Midwest TSMO Peer Exchange

Milwaukee, Wisconsin: Sheraton Milwaukee Brookfield
September 13-14th, 2016

KEY TAKEAWAYS

State DOTs are no longer limited to traditional 'brick and mortar' roles as they become increasingly responsible for enhancing mobility through operations and performance. State DOTs are trying to identify their traffic operations roles in the face of ever-increasing availability of disruptive technologies and data and the rising expectations of the user. But, what, when, where, and how should state DOTs utilize their resources to improve traffic operations? Through this peer exchange, Midwest state DOTs identified challenges and opportunities.

ROLE OF STATE DOTs

WHY DOTs NEED TO LEARN ABOUT NEW TECHNOLOGIES

State DOTs have an obligation to the public to be knowledgeable enough to make informed decisions on which technologies to deploy, policies to develop, and ultimately what efforts to pursue.

HOW THE ROLES OF DOTs WITH THE PRIVATE SECTOR HAVE CHANGED DUE TO INCREASED FOCUS ON TSMO

- Efforts have been made by both sectors on activities such as 511 and real-time traffic map such as Waze.

- Auto manufacturers need, depend, and/or expect on state DOTs for connected vehicle infrastructure readiness, such as lane markings for Lane Departure Warning.

- Agencies must address this question in multiple timeframes:
    - In the short-term, which data can be shared or leveraged for a more comprehensive understanding of system performance?
    - In the long-term, in which areas does it make sense for the DOT to devote significant resources for internal development? In the face of increasing private sector innovation within TSMO, does the DOT of the future serve primarily as an entity for communicating the current state of operations to the end user?

HOW STATE DOTs CAN COLLABORATE WITH OTHER DEPARTMENTS

Generally, there is a lack of fluidity between departments – communications, information exchange, systems, shared workforce capabilities, etc. State DOTs should identify and capitalize on synergies among and between information and equipment from other state departments.

- For example, agencies can equip state-owned vehicles to be probe and/or data-collection vehicles

- The "Video Analytics Towards Vision Zero" project is a partnership between Microsoft, the University of Washington, and the City of Bellevue, with support from associations such as ITE and ITS America, that would utilize CCTV infrastructure currently monitoring intersection conditions to identify near-miss crashes between vehicles and pedestrians for safety planning and programming purposes.

BUY-IN & FUNDING

FUNDING CHALLENGES THAT STATE DOTS FACE

State DOTs often find themselves having to justify funding for TSMO-related projects that do not have a clear use and results in the immediate term, while being subjected to fixed funding cycles.

- Many states struggle to find their footing in the broader question of funding, even while their agencies have made a commitment to increased expenditure on improving the state of transportation infrastructure.

- The challenge specific to TSMO is that many projects, compared to bridge or pavement renewal, lack the immediately visible end product that the travelling public sees.

- In these cases, several agencies described their efforts to more closely work with and coordinate across their capital improvement programs for identifying opportunities to include TSMO work on other projects. For example, using an existing Interstate bridge project as an opportunity to install an adaptive traffic signal system on the corridor, which will accommodate changing traffic flows during construction.

- Typically, in the overall scope of these projects, the relative cost for TSMO upgrades is small; by demonstrating a measured benefit, practitioners can make an easy case for the investment.

THE NEED TO ENGAGE AND EDUCATE LEADERS ON TSMO

There is a need for increased buy-in by leaders on the need for TSMO. TSMO is a somewhat new practice that has not yet been fully embraced among the state DOTs. While the approach is disruptive (resulting in a lack of desire to adapt the TSMO models) the results can be quite beneficial for overall transportation operations within the states that have adopted.

- The Wisconsin DOT, for example, prepares 1-2 page "fact sheets" for all major road projects, including those TSMO-focused, for public consumption. These fact sheets lay out the basic elements of the program, the benefits, and the strategies that Wisconsin DOT is using to minimize adverse impacts to the travelling public.

- Minnesota DOT established a high-level leadership team to promote the benefits and impacts of TSMO strategies to government officials and the public.

LEVERAGING WITH PERFORMANCE MEASUREMENT

Leaders and executives with decision-making power are more inclined to provide support when given quantitatively defined performance measures with positive results.

- Michigan DOT utilizes the RITIS toolset developed by the Center for Advanced Transportation Technology (CATT) at the University of Maryland. By providing data to the CATT Lab and receiving a broad spectrum of performance measurement tools and dashboard capabilities in return, MDOT is able to present a highly effective business case, including annual and monthly reports, to support continued TSMO investment.

- Wisconsin DOT is actively developing high-resolution data capabilities for their signal controller infrastructure to make the case for continued investment in new technology. The use of this data ultimately drives the evaluation and decision-making on the effectiveness of new investments, such as adaptive traffic signal systems.

