Road Weather Management Capability Maturity Framework

Stakeholder Meeting

08/13/2014
Framework Development Team

• Project Team
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  ▪ Kevin Balke
  ▪ Jerry Ullman
  ▪ Beverly Kuhn
  ▪ Bob Brydia

• Panel
  ▪ Roemer Alfelor (FHWA)
  ▪ Paul Pisano (FHWA)
  ▪ Joe Gregory (FHWA)
  ▪ Jim Hunt (FHWA)
  ▪ Jack Stickel (Alaska)
  ▪ Ben Dow (City of Fargo)
  ▪ Denise Inda (Nevada DOT)
  ▪ Denise Markow (New Hampshire DOT)
  ▪ Phil Anderle (Colorado DOT)
  ▪ Larry Dunn (NWS)
  ▪ Ralph Patterson (Narwhal)
Acknowledgments

• Wayne Berman
• Tracy Scriba
• Ralph Volpe
• Steve Clinger
• SHRP2 L06 Teams
• SHRP2 L01 Teams
• AASHTO
Objectives of Session

1. Provide an overview of capability maturity frameworks
2. Review the road weather management framework
3. Gather feedback on validity and utility of framework
4. Spur engagement and involvement in further development and application of the framework
Supporting Material

- Handout I – Fact Sheet
- Handout II – Capability Maturity Matrix
- Handout III – Draft List of Actions
Capability Maturity Framework
Context
Audience Poll

- Awareness of capability maturity frameworks for Transportation Systems Management and Operations

- **High** – Have participated in SHRP2 efforts in my agency/region
- **Medium** – Aware of it and some understanding but have not participated in any workshops on this topic
- **Low** - New concept
Capability Maturity Frameworks

Process Matters
Projects fail or do not achieve desired functionality for a variety of reasons unrelated to the technology.

Prioritizing the right actions
Is your agency ready? How would you know? What should you do next?

Focus on the weakest link
What is holding the agency back in becoming a leader in this area?

Capability Maturity Frameworks for Transportation Operations

Process
- Adapted from software development world
- A consensus-driven consistent structured evaluation or assessment of a process.
- Guides an agency towards a higher level of implementation, standardization, and return on investment.

Outcomes
- Clear identification of weak links in the process
- Prioritization of areas of improvement
- List of process-oriented actions that an agency can implement
SHRP2 and AASHTO SOM Guidance

- **SHRP2 L06**
  - Undertook a comprehensive and systematic examination of the way agencies should be organized to successfully execute operations programs that improve travel time reliability
  - Developed a version of Capability Maturity Model for highway operations and in turn travel time reliability

- **AASHTO**
  - Support the conversion of the SHRP 2 Reliability Project L06 research into a web-based tool that would be user friendly, easy to access, and updatable. (NCHRP Project 03-94, Transportation Systems Operations and Management Guide)
AASHTO SOM Guidance

• AASHTO SOM Guidance. www.aashtosomguidance.org

• CMM is being used widely as part of SHRP2 implementation efforts

• Focuses on capability for all operations
Program Area Frameworks

• FHWA continues the development of these capability frameworks to support improvements at program-level
  • Traffic Incident Management
  • Planned Special Events
  • Work Zone Management
  • Road Weather Management
  • Traffic Signal Management
  • Traffic Management
Road Weather Management CMF

• Assesses the institutional capacity of an agency or a region to respond to adverse weather conditions from both a maintenance and operations perspective.

• Involves stakeholders from maintenance, operations, meteorology, and emergency management

• Will result in a set of prioritized actions for improvement that address institutional barriers for effective road weather management.
Handout #1

- Factsheet on CMF development efforts
Capability Maturity Framework Structure
## Capability Maturity Framework

<table>
<thead>
<tr>
<th>Dimensions or Process Area</th>
<th>Level 1 Ad-Hoc. Low Level of Capability</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4 Optimized. High level of capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Process</td>
<td>Plans, Programs, Budgets</td>
<td>Statement of capability</td>
<td>...</td>
<td>Step 1. Self-Assessment Work with your stakeholders to assess where you are in terms of the capabilities in each area</td>
</tr>
<tr>
<td>Systems &amp; Tech</td>
<td>Approach to building systems</td>
<td>...</td>
<td>...</td>
<td>Step 2. Identify areas of improvement and the desired levels of capability to improve program effectiveness</td>
</tr>
<tr>
<td>Perf. Measurement</td>
<td>Use of performance measures</td>
<td>...</td>
<td>...</td>
<td>Identify actions that you need to take to move to the desired levels of capability</td>
</tr>
<tr>
<td>Workforce</td>
<td>Improving capability of workforce</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Culture</td>
<td>Changing culture and building champions</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Collaboration</td>
<td>Improving working relationships</td>
<td>...</td>
<td>...</td>
<td>...</td>
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</table>

**Process Improvement Areas**

1. **Step 1. Self-Assessment**
   - Work with your stakeholders to assess where you are in terms of the capabilities in each area.

