HSM Pooled Fund Study:

Summary of State DOT needs for a Resource for Implementing the HSM Part C

# Introduction

The Highway Safety Manual (HSM) is a new tool to assist state transportation departments in improving the safety-related inputs to decisions involving the planning, design, construction, maintenance, and operations of roadways. Use of the manual, while not required by the Federal Highway Administration (FHWA), is in the process of being implemented in many states. Implementation, however, is slow as the HSM contains a large number of new skills and processes spanning all areas of road design and maintenance.

One notable area of the HSM that is new and particularly difficult for state Departments of Transportation (State DOTs) to implement is the use of Safety Performance Functions (SPFs). Consequently, the FHWA Office of Safety, in coordination with a FHWA Pooled Fund Study, is interested in defining resources to assist states looking to learn from one another as they develop, use, and refine SPFs.[[1]](#footnote-1)

This memo is the first step in a project that will help define the needs for a resource to provide this level of support and select one or more options to provide the needed resources.

This document represents the current understanding of the Volpe Center when it comes to States’ needs, priorities, knowledge, resources, and hurdles when it comes to using SPFs as part of HSM adoption. Two additional documents will follow this one, one identifying alternative resources that will help satisfy these identified needs and a second representing the selected alternative(s) as well as a path to implementing the chosen alternative(s).

# Methodology

The Volpe Center conducted ten phone conversations with state DOTs as well as one with a university researcher assisting the state DOT with SPFs. In one case, a project consultant was on the call. States that were members of the Technical Advisory Group (TAG) for the Pooled Fund Study were contacted first, followed by other states that expressed an interest in the topic. Four TAG states and six non-TAG states were included. A list of participants is included in an Appendix to the memo. Other states, particularly those who are farther along in the adoption of SPFs, or who are developing SPF resources separately from the Pooled Fund Study, will be interviewed during the next stage of project.

These informal discussions centered around a list of suggested topics. While the topics suggested were common to all participants, conversation topics varied considerably state-by-state due to differing levels of interest, concerns, and experience. The topics included the state DOT’s current experience with SPFs and/or plans for future use, how SPFs were developed or calibrated, how the DOT decided whether to calibrate or develop the functions, who was involved in that process, how long it took, and how SPFs are or will be used by the DOT. Other topics focused on agency-wide perspectives, such as the role of SPFs and the HSM in the agency’s safety priorities and programs, knowledge gaps among the staff regarding SPFs, and where the DOT staff currently looked for information and training opportunities.

# Findings

#### Data

A key finding from the conversations was that data availability and quality drive SPF-related decisions, particularly the decision whether to calibrate or develop. While calibration can be performed with a smaller sample of road data, it requires a specific data set to match the data types used to develop the HSM function.

One of the most important State needs was a data roadmap or similar resource detailing 1) which of the elements in the Model Inventory of Roadway Elements (MIRE) are the highest priority for an SPF and, 2) what are the additional benefits from adding other data elements. Existing programs to help states manage and use their roadway safety data, including SafetyAnalyst and the IHSDM, can be a burden because of the large amount of data required. Some state DOT respondents stated that the effort needed to bring their data to the point where it could be used by SafetyAnalyst did not justify its use. The Roadway Safety Data Partnership has also recognized this need and is supporting states by providing an assessment of their current data capabilities and an action plan framework to guide their improvement efforts.[[2]](#footnote-2)

#### Collaboration

State DOT respondents expressed their need for a better understanding of the national context of their efforts, knowing how other states are getting their data and what they are doing with it. States want to be able to compare their functions and share innovative uses for both the data and the functions. Similarly, to aid in cross-state collaboration, many expressed an interest in new tools to use either common (such as Excel) or open-source, editable software and, as a companion to that, a place to share the code that they or their consultants wrote when developing a new function.

#### Use of SPFs

Many state DOTs view the calibration of the HSM Part C functions as a stepping-stone to developing their own functions once they improve their statewide roadway data. Some state DOTs also envision a mix of functions, where some are calibrated and some are developed, depending on how well the calibrated functions perform for the statewide road network. Some state DOTs are using or planning to use their functions for network screening, alternatives analysis, cost-benefit analysis, and incorporating them into agency decision-making for design exceptions.

#### Prioritization of Efforts

Many state DOT respondents had difficulties with prioritizing each step of SPF implementation, with prioritizing SPFs versus other parts of the HSM, and with making SPFs and the HSM a higher priority within the organization as a whole. As noted previously, knowing which data was most essential was difficult, particularly when viewed from a cost-benefit perspective. Some data is more expensive to collect and “clean” than others. Other state DOTs found success tying safety data to asset management needs, allowing the requisite costs to be spread among multiple departments.

