce development and staffing expertise across other industries. Once the Guide has been published, we recommend conducting outreach to those who participated in the research since they already have a vested interest in the results of this study. We could encourage those participants to use, promote, and share the Guide with their DOT peers. Additionally, example industry leaders who could share and promote the Guide with a broad audience, in addition to the Transportation Research Board (TRB) itself, include the U.S. DOT, FHWA, and AASHTO. The **Industry Framework Report** submitted to NCHRP as part of this project's deliverables also provides a longer list of potential traditional and nontraditional partners who could serve as valuable collaborators with DOTs to address these industry-level issues.

U.S. DOT

The mission of the U.S. DOT is to ensure our nation has the safest, most efficient and modern transportation system in the world, which improves the quality of life for all American people and

communities, from rural to urban, and increases the productivity and competitiveness of American workers and businesses. The U.S. DOT would be an effective advocate for the application of the Guide by incorporating relevant strategy components in its own policies and communications. Specifically, the U.S. DOT's FHWA could also take on some of these strategies directly and assist individual state DOTs in forming partnerships and implementing them. For example, the FHWA has an Office of Innovation Implementation that serves as a resource center for technical service teams, including the Construction and Project Management team and the Safety and Design team. These teams could help facilitate dissemination and application of the Guide's contents by promoting specific effective practices from the Guide directly to DOT contacts.

AASHTO

AASHTO is a nonprofit, nonpartisan association representing highway and transportation departments in the 50 states, the District of Columbia, and Puerto Rico. Its primary goal is to foster the development, operation, and maintenance of an integrated national transportation system. AASHTO serves as a liaison between state DOTs and the federal government. AASHTO is an international leader in setting technical standards for all phases of highway system development. AASHTO would be an effective advocate for the application of the Guide because the organization can spread awareness of the Guide by highlighting relevant research findings and practices from it during annual meetings, regional meetings, and committee meetings. As mentioned previously, relevant AASHTO committees, including the Committee on Design, the Committee on Construction, and the Committee on Maintenance, could help promote the Guide where possible and incorporate the workforce capacity-building strategies in their own activities with DOTs.

TRB

TRB promotes innovation and progress in transportation through research. TRB facilitates the sharing of information on transportation practice and policy by researchers and practitioners, stimulates research, offers research management services that promote technical excellence, provides expert advice on transportation policy and programs, disseminates research results broadly, and encourages their implementation. TRB's Annual Meeting, typically held in January, would be a great opportunity to present the contents of this Guide and to help promote further dissemination and application of the findings within. In the conduct of future webinars as a follow-up to this NCHRP study, the ICF team looks forward to sharing stories about how the strategies are applied and lessons learned from organizations that have used similar types of strategies. Those real-world accounts will help to encourage other transportation stakeholders to seek information from the Guide and apply it to their own workforce challenges.

Issues Affecting Implementation and Recommended Actions

There are likely challenges for DOTs seeking to implement the strategies in the Guide. The following is a summary of those likely challenges and remedies.

Selecting an Implementation Lead

The strategies within this Guide suggest each user identify an Implementation Lead who will oversee the implementation of the strategy and action steps outlined. Ideally, these Implementation Leads are individuals designated to make decisions required for implementation without having to seek multiple layers of approval. However, many government agencies have historical processes and approval requirements that might not be conducive to swift implementation, and disrupting the implementation with unnecessary pauses could impact the effectiveness of the strategy. For example, staff may be leery about the adoption of a new approach if the implementation is too lengthy or gets disrupted too often. Thus, in addition to encouraging DOTs to appoint leads with necessary decision-making authority and

resource access, we have provided case study examples and research within each strategy that can be leveraged by these leads to demonstrate the value of a strategy to promote buy-in.

In fact, there are specific sections, such as an applied “Strategy in Practice,” that provide real-world examples of the strategy as well as a section that notes applicability in Design, Construction, and Maintenance (as applicable), an Implementation Plan and Guidance section, sections that specify needed support or resources, additional resources, and practical “plug and play” tools associated with each strategy. To address this potential obstacle, ICF recommends the DOT thoughtfully consider the decision-making authority as well as how influential the individual is who might be selected to lead the implementation since the individual will likely need to achieve buy-in from leadership. Further, we recommend the Implementation Lead use the Guide resources, namely the “Strategy in Practice,” tools, and metrics to help build a business case and demo what the strategy would look like in practice for the agency, division, or functional area *prior to* initiating any of the steps within the action plan.