2. **Step 2. Identify**
   - Identify areas of improvement and the desired levels of capability to improve program effectiveness.
Six Dimensions of Capability

1. Business processes
2. Systems and technology
3. Performance measurement
4. Culture
5. Organization and workforce
6. Collaboration
Actions

• Framework defines levels
• Actions define steps that an agency can take to advance levels
  ▪ Level 1 to Level 2
  ▪ Level 2 to Level 3
  ▪ Level 3 to Level 4
• Advancing a level implies potentially taking actions across all dimensions
• Provides an idea or nugget for a region to consider
• Agencies can customize and prioritize actions as part of their planning efforts
## Moving From Level 1 to Level 2

<table>
<thead>
<tr>
<th>Level 1 Capability Features</th>
<th>Level 2 Capability Features</th>
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<tr>
<td>• Agency specific</td>
<td>• Nominal systematic approaches starting to emerge</td>
</tr>
<tr>
<td>• Ad hoc</td>
<td>• Addressing immediate concerns but geographic influence broadening</td>
</tr>
<tr>
<td>• Address immediate concerns</td>
<td>• Applications of advancements / technologies in spot locations</td>
</tr>
<tr>
<td>• Driven by problems (firefighting)</td>
<td>• Approaches are operator driven; static and time-of-day</td>
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# Moving From Level 2 to Level 3

## Level 2 Capability Features
- Nominal systematic approaches starting to emerge
- Addressing immediate concerns but geographic influence broadening
- Applications of advancements / technologies in spot locations
- Approaches are operator driven; static and time-of-day

## Level 3 Capability Features
- Advanced application of technology.
- Limited level of automation.
- More of a system-wide approach.
- Replicate and integrate systems within operations.
- Collaboration is high via engagement of regional stakeholders
## Moving From Level 3 to Level 4

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<td>• Advanced application of technology.</td>
<td>• Regional approaches.</td>
</tr>
<tr>
<td>• Limited level of automation.</td>
<td>• Levels of automation based on historical, current, and predicted data.</td>
</tr>
<tr>
<td>• More of a system-wide approach.</td>
<td>• Full extent of regional collaboration.</td>
</tr>
<tr>
<td>• Replicate and integrate systems within operations.</td>
<td>• Multi-modal decision making across the entire region.</td>
</tr>
<tr>
<td>• Collaboration is high via engagement of regional stakeholders</td>
<td></td>
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Capability Maturity Framework
Products and Outcomes
Products

- Agency or regional findings related to capability
- Capability assessment by dimension
- Suggested actions for improvement

Consensus-based assessment

<table>
<thead>
<tr>
<th>Dimensions or Process Area</th>
<th>What is it</th>
<th>Level 1: Ad Hoc, Low Level of Capability</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4: Optimized, High Level of Capability</th>
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Current capability

Prioritized actions for improvement

Consensus-based assessment

Current capability

Prioritized actions for improvement
Outcomes

• Jumpstart improvement process
  ▪ Focus on immediate weaknesses
  ▪ Prioritize key organizational changes that can have major impact

• Provide justification for actions
  ▪ Actions are based on sound rationale and a consistent assessment of capability

• Improve consistency and collaboration between jurisdictions
  ▪ Leverage mutual capability
Agency or Region or Corridor?

• Capabilities exist in agencies
• Together, they provide the capabilities for the region or corridor
  ▪ Differences in capabilities are normal but can be a challenge when looking regionally or along a corridor
  ▪ Differences in agencies can constrain regional responses
• Actions can be
  ▪ Agency-level
  ▪ Multi-Agency
  ▪ Regional
Audience Poll

• For those in the audience that have gone through the SHRP2 CMM activities and are now in the implementation phase, how would you describe your experience to the group:
  - Value
  - Challenges
  - Benefits
Road Weather Management
Capability Maturity Framework

Overview and Using the framework
Recommended Uses

• Implementing new weather-responsive traffic management practices

• Updating maintenance practices or implementing new approaches to winter maintenance such as deploying an Maintenance Decision Support System

• Updating or creating new program plans for road weather management

• Undergoing organizational realignments for TSMO
Using the Framework

Step 1 - Preparation for the Program Area Capability Maturity Framework
- Assemble the right group
- Decide on the geographic/jurisdictional scope
- Define the operational objectives

Step 2 - Capability Maturity Framework Review Process
- Answer 20-question self-assessment as a group
- Review the capability level determined by the answers
- Identify the improvement areas
- Review suggested actions
- Modify and select actions for further consideration

