NCHRP 20-68A

US Domestic Scan Program

Domestic Scan 20-01

"Successful Approaches to Utilizing Bridge Management Systems for Strategic Decision Making in Asset Management Plans"

Findings, Conclusions and Recommendations

ARORA and ASSOCIATES, P.C.
Consulting Engineers

35th ANNIVERSARY 1981 - 2016

Domestic Scan 20-01

"Successful Approaches to Utilizing Bridge Management Systems for Strategic Decision Making in Asset Management Plans"

- This scan is being conducted as a part of NCHRP Project 20-68D, the U.S. Domestic Scan program

- The program was requested by the American Association of State Highway and Transportation Officials (AASHTO) Committee on Construction (SOC), with funding provided through the National Cooperative Highway Research Program (NCHRP)

NCHRP 20-68A
U. S. Domestic Scan Program

- The Program is a multi year project conducting 3-4 scans per year.
- Each scan is selected by AASHTO and the NCHRP 20-68D Project Panel
- Each scan addresses a single technical topic of broad interest to many state departments of transportation and other agencies
- The purpose of each scan and of Project 20-68D as a whole is to accelerate beneficial innovation by:
  - facilitating information sharing and technology exchange among the states and other transportation agencies
  - identifying actionable items of common interest

NCHRP Panel's General Guidance to the Scan Team

"This scan will help identify common features and approaches being used by agencies to successfully use BMS within the overall transportation asset management context. Particular attention will be given to examination of leading practices for predicting future bridge condition and developing deterioration curves. The Scan Team will investigate agency practices and case studies that illuminate such concerns as (1) data collection and management, (2) performance measure tracking and reporting, (3) use of component- and element-level data to track and forecast bridge condition, (4) usage of BMS data to convey condition information, and (5) agencies' knowledge transfer strategies to sustain staff qualified to operate their BMS."

NCHRP Panel's General Guidance to the Scan Team (Cont.)

" By documenting and sharing successful practices the scan team will produce a valuable resource for use by agencies in effectively integrating BMS data into their TAMP to successfully improve or preserve the condition of the assets and the performance of their system. The audiences for this information would include AASHTO Committee on Performance-Based Management, Committee on Bridges and Structures, asset management and bridge preservation staff within state, local or other transportation agencies."

Scan Team

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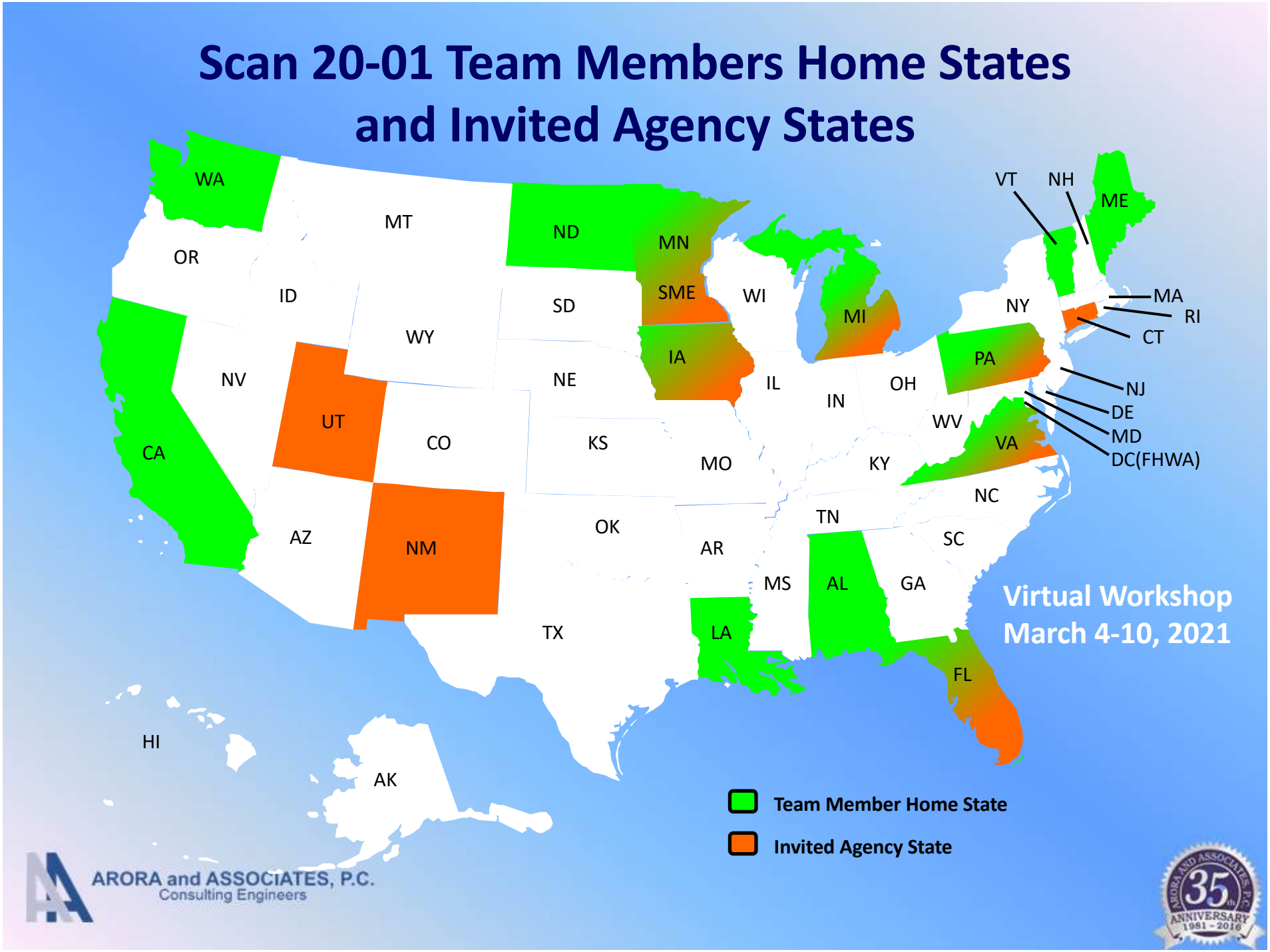
Scan 20-01 Team Members Home States and Invited Agency States