Employee Support for New Strategy

The labor market is increasingly diversified in terms of the cultures, ethnicities, personal/family commitments, generations, and work preferences represented. Given this, some employees may be more resistant to the adoption of some of the new approaches outlined within specific strategies. Often employees wonder why change is necessary, particularly for employees who have a long history working with the agency and feel particularly proud of the institutional knowledge and experiences they have.

Since it is important to have buy-in across staff, we advise conducting initial employee “Town Halls” and feedback sessions to help discuss the impact of the impending changes and address concerns employees may have in advance of implementation. We also recommend conducting brief, anonymous surveys and demographic information to anticipate whether the strategies are more likely to have a challenging or positive impact over one group of people compared to other groups. It is important that all strategies be paired with an emphasis on diversity, equity, and inclusion and thus, we advise all agencies fully prepare their workforce and assess the perceived impact of the strategies for different demographic groups. These insights can then be used to identify where slight changes in implementation planning need to be made or new policies developed to continue to promote diversity, equity, and inclusion (DEI) along with the changes that will occur due to the application of the strategy. Further, we recommend selecting champions from across divisions and levels of the organization to support various aspects of the strategy and to promote consistent, timely messaging about changes throughout each business unit. The more employees are actively involved and feel they were given an opportunity to express their concerns (i.e., given a voice) in advance of implementation and experience a sense of “ownership” by being given aspects of the process to oversee or push out, the more employees will be more likely to buy-in and celebrate the changes coming.

Potential Future Work

While employing many of the ideas described herein will encourage dissemination and subsequently implementation of the Guide and research findings, additional ideas to support implementation are available through NCHRP Project 20-44, “NCHRP Implementation Support Program.”³ The program focuses on facilitating implementation of NCHRP research results. Compared to ad hoc implementation, systematic active implementation obtained through the support program funding is beneficial because it comes with dedicated expertise, formalizes an implementation team and project implementation materials, and typically accelerates the implementation process. One idea for future work could involve leveraging this implementation guidance and assembling teams of multiple transportation stakeholders to

³ <http://www.trb.org/NCHRP/NCHRPIImplementationSupportProgram.aspx>

participate in pilot projects related to the strategies from this project effort. For these pilots, we could present a subset of the strategies and have the teams create a framework for more specific implementation of each strategy or combination of strategies. In other words, these pilots would involve the different stakeholders identifying their unique role in seeing the strategy implemented fully and processing through the logical steps involved in that full implementation. This idea would serve as a tangible way to expand the research products through engaging multiple stakeholders and demonstrating the steps and value in implementation.

Recommended Methods of Identifying and Measuring Impacts of Implementation

We recommend assessing both the overarching utility of the Guide as well as the impact of implementing a specific strategy within a DOT. Each is further explained.

Measuring Guide Utility

Institution such as the TRB and NCHRP could have a role in tracking and measuring the impact of the Guide across the DOT industry. One simple metric to track is downloads of the Guide from TRID, the integrated database that combines TRB's Transportation Research Information Services (TRIS) Database and the Organisation for Economic Co-operation and Development's (OECD) Joint Transport Research Centre's International Transport Research Documentation (ITRD) Database. Additional follow-up research could include surveying DOTs on their experience with navigating the Guide and applying content found within as well as more informally gathering feedback from transportation industry experts in future NCHRP workshops on their perceptions of the Guide's utility.

Measuring Impacts of Strategy Implementation

The metrics presented at the end of each strategy in the Guide should be used to both anticipate the effectiveness of applying the strategy and to evaluate the impact of each strategy after implementation. DOTs can lose vital time and resources, including personnel, when they implement strategies that fail to align to the precise needs of their workforce and to the culture and unique context within which their organization operates. Thus, it is important to use these metrics as indicators to expeditiously evaluate how effective the implemented workforce capacity-building practices are within their organizations. These metrics are grounded in scientific research but are translated in a way that makes them easily implementable for DOTs of different sizes and with varying resource levels.