Step 3 - Implementing the Results
- Prioritize selected actions
- Develop a timeline for implementing actions
- Identify champions for each action

Step 4 - Progress Review
- Review status of actions
- Adjust based on new information
- Revisit Step 1
Conduct Self-Assessment

• Consists of 20-25 multiple-choice questions across all dimensions
• Each question has 4 choices/statements
• Agencies pick the statement that best describes their current situation
• Questions and choices are still being refined
Current List of Questions

• BP.1. How are the agency road weather management activities funded and used?
• BP.2. How tightly integrated are processes within the area when the scale and the complexity of the response increases?
• BP.3. What is the current level capability to influence and control traffic and travel behavior on facilities in the area?
• BP.4. What support is available to implement the right response to a particular condition or event?
• ST.1. What is the ability to assess and procure new technology for road weather management?
• ST.2. What is the capability to provide consistency of design and operations to insure scalability and Interoperability of road weather systems?
• ST.3. What is the capability to ensure health and reliability of road weather systems?
• ST.4. What is the level of availability of road weather information through the existing systems and technology?
Current List of Questions

• PM.1. Does the agency have a process to assess operational (traffic) impacts during weather events?

• PM.2. Is the agency able to report and compare the RWM performance across regions, events and seasons?

• PM.3. How does the agency report road weather performance to the public?

• C.1. What is the perception of road weather management in the agency?

• C.2. How willing is the agency and its partner agencies to make decisions based on proactive measures?

• C.3. What level of strategic planning occurs for weather events?
Current List of Questions

• OW.1. What are the capabilities with respect to staffing are available to support road weather management?
• OW.2. How are staffing resources allocated for road weather?
• OW.3. How does the agency deal with professional capacity building for road weather?
• CO.1. How do the Maintenance, TMC Operations and other TSM&O teams coordinate?
• CO.2. What level of collaboration exists with the weather community/ meteorologists?
• CO.3. What level of collaboration exists with the media and the public?
Example Question #1 and Audience Poll

BP.2. How tightly integrated are processes within the area when the scale and the complexity of the response increases?

- Limited ability to scale the response with available assets. Agencies/garages/districts operate within their confines with significant challenges in scaling up for events.

- Able to leverage other maintenance garages or other operating agencies within agency to scale up responses as necessary. Can pull together for the major events. However, still face challenges due to significant variability between how different parts of the agency work.

- Significant ability to collaboratively use capabilities and resources throughout the region due to agreed upon procedures and processes. Agency-level process coordination is high but some hurdles to varying processes and capabilities between external partners.

- Strong process integration and flexibility in contracting and external collaboration with other partners including construction allow for rapid deployment and response.

Pick the statement that best resembles your current capability. Err towards grading yourself on the lower-end. Document the discussion that arises from this question.
Example Question #2 and Audience Poll

ST.3. What is the capability to ensure health and reliability of road weather systems?

- Do not have the technologies and systems in place to provide structured response conditions that affect systems; Frequent outages occur and have no good way of knowing when and where.

- Health of systems can be remotely monitored but limited in functionality and use. Might be able to alert complete failures but not able to detect more subtle errors in data quality. Maintenance of systems is still sporadic and down-time is significant.

- Health of systems is remotely monitored with alerts to operators. Limited quality checking of data allows for identification of sensor issues. Ability to deploy maintenance personnel quickly to restore system health.

- In addition to Level 3, can reestablish continuity of service remotely; automated dispatching and prioritization of maintenance actions

Pick the statement that best resembles your current capability. Err towards grading yourself on the lower-end. Document the discussion that arises from this question.
Example Question #3 and Audience Poll

CO.2. What level of collaboration exists with the weather community/meteorologists?

- Limited to no coordination. Rely only on publically available information via media and monitor NWS information.

- Starting to work with NWS field offices and other weather stakeholders. Identifying information requirements for in-house or private weather sources. Reach out to weather community only in rare circumstances.

- Routine coordination with NWS. Have access to meteorological expertise to assist decision making for most events. Starting to include them in planning as well as operational decisions.

- Have in-house or procured capabilities to access, process and analyze weather and road weather forecasts. Meteorological expertise acts as liaison between weather community and road weather management. Weather enterprise is fully involved in planning, response and after action reviews.

Pick the statement that best resembles your current capability. Err towards grading yourself on the lower-end. Document the discussion that arises from this question.
Result of Self-Assessment - Current Capability Matrix

• Snapshot of capability levels is generated based on responses to assessment questions
• Discussion items are captured
• Currently all questions are equally weighted within and across dimensions
• Likely that agencies will fall between levels
# Capability Matrix

## General Definition (consistent with AASHTO CMM)

### Business Process
- **Level 1 (Lowest)**: Constrained by annual funding limitations and inability to make long-term capital or operational improvements. Have difficulty in scaling up responses to conditions due to significant differences and inconsistencies between processes based on jurisdiction.
- **Level 2**: Some dedicated funding available for multi-year programs and improvements. Starting to see allocation of funds to invest in road weather technology, systems and tools.
- **Level 3**: Funding for road weather management is part of regional planning process. Dedicated funds with flexibility are available as part of a multi-year program.
- **Level 4 (Highest)**: Funding is tied to a multi-year strategic roadmap for road weather.