Several state DOTs also had difficulty determining how to prioritize implementing SPFs relative to implementing the rest of the HSM. Many states chose to implement piecemeal, inserting or changing certain processes as those processes came up for review within the agency. This approach, while viewed as a necessary adaptation, introduced a certain randomness into the process of implementing SPFs.

State DOTs also expressed strong interest in finding resources to help make SPFs and the HSM a higher priority within their organization as a whole. Some states had success tying it to other priorities, such as the asset management link, while others presented it as a useful tool for helping the agency achieve a broader goal, such as more objective and accurate project planning. Some respondents noted, however, that the piecemeal implementation noted above led to inconsistent use across the organization.

Some state DOTs requested materials that explain the benefit of SPFs to the general public in understandable, laymen’s terms; one state DOT respondent noted that telling a community why they predicted fewer crashes on a road the year after they had an uncharacteristically high number can be a difficult sell. Communities expect action based on the crash count, not on a formula.

#### Expertise

Most states have used outside expertise for calibration and development, either a university or a consultant. They often do not have the in-house statistical expertise to develop the functions, and many also do not have the expertise to evaluate the product once it is completed. In particular, states need a method for validating the functions that they receive from universities and consultants.

State DOTs identified the following needs in this area:

* A model scope that be incorporated into a state’s standard RFP or work order (including call-outs for sections that can be tailored to individual state needs).
* A guide for managers, including 1) evaluating the end result of and validating the function and 2) rules for when to update, when calibration factors are too large, etc.
* A step-by-step guide to development, with a list of the data needed and a detailed process for developing the functions, to be used either in-house or as a set of specifications to hand to outside consultants (states mentioned that they had a similar guide for CMFs). Ideally, such a guide would include notes about possible adjustments that could be made, how adjustments would change the use of a function, or allow a state to use the function with less data.[[3]](#footnote-3)

State DOT respondents as a whole felt they lacked a basic understanding of the underlying principles of the function. This made them unsure about what is allowed in adjusting a function, including how to perform the adjustment, how it affects the results, and how it affects the margin of error.

Some state DOTs also requested information about quality training options offered by qualified instructors. Others mentioned the value of peer exchanges to learn how functions were developed and used. Two were interested in exploring regional SPFs,[[4]](#footnote-4) but felt that they currently lacked a way of knowing which SPFs merited collaboration. Lastly, one respondent noted that for some innovative road designs or mitigations, a single state or region may not have enough sites collecting data to develop a function and it may be worth exploring whether national SPFs would make sense in that case.

# Summary and Conclusion

The key to widespread implementation of SPFs is **supporting improvements in data availability and quality**. Aside from data improvements, resources aimed at supporting the implementation of SPFs should focus on improving:

* State DOTs’ understanding of the national context and other states’ experiences,
* State DOTs’ awareness of necessary data for SPF implementation and effective strategies to encourage the collection of this data,
* State DOTs’ ability to “sell” the HSM and SPFs throughout the organization, not solely within their safety offices,
* State DOT staff’s understanding of the functions’ fundamentals and accuracy.

1. Participants

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| State/Organization |
| Contractor |
| Idaho DOT / Highway Safety Manager |
| Illinois DOT/ State Safety Engineer |
| Kansas DOT/ Field Engineering Administrator |
| Louisiana DOTD / Highway Safety Administrator |
| North Carolina DOT / Traffic Safety Unit |
| Ohio DOT / Office of System Planning & Program Management |
| Oklahoma DOT / Traffic Division |
| Pennsylvania DOT / Safety Management Division |
| University of Wisconsin / Traffic Operations and Safety Laboratory |
| Wisconsin DOT / State Traffic Engineer |

1. The pooled fund study is also developing guidebooks to aid in decision-making about the kind of SPF to use and how to go about its development. These guidebooks are being developed by the University of North Carolina Highway Safety Research Center. [↑](#footnote-ref-1)
2. FHWA. *State Data Capabilities Assessment Preliminary Findings/Midpoint Report December 2011*. Accessed online at <http://safety.fhwa.dot.gov/rsdp/> [↑](#footnote-ref-2)
3. Note: This document reflects the needs expressed by selected State DOTs. It is possible that this need could be filled by one of the guidebooks already under development as part of this Pooled Fund Study. [↑](#footnote-ref-3)
4. “Regional” encompassed both multi-state and intrastate, as regions within a state may vary considerably in certain characteristics, but may share characteristics with the adjoining region in a different state. [↑](#footnote-ref-4)