- GLRTOC does the reliability metrics per the MAP-21 (both NPRM, and the freight reliability per the final rule) for all of these Midwest states.
  - http://www.glrtoc.org/operations/performance/map21/map/
  - http://www.glrtoc.org/operations/performance/map21/freight/

DATA/TECHNOLOGY INTEGRATION & CAPACITY

THE NEED FOR A DEDICATED WORKFORCE FOR TSMO

As the amount of available data and tools expand so does the amount of time, skill, and effort that are required from state DOT workforce.

- In pursuit of this resource development, it is critical that employees from all program areas, not just those dedicated to TSMO, begin to think about how their areas affect, or are affected by, operations.

- Michigan DOT held a statewide strategic planning workshop in September 2016 around the prioritization of employee resources. TSMO Business Plan strategic actions were matched against six different strategic dimensions to enable agency decision-makers to visualize the cross-cutting nature of TSMO, and the necessary skills development to support it.

INTEGRATION AND COMPATIBILITY OF TECHNOLOGIES

Concerns of state DOTs go beyond the initial and maintenance expense of various roadside unit (RSU) technologies. More often than not, efforts in trying to integrate new technology into existing infrastructure is a costly and challenging process.

- In many cases, existing resources and technology can be leveraged across multiple divisions. Michigan's DUAP (Data Use Analysis and Processing) program strives to create a "system of systems" with respect to agency-collected connected vehicle data, housing it in a central repository accessible by all divisions. An example application is pavement roughness data collected by sensors on-board DOT-owned vehicles.

- Transportation Systems Performance Measurement and Data will be a critical issue for agencies to consider. As Round 2 of the Strategic Highway Research Program (SHRP2) winds down, the simple fact is that there is no ongoing central program responsible for guiding TSMO programming and development. Coupled with the increasing performance management demands of legislation such as MAP-21 and the FAST Act, the onus will be on individual agencies to spearhead new initiatives in performance management and data collection. Organizations such as NOCoE, along with technical resources such as RITIS from the University of Maryland can help in this endeavor, but agencies must quickly chart their own courses in the most fundamental area needed to support TSMO: data collection and management.

OPPORTUNITIES AND LIMITATIONS OF DATA PROCESSING AUTOMATION

To what extent can data analysis be automated? If automated, how much of it needs to be manually validated?

- The question of automated vs. manual data processing speaks to the longer-term role of DOTs in the data management realm. If fully automated solutions can be established, should DOTs continue to play a significant role in data management? Or should they serve primarily as a portal for collecting the data and presenting the analysis, while handing off the actual analytics via private sector contracts?

- The high-resolution signal controller data may be one programmatic area to look to in understanding challenges with automation of data analysis. The performance measure tools developed by Purdue University, INDOT, and UDOT are relatively mature examples of automated data processing. These tools are being used and refined by agencies such as Michigan DOT and Minnesota DOT.

CHALLENGES & OPPORTUNITIES ACROSS MULTIPLE STATES

VARYING TECHNOLOGICAL PENETRATION ACROSS STATES

There is significant disparity between State DOTs on levels and types of technological penetration. (See Appendix 1)

VARYING PERFORMANCE MANAGEMENT DATA INPUTS AND PLATFORMS ACROSS STATES

Each state DOT has its own combination of data inputs and platforms, which makes it very challenging to achieve multistate integration. As the vast majority of these technologies is not 'plug and play', varying data inputs and platforms make it challenging to apply lessons learnt.

THE NEED FOR MULTISTATE PROJECTS

Pooled funding opportunities are rare. In fact, the current USDOT setup makes state DOTs compete against each other for funds. This creates a challenging environment to foster partnerships and collaborations which would improve system integration and harmony.

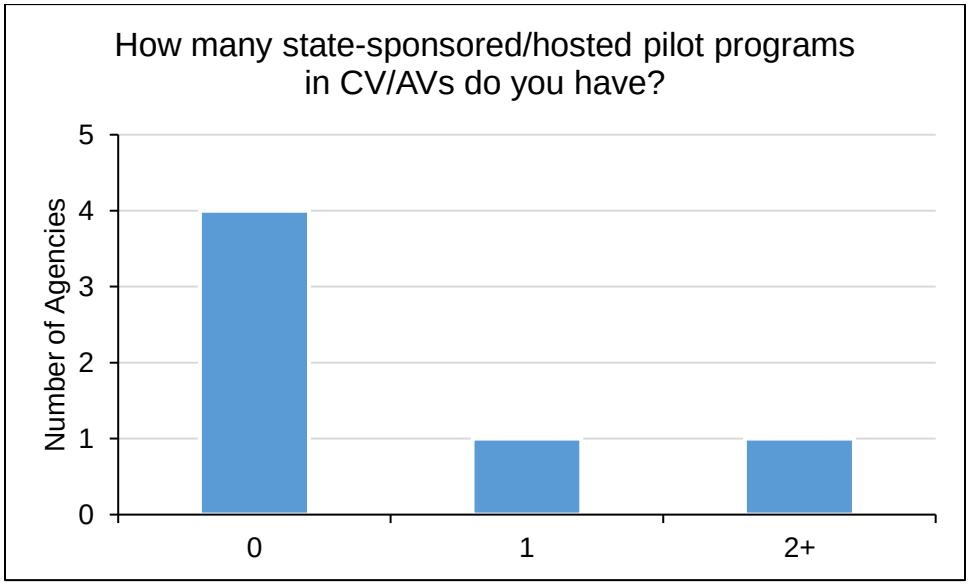
- Regional partnerships, such as GLRTOC – the Great Lakes Regional Transportation Operations Coalition – demonstrate the immense success that can be borne out by agency cooperation. The data tools and analytics available to these groups also demonstrate the need for their existence in the first place: it can easily be shown that the impacts of (poor) TSMO do not stop at state borders, and regional communication must be prioritized for the effective deployment of agency resources and minimization of customer complaints.