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Summary of Initial Findings

- BMS tools used by agencies vary based on organizational structure, funding structure, bridge network and user preference.
- Type of BMS used also varies:
  - Consumer off the shelf technology (COTS)
  - inhouse developed software or spreadsheets, or
  - procedures followed by staff to perform analysis and make decisions.

Summary of Initial Findings

- For some agencies, overall bridge management decision making is driven by BMS while for others BMS partially supports the decision-making framework or Transportation Asset Management Plan analysis.

Summary of Initial Findings

- All scan agencies were strong in inspection data collection and management.
- Using information based on element condition data in asset management decision making is limited, however, some agencies have made progress in this area and developed agency-custom performance measures.

Summary of Initial Findings

- Scan agencies collectively reported challenges in hiring and sustaining qualified staff and noted that they feel understaffed to keep up with increasing needs.
- Agencies are finding innovative ways to report and track performance and have made significant progress with the TAMP development in their use and implementation of BMS.

Summary of Initial Findings

- Agencies have challenges and needs for BMS implementation:
  - Improved models (deterioration, costs, risks),
  - Qualified and increased staffing, and
  - Improved measures/metrics to define bridge performance and contrast bridge performance with other assets to name a few.

Findings by Focus Area

- data collection and management,
- performance measure tracking and reporting,
- use of component- and element-level data to track and forecast bridge condition,
- usage of BMS data to convey condition information, and
- agencies' knowledge transfer strategies to sustain staff qualified to operate their BMS

Data Collection and Management

- Custom inspection tools and databases.
- Established QC& QA processes but room for improvement.
- Development and use of data, models and tools led to identification of needs, such as collection of bridge preservation work data and additional data attributes.
- Great uses of GIS such as partially viewing risks.
- Identifying and collecting data attributes for risk is an area for improvement.
- Agencies identified data items to collect based on the TAMP development.

Performance Measure Tracking and Reporting

- Custom performance measures, which are mostly condition driven.
- Dashboards-visibility of information increases chances of increased/sustained funding.
- Long-term reporting of performance measures and analysis results inform long-term financial investment needs.
- There is a national need to better identify, quantify and combine risks into performance measures and integrate risk into overall asset management process.
- There is a need to better understand and model how much to invest in pavements versus bridges.
- Managing to a bridge health index may inform preservation decisions better, custom but few uses of Bridge Health Index.

Use of Component- and Element-Level Data to Track and Forecast Bridge Condition

- Component-level data (G/F/P) is mostly used, element-level data use is limited.
- Good/Fair/Poor does not cover all bridge conditions, use of SEVERE.
- Use of decimal GCRs for analysis and accounting for time within a GCR.
- Need: deterioration curves that factor variability in condition, age, environment or other significant variables.
- Element condition data to track condition and program maintenance needs.
- National need: Correlating element condition to GCRs with improved accuracy.