### Systems and Tech
- **Level 1 (Lowest)**: Limited in their successful use of technology for road weather with a few examples primarily on the maintenance side. Existing road weather systems are considered to be unreliable. Low level of integration to the broader agency or external systems (like NWS). Lack of awareness of available systems and tools internal and external to the agency.
- **Level 2**: Starting to focus on advanced technology for road weather management. Pilot tests, limited deployments are likely underway. Have identified critical areas/facilities of interest. Patchy network of RWIS available but information from these locations are not fully utilized.
- **Level 3**: Systems and technologies integrated fully into the regional ITS infrastructure. Built systems followed a robust systems engineering process driven by clear user needs.
- **Level 4 (Highest)**: In addition to items in level 3. Agency invests in test beds and other research to continuously develop new technology capabilities. Systems engineering process is used for all projects with high internal capability to review deliverables like requirements and design documents.

## Dimension
- **Activities and relationships largely ad hoc, informal and champion-driven, substantially outside the mainstream of other DOT activities**
- **Basic strategy applications understood; key processes support requirements identified and key technology and core capacities under development, but limited internal accountability and uneven alignment with external partners**
- **Standardized strategy applications implemented in priority contexts and managed for performance; Technical and business processes developed, documented, and integrated into DOT; partnerships aligned**
- **Full, sustainable core DOT program priority, established on the basis of continuous improvement with top level management status and formal partnerships**

## Level 2
- Agencies at this level for road weather management are likely to be/have:

## Level 3
- Agencies at this level for road weather management are likely to be/have:

## Level 4
- Agencies at this level for road weather management are likely to be/have:
Handout #2 - Matrix

• Apologize for the small font size
• Please take a couple of minutes to review the description of the levels
• Note that not all agencies will be described exactly

• Feedback/Thoughts
  ▪ Descriptions reflective of state of the practice?
  ▪ Too easy to reach level 4?
Identify Actions

• Primary value of the framework are in the action statements
• Represent the thinking of various peers, studies and guidelines
• Concrete steps that an agency can take
• Actions are not prescriptive. They are suggestions and can be modified, improved, changed, or CREATED
Handout #3- Review of Actions

• 11x17 Handout lists all the actions that are available in the framework

• Focus should be on the lowest rated dimension since that is your primary constraint

• Skipping levels is not advised in general
Prioritize Actions

- Can be overwhelming to be presented with all the actions
- Not all actions need to be implemented right now
- Start with the weakest dimensions first
- Critical few in each dimension
- Identify a champion
- Think in 6-month increments and early successes
- Develop a plan to implement and revisit these actions
Road Weather Management Capability Maturity Framework

On-line tool
Online Tool

• Framework will be available as a web-based tool on the FHWA Office of Operations website

• The tool will enable users to
  ▪ Conduct the self-assessment
  ▪ Record the discussion and consensus building around each question
  ▪ Identify and prioritize actions

• Look and feel still being finalized and will change in the next six months
Introduction Page

Agency Identification – Included in the reports. Useful if you have multiple regions/agencies undertake the assessment independently.
Screenshots of the tool

Self-Assessment

How is traffic management planning performed in your agency?

- Project oriented to solve immediate problems on individual facilities or at particular T&O? location of interest.
- Traffic management planning approached from a corridor perspective.
- Traffic management planning and programming are coordinated at a mostly metropolitan level and led to regionally agreed-upon operational objectives. Limited statewide or local coordination.
- Traffic management planning processes have links at all planning levels (state, metropolitan, and local) via performance-based operational objectives.
- NA

Enter discussion points here

Self-Assessment question and choices

Question relates to highlighted dimension
Screenshots of the tool

Identification of Actions

Dimension and desired progression

List of all actions at the level

Recommended Actions. Drag selected actions into Green box
Feedback from Audience
High-Level Questions

• Will such a tool/framework be useful to the transportation agencies?
• How should an agency use this?
• What is missing?
• Other questions/comments
Specific questions

• Does the current list of actions improve agency capabilities for RWM?
• How can we keep this list current?
• Would you be willing to provide feedback/additional actions based on your agency perspective?
Get involved
Get involved

• Test drive the framework in your location
• Provide feedback and improvements
• Let others know within your agency
• Request workshop in your region
  ▪ Contact Roemer Alfelor or Paul Pisano
Thank you!

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