

HSM Pooled Fund:

Next Steps for the Development of an SPF Warehouse or Clearinghouse to Support Implementation of the HSM Part C

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# Introduction

The Highway Safety Manual (HSM) Implementation Pooled Fund Study (PFS) was created to assist states in using the HSM to improve the safety-related inputs to decisions involving the planning, design, construction, maintenance, and operation of roadways. One notable area of the HSM that is new and particularly challenging for State Departments of Transportation (DOTs) to implement is the use of Safety Performance Functions (SPFs). To support State DOT development of SPFs, the Pooled Fund Study is supporting the development of guidebooks on the selection and development of SPFs as well as an assessment to identify other resources that would support SPF implementation.

This memo is the third step in the resource needs assessment. The first identified key State DOT needs, developed through a series of interviews with State DOT personnel and others who support State DOT SPF development.[[1]](#footnote-1) The second memo described a set of resource alternatives grouped into four categories: exchange-based resources, compilations of existing knowledge and best practices, online function warehouses or clearinghouses, and a research agenda.[[2]](#footnote-2) Through a balloting process and in discussions at the annual PFS meeting and a follow-up teleconference, the PFS states selected an online warehouse or an online clearinghouse as the two resources to be developed further in this third and final needs assessment memo.

This memo describes the two resource options in detail (Section 2), discusses the actions needed to develop each option (Section 3), attempts to estimate order-of-magnitude costs for each option (Section 4) and provides next steps to the Pooled Fund states (Section 5). Having been reviewed by the Technical Advisory Group, this memo serves as the final deliverable in the Needs Assessment and will provide the basis for development of the clearinghouse, the selected option.

# DeSCRIPTION OF SELECTED ALTERNATIVES

Both a warehouse and a clearinghouse are based on the same fundamental concept: an online site or network of sites where states can share and select SPFs and potentially other related resources, particularly code for certain programs. The two alternatives differ in complexity, usability, and cost, with a clearinghouse being more complex and costly than a warehouse, but providing more utility to the states.

When selecting the preferred alternative, it is useful to remember that because they share a basic framework, one may become the other over time, i.e. a warehouse can be set up and over time an evaluation framework can be developed, or a clearinghouse can revert to a warehouse if resources are scarce or scoring SPFs proves less useful than initially envisioned.

## Warehouse

An SPF warehouse would be an online site or network of sites that stores completed SPFs, reports, and code for other states to use. The site would include a database that listed state, object type, and title, so that submissions could be cataloged. However, submissions would neither be evaluated for quality nor tagged with keywords to aid in selection. A warehouse would require either maintenance of a single site, or the development of a protocol for a set of networked regional sites as well as maintenance of those sites. A warehouse would also require the development of a set of database fields for item identification. A warehouse would enable the sharing and storing of SPFs, reports, code, and any additional resources states would find useful. These functions would enable the “early adopter” states to pass along information that is easily accessible by later-adopting states. Because the utility of the site would depend largely on the number of uploads to the warehouse and the amount of traffic to the site, the availability of the warehouse should be promoted on related sites, the HSM online forum, and peer exchanges.

## Clearinghouse

An SPF clearinghouse would be based largely on the experience of the Crash Modification Factor (CMF) Clearinghouse operated by the Highway Safety Research Center at the University of North Carolina.[[3]](#footnote-3) Like the warehouse alternative described in section 2.1, above, a clearinghouse would require the development of a set of database fields for report identification, and would enable the sharing and storing of SPFs, reports, code, and any additional resources states find useful.

The key difference between a warehouse and a clearinghouse is that the clearinghouse has a methodology and system for reviewing and rating SPFs that can be applied consistently and fairly. It also requires dedicated staff time to enter papers, ratings, and results into the database and publicizing its availability. The development of a methodology and rating system would require consensus within the field on the attributes necessary for a quality SPF. A clearinghouse would also aid in the selection of SPFs with a search function and links to training and other SPF related resources. As with a warehouse, a clearinghouse would need to be widely publicized in order to ensure its effectiveness, but may also require additional training, as in the CMF Clearinghouse case, for its use. A clearinghouse would function less well as a network of regional sites, due to its greater complexity; therefore, a clearinghouse network is not assessed here.