Use of BMS Data to Convey Condition Information

- Using GIS for supporting cross-asset project decisions or improved corridor management.
- Great charts/visuals that communicate both condition and change in condition trends (e.g., Michigan DOT Cycle of Life).
- Some agencies had great success in communicating with decision makers using BMS scenario analyses. They were able to make a case for increased funding and inform decision makers of future needs.

Agencies' Knowledge Transfer Strategies

- Hiring and sustaining qualified staff to operate BMSs is a shared challenge for all agencies.
- Commitment from upper management is needed to support strategies such as double filling (the person who is ready to retire trains the incoming person for a while), which will improve knowledge transfer.
- Agencies need time and opportunities for training and exploring BMSs, which are complex tools and require a learning curve.
- Documentation is key for knowledge transfer. Bridge management manuals and decision trees were great examples of documentation. However, documentation is not a top priority when agencies are understaffed.

Insights from Asset Management Practitioners

- Asset management contacts from Connecticut, Iowa, Minnesota, New Mexico and Utah responded.
- Information for setting performance management targets (PM2), TAMP life cycle planning requirements and TAMP investment scenarios are typically provided from the bridge management staff.
- BMS are used in various ways to gather or analyze agency data to provide these inputs, particularly to investigate the impact of alternative funding scenarios on the bridge network over time.
- TAMP risk management is typically not directly linked to BMS and falls under the agency asset management umbrella with exceptions.

Insights from Asset Management Practitioners

- BMS are not utilized to address the CFR 667 requirements directly.
- Establishment of funding levels for bridges and pavement: the TAMP, BMS analysis, a combination of both or other analysis?

The process varied and while BMS analysis informed the funding levels for some agencies, analysis outputs were utilized rather to inform future investment direction.

Insights from Asset Management Practitioners

- TAMP has influenced their bridge programs for the better.
  - Realization for needs, such as increased staffing and data-driven decision making, improving data quality, a shift to proactive AM approach instead of worst-first

Insights from Asset Management Practitioners

- Communications and any beneficial connections between the TAMP and BMS efforts?
  - Committees, groups with representation for improved communication and implementation.
  - Room for improvement.
- Does BMS inform treatment level investments?
  - BMS influences these decisions for a few agencies but typically the connection is missing.

Insights from Asset Management Practitioners

- How does the AM team work with the BMS owners and the bridge asset owners to develop a performance-based planning and programming (life cycle planning) approach?
  - This appears to be an area that most agencies are trying to improve upon.

Recommendations

- State and national bridge, pavement and asset management groups should coordinate and form task forces with shared membership or meet regularly to produce a roadmap to improve the use of BMS in asset management decision making and better coordination of BMS use within asset management.
- Agencies need to have a strategic vision and process to guide BMS and incorporate BMS information into overall asset management. Agencies that coordinate at a strategic level have better success.
- Executives should support hiring qualified staff, strategies to maintain agency knowledge, and research to support BMS implementation.
- Agencies should start exploring element condition data to identify, track and model bridge work.
- Data on cost and impact of bridge work needs to be systematically documented.

Recommendations

- Agencies should consider long-term analysis and scenario planning to inform long-term financial planning and improved communication with elected officials.
- Future data needs should be discussed and planned based on the recent TAMP development experience. Agencies should identify additional data needs that can be used to improve BMS modeling framework or consider refinement if data items are no longer helping with bridge management decision making.
- National and state research is needed on a variety of topics to improve BMS modeling. Main research topics are deterioration modeling, cost modeling, life cycle cost modeling, element to GCR conversion, developing element-based performance measures/health indices, risk modeling, developing alternative performance measures to better facilitate cross-asset resource allocation.
- Quality data is needed for good decision-making. Agencies should consider adapting good practices of QC and QA or add to existing practice.

Recommendations

- Asset and bridge management professionals need closer coordination and stronger collaboration to communicate a unified risk and performance-based message to secure funding to ensure future sustainability.
- There is a future opportunity for asset and bridge teams to perform internal cross-training to promote understanding, reduce silos, and enhance communications and knowledge transfer.

You can find the scan report below:

SCAN20-01.pdf (trb.org)

Further information on this scan and the NCHRP 20-68D U.S. Domestic Scan program is available at:

http://144.171.11.40/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=1570

Or

http://www.domesticscan.org/

Questions?