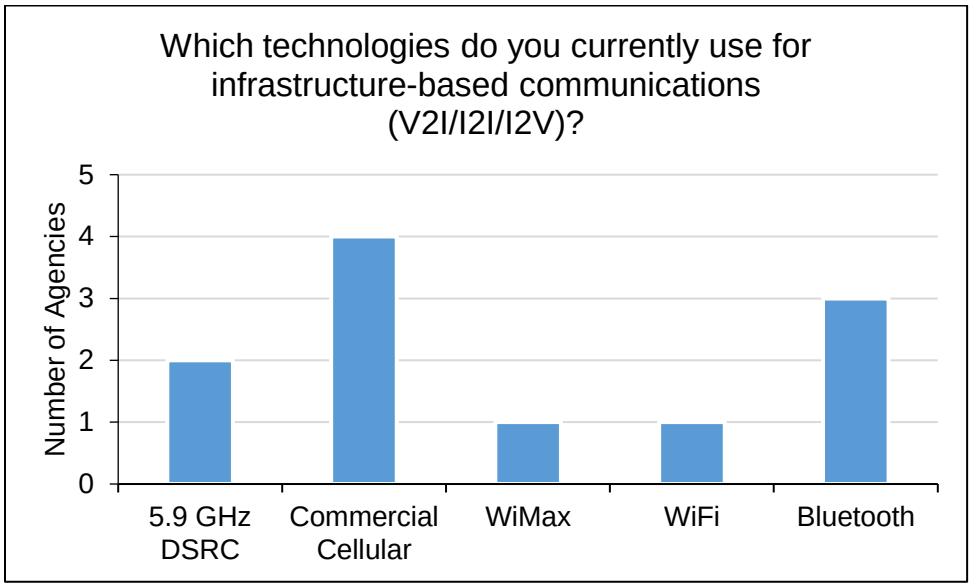
Appendix 1 – Summary of State DOT Participant Questions

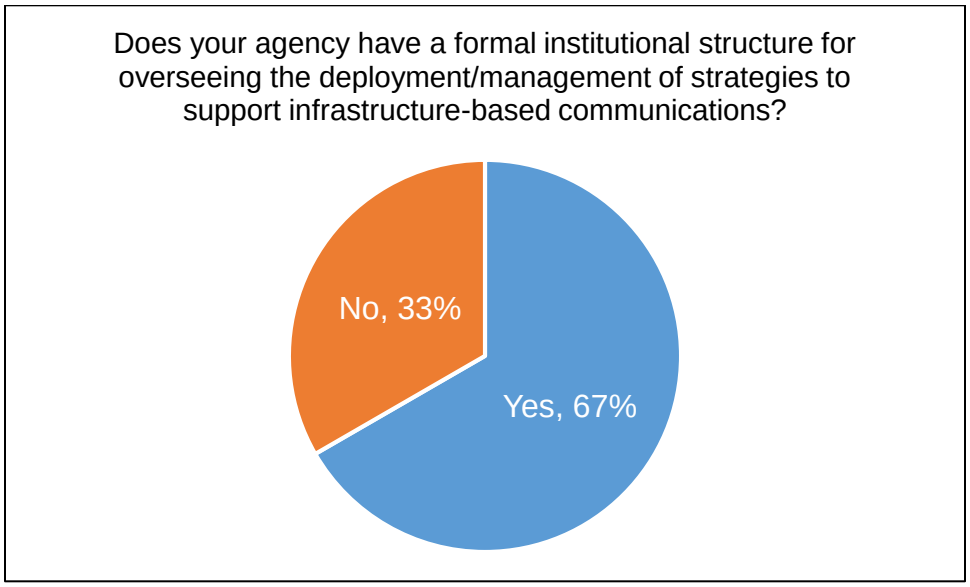
The following questions were presented to the six agencies participating in the peer exchange, prior to the date of the event. The intent was to provide ideas for group discussion and to quickly present the group with an overall snapshot of where each agency is in their level of TSMO development.