# NEXT STEPS

There are five steps in the development process shared by both a warehouse and a clearinghouse. These steps generally follow the Systems Engineering process favored by FHWA for Intelligent Transportation Systems Projects, as they are good practice for Information Technology projects in general.[[4]](#footnote-4) These steps are

* Selection of one site or a network of sites
* Development of a Concept of Operations
* Documentation of system requirements
* Drafting of a design document
* Formation of strategy for collection, outreach, and training
* Development, deployment and maintenance of site(s)

## Selection of one site or a network of sites

The first decision must address whether a single site or a network of sites better meets available needs and resources. A network of warehouses realizes cost savings largely by absorbing the use of spare resources (i.e. web space or staff time) at existing institutions but requires ongoing coordination efforts to maintain utility. Important considerations include:

* *The states’ perceptions of whether SPFs from different regions are useful*. There are significant differences among states on some variables - such as climate and driver characteristics - that are often difficult to include in an SPF,. As a result, states have expressed a preference for SPFs from similar states. On the other hand, some configurations are found only in a small number of distant states, supporting a nationwide scope.
* *The quantity of SPFs available in each region for upload*. Some regions may not yet have enough SPF activity to support a viable site.
* *The availability of institutions willing and able to host a site in each region*. A network of sites would likely be hosted by universities or DOTs with a particular interest and/or expertise in SPFs. While a number of university partners were identified in the needs assessment, they did not cover each region, and not all partners may have the resources or interest in maintaining a site.
* *The technical complexity of maintaining the network.* A functioning network would require long-term coordination among host institutions to ensure live links and consistent submission requirements.
* *The ability of state/regional/university/federal partners to take on costs of the site.* The need for pooled fund contributions could be lessened if some of the setup, implementation, and maintenance costs were allocated among participants in a network of sites. Further, some aspects of building, running, and maintaining the sites may be folded into other existing duties by current staff, contractors, or partners.

## Development of a Concept of Operations

The next step is the creation of a Concept of Operations, laying out generally how the site will function based on identified user needs and stakeholder roles and resources. The document will describe each step in the process from a user perspective, from an SPF’s submission to its download and use by another state, as well as ancillary functions such as the posting of training opportunities. Once the document has been approved by the TAG states and other identified stakeholders, particularly the selected host or hosts, work can begin on specific system requirements.

## Documentation of system requirements

Following the Systems Engineering process, the next step is determining the specific system requirements. The system requirements begin and end with the stakeholder needs. Key high-level questions include:

* What data fields are needed to easily identify a resource?
* What additional fields would be required for a clearinghouse with search capabilities and quality indicators?
* Given available resources of potential host organizations, what IT capability and staffing levels are required?

Each of these questions, and any others identified in the concept of operations, are broken down to specific technical specifications. Each detailed requirement is then traced back to the user need it serves, ensuring that the final document contains only requirements that are necessary, clear, complete, correct, and verifiable.[[5]](#footnote-5)

## Drafting of a Design Document

Once the system requirements are established, a design document is developed to address the requirements. The document contains both a high-level depiction of the site’s architecture and detailed specifications for interfaces and hardware/software components. It also includes mockups or prototypes of user interfaces, as well as a test plan for each section of the site.

## Formation of a strategy for collection, outreach, and training

A strategy for collection of reports, outreach, and training can be developed concurrently with the concept of operations, system requirements, and design document. The strategy should focus on both types of users, submitters and downloaders, though ideally many users will perform both functions. The strategy would focus first on those reports and SPFs already in use, then develop a plan for attracting new reports and SPFs on the site as quickly as possible.

Encouraging submissions and downloads depends on a consistent and ongoing outreach efforts, aimed at newcomers and experienced SPF users alike. Outreach efforts should also encourage feedback from users on ways to improve the site and its offerings. Linked to the outreach component is the need to develop training for site users as well as providing a space on the site to promote other related training opportunities. Each plan, for collection, outreach, and training, would include both startup activities and ongoing maintenance activities.

In addition to the steps listed above, a clearinghouse would require the concurrent development of a review methodology and ranking system and an estimation of ongoing staffing needs for review and ranking. The CMF clearinghouse reviews CMF submissions quarterly.

## Development, deployment, and maintenance of site(s)

Once the system requirements are complete, approved by stakeholders and a communication strategy is underway, the site can be built and launched. This requires securing an online site and staff time both for web development and outreach. The outreach staff needs to secure a critical mass of existing SPFs to ensure the site is useful from its launch. After the site is built, it is tested against system requirements to ensure all stakeholder needs are met. Once approved and stocked with an initial set of SPFs, it can be launched.

Site maintenance activities include:

*Regular updates of site content.* This effort involves identifying new SPFs, refining database fields/entries, developing and refining training, maintaining links to outside resources, and implementing the outreach plans

*Technical maintenance of the website*. This involves keeping software up-to-date, conforming with developing user interface, web, and other standards, applying security updates, maintaining an accurate list of roles/permissions, keeping hardware functioning, and keeping physical facilities (including power, cooling, etc.) operating.