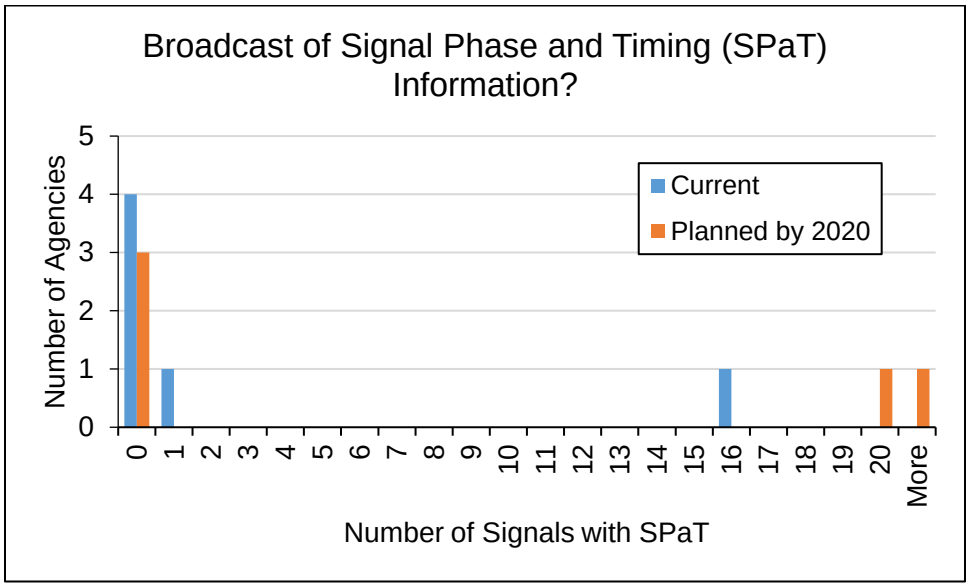
Responses are shown without individual agency identification. For several questions, agencies may have been able to select more than one answer.