Site maintenance represents an ongoing annual cost. The advantage of a network is that it can shift many of these costs onto a wider base of resource providers, though some central pool of money will be required to cover coordination among the sites.

# Cost Estimate

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| --- | --- | --- | --- | --- | --- | --- |
| Task | Clearinghouse –  Time | Clearinghouse –  Cost | Warehouse –  Time | Warehouse –  Cost | Decentralized Warehouse – Time | Decentralized Warehouse –  Cost[[6]](#footnote-6) |
| Selection of one site or a network | Three weeks FTE | $11,000-$16,000 | Three weeks FTE | $11,000-$16,000 | Three weeks FTE | $11,000-$16,000 |
| Concept of Operations | Seven weeks FTE | $25,000-$38,000 | Six weeks FTE | $21,000-$33,000 | Six weeks FTE | $21,000-$33,000 |
| System Requirements | Ten weeks FTE | $35,000-$54,000 | Six weeks FTE | $21,000-$33,000 | Eight weeks FTE | $28,000-$44,000 |
| Design Document | Ten weeks FTE | $35,000-$54,000 | Six weeks FTE | $21,000-$33,000 | Eight weeks FTE | $28,000-$44,000 |
| Strategy for Collection, Outreach, and Training | Eight weeks FTE | $28,000-$44,000 | Four weeks FTE | $14,000-$22,000 | Five weeks FTE | $18,000-$27,000 |
| Development and Deployment | Ten weeks FTE | $35,000-$54,000 | Eight weeks FTE | $28,000-$44,000 | Nine weeks FTE | $22,000-$44,000 |
| Total Through Deployment (2013 $) | **38 weeks FTE** | **$169,000-$260,000** | **27 weeks FTE** | **$116,000-$181,000** | **31 weeks FTE** | **$128,000-$208,000** |
| Annual Operations and Maintenance (2013 $) |  | 75K-100K |  | 40-70K |  | 4-21K |
| Total Including Five Operating Years (2013 $) |  | **$544,000-$760,000** |  | **$316,000-$531,000** |  | **$148,000-$313,000** |

# Summary and Next Steps

Any of the alternatives described above could provide those states adopting SPFs with an online location to store and share their outputs. Each would complement ongoing efforts by the PFS and other HSM stakeholders, including the development of guidebooks and the hosting of peer exchanges. A warehouse, or network of warehouses, would provide the resource at a lower cost but would provide less guidance to states in selecting the SPF most useful to their needs. A clearinghouse would require a longer and more expensive startup effort, and significantly more resources devoted to maintenance and operation, but would provide more support and utility for states.

The key consideration for the Pooled Fund Study in creating this type of resource is that an online presence must be maintained beyond the projected duration of the Study. Whichever alternative is adopted, the next step for the Study members is to identify the entity or collection of entities that will maintain responsibility for the site(s) after the Study ends, and to define how the Study members will transition responsibility for the site(s) to such entities.

Second, if a warehouse is selected, the Study members must determine whether they will select the structure of the product (single site vs. network) before sending out requests, or whether to include that decision in a contractor’s scope of work. State DOTs know what resources they and their partners in SPF development have available, but it may take an outside entity to envision what can be achieved nationwide.

Following these decisions, this memo will provide the basis for an RFP or SOW to identify and select a contractor to develop the resource in question.

1. Volpe Center, “HSM Pooled Fund: Summary of State DOT needs for a Resource for Implementing the HSM Part C” prepared for Highway Safety Manual Pooled Fund Study, Forthcoming from <http://www.pooledfund.org/details/study/484>. [↑](#footnote-ref-1)
2. Volpe Center, “HSM Pooled Fund: Summary of Resource Alternatives to Support Implementation of the HSM Part C” prepared for the Highway Safety Manual Pooled Fund Study, Forthcoming from <http://www.pooledfund.org/details/study/484>. [↑](#footnote-ref-2)
3. “Crash Modification Factor Clearinghouse” <http://www.cmfclearinghouse.org/> funded by FHWA and hosted by the University of North Carolina Highway Safety Research Center [↑](#footnote-ref-3)
4. For more information, see the FHWA Handbook on Systems Engineering for Intelligent Transportation Systems at: <http://ops.fhwa.dot.gov/publications/seitsguide/>. [↑](#footnote-ref-4)
5. For more on system requirements, see Section 4 of the FHWA Handbook on Systems Engineering for Intelligent Transportation Systems. <http://ops.fhwa.dot.gov/publications/seitsguide/section4.htm#s4.4>. [↑](#footnote-ref-5)
6. For the decentralized warehouse, cost figures for site development and operations reflect an assumption that host institutions carry 10-30% of development costs and 70-90% of operations costs. [↑](#footnote-ref-6)