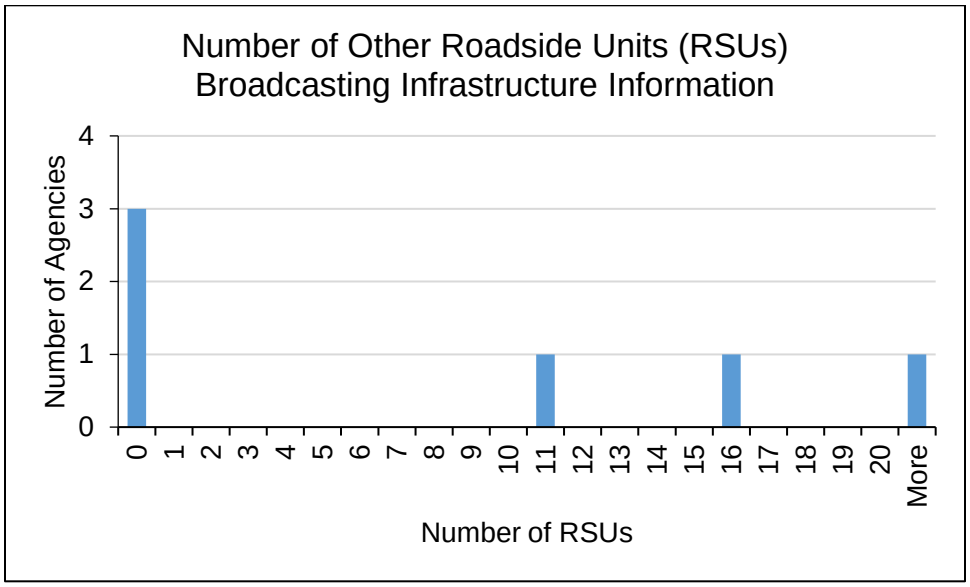
SESSION 1: INNOVATION & EMERGING TECHNOLOGIES

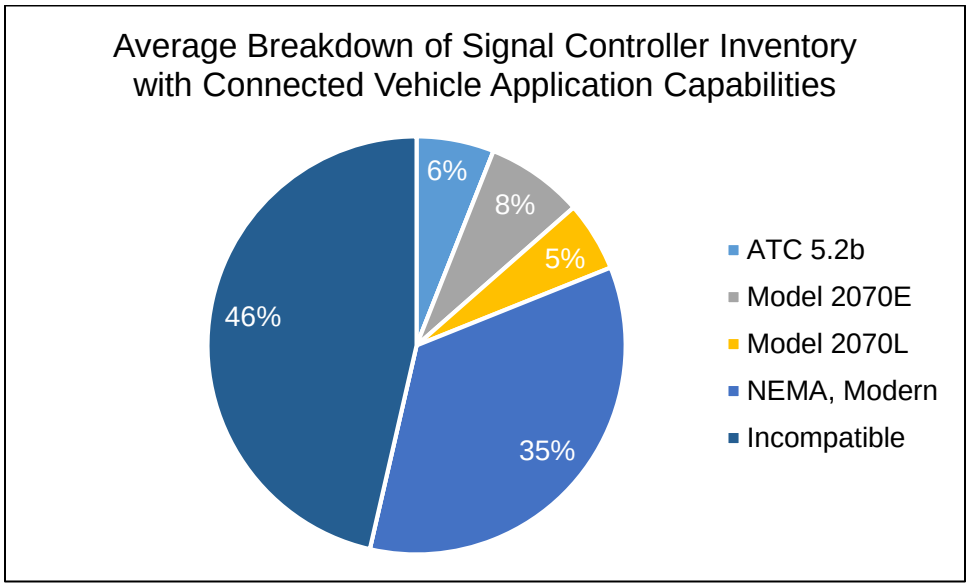


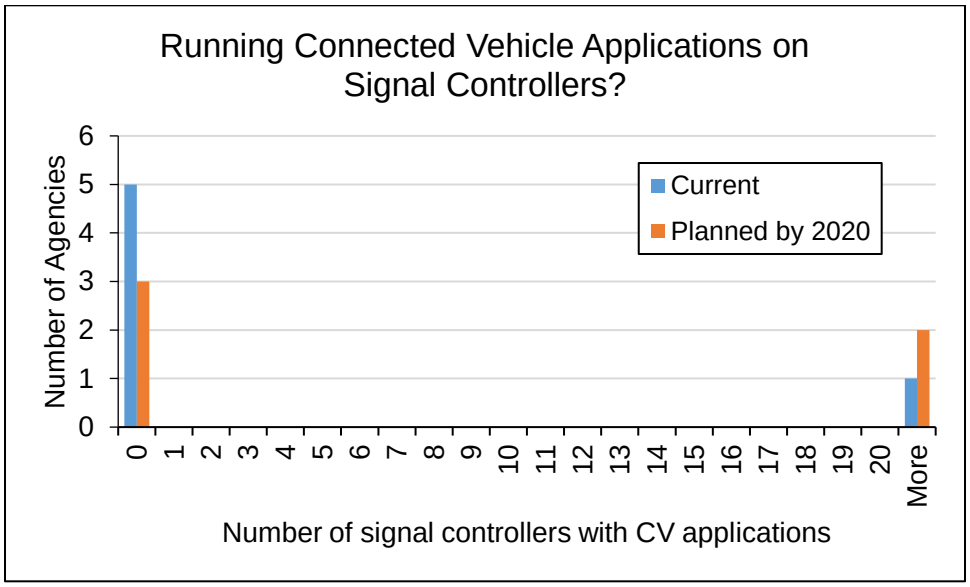

Which technologies do you currently use for infrastructure-based communications (V2I/I2I/I2V)?
Number of Agencies
0
1
2
3
4
5
5.9 GHz DSRC
Commercial Cellular
WiMax
WiFi
Bluetooth


Does your agency have a formal institutional structure for overseeing the deployment/management of strategies to support infrastructure-based communications?
No, 33%
Yes, 67%

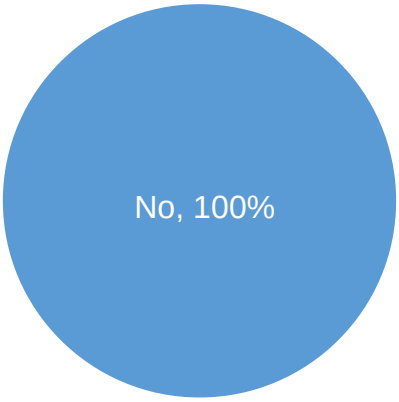

Broadcast of Signal Phase and Timing (SPaT) Information?
Number of Agencies
0
1
2
3
4
5
Current
Planned by 2020
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 More
Number of Signals with SPaT


Number of Other Roadside Units (RSUs) Broadcasting Infrastructure Information
Number of Agencies
0
1
2
3
4
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 More
Number of RSUs

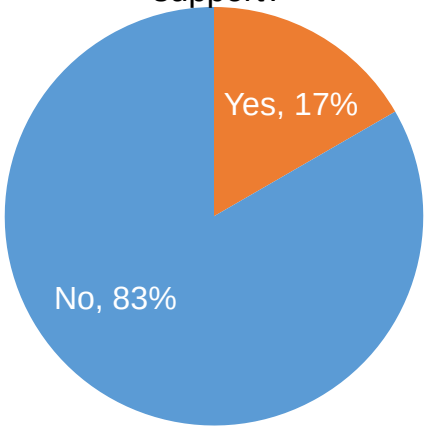

Average Breakdown of Signal Controller Inventory with Connected Vehicle Application Capabilities
6%
8%
5%
46%
35%
ATC 5.2b
Model 2070E
Model 2070L
NEMA, Modern
Incompatible


Running Connected Vehicle Applications on Signal Controllers?
Number of Agencies
0
1
2
3
4
5
6
Current
Planned by 2020
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
More
Number of signal controllers with CV applications

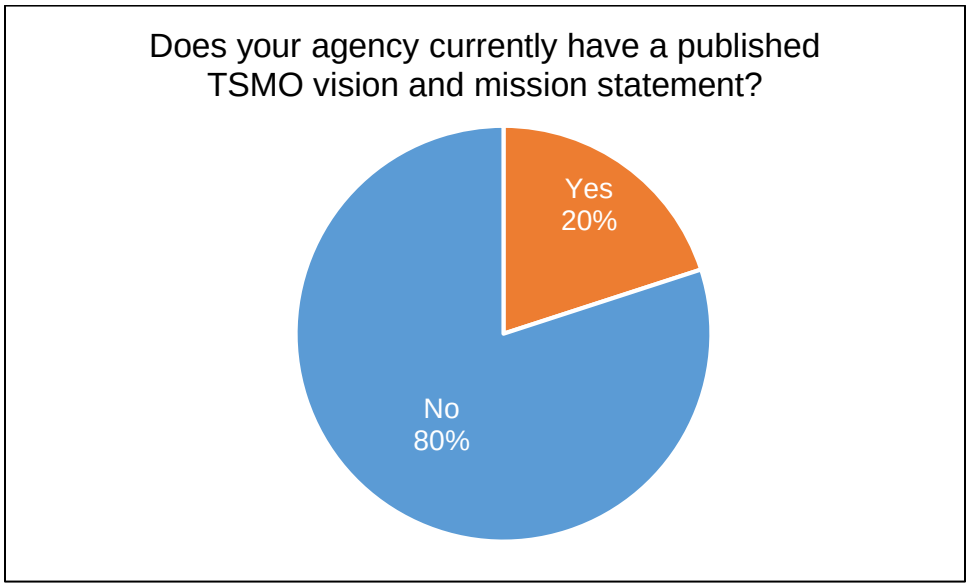
Do your current procurement specs for traffic signal hardware include language for signal performance measure support?

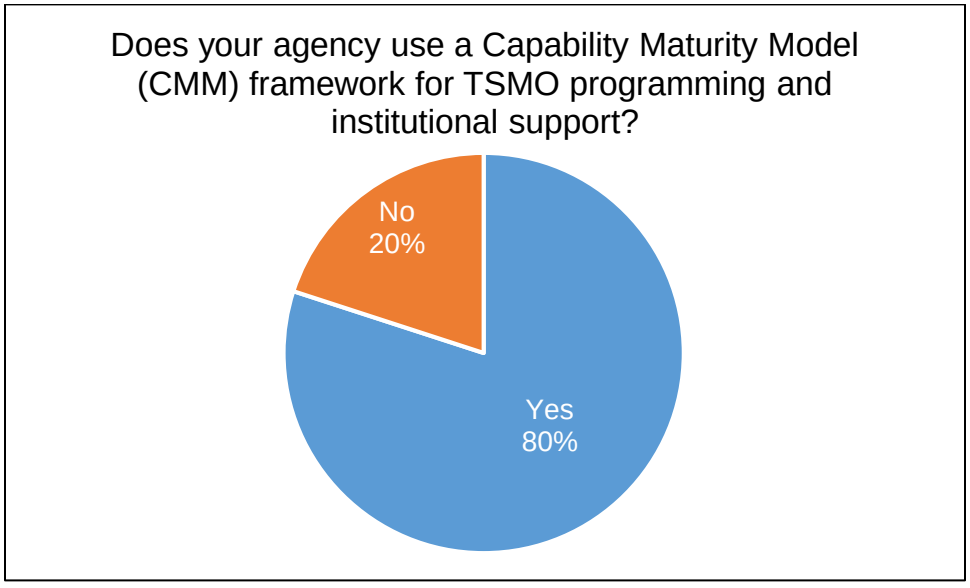


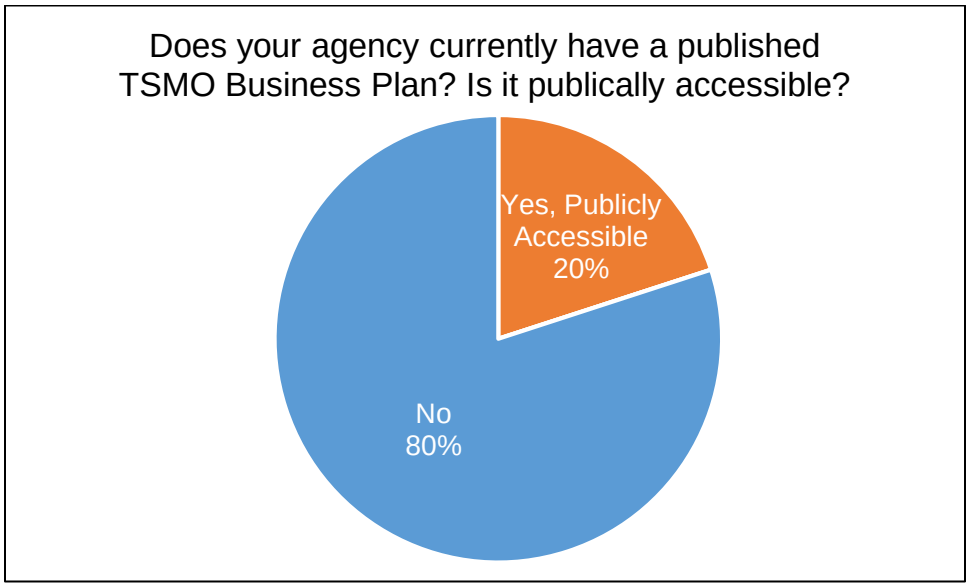
Do your current procurement specs for ITS hardware include language for CV application support?

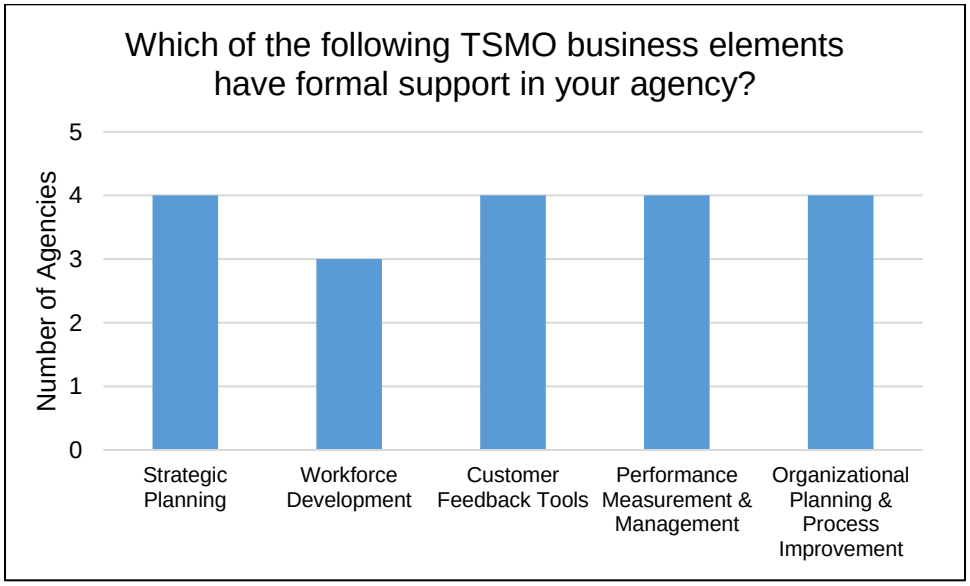


SECTION 2: TSMO BUSINESS PLANNING

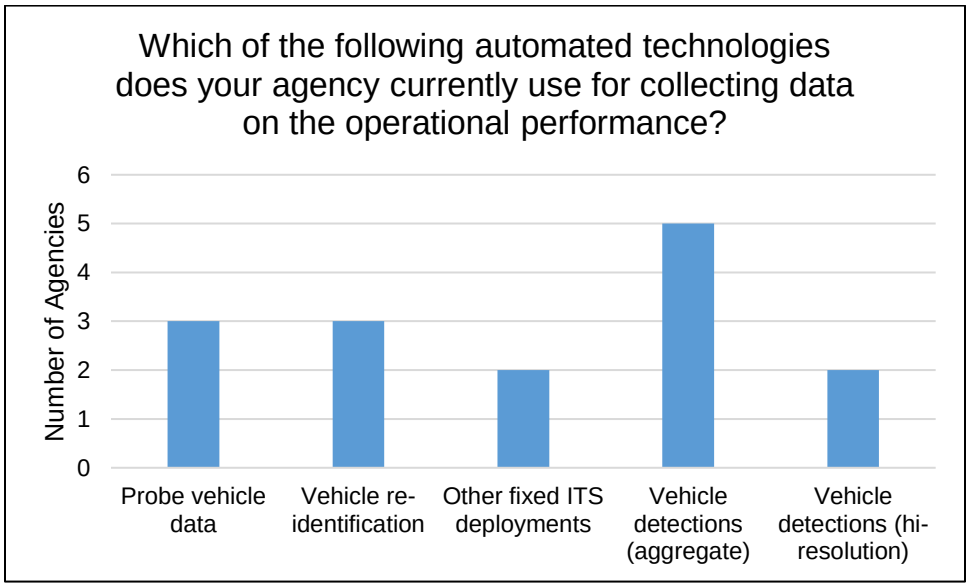


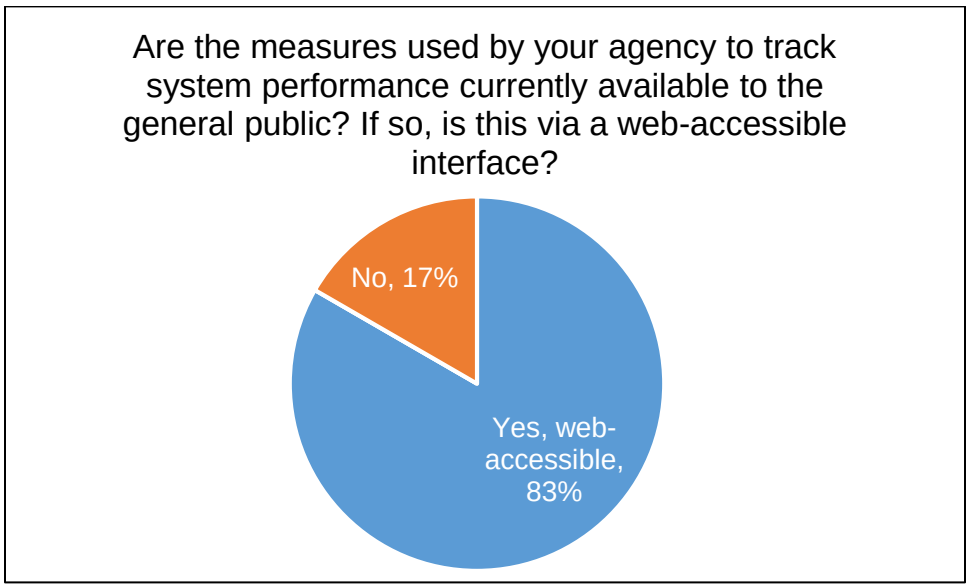



Does your agency currently have a published TSMO Business Plan? Is it publically accessible?
Yes, Publicly Accessible 20%
No 80%

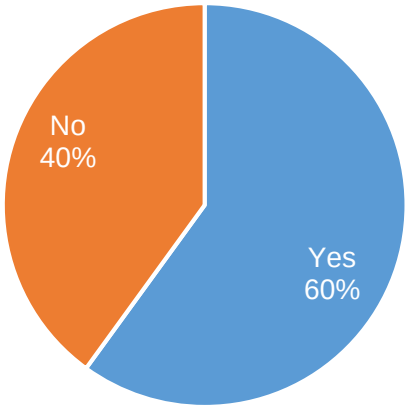

Which of the following TSMO business elements have formal support in your agency?
Number of Agencies
0
1
2
3
4
5
Strategic Planning
Workforce Development
Customer Feedback Tools
Performance Measurement & Management
Organizational Planning & Process Improvement

SECTION 3: PERFORMANCE MEASURES

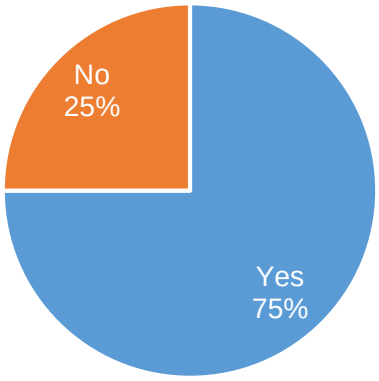


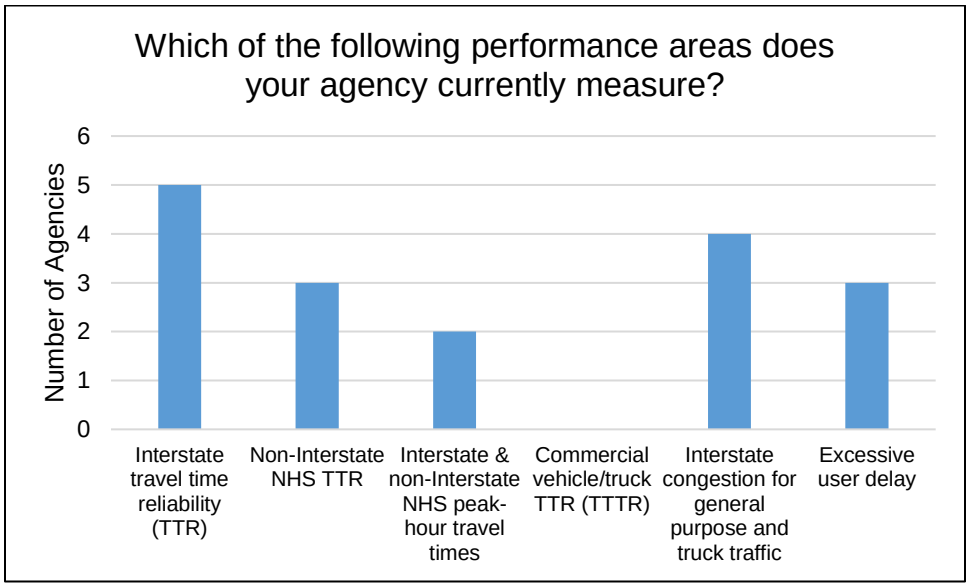


Does your agency currently utilize any performance measures or management tools that consider multiple modes of transportation?



Do you have any formal agreements with surrounding states on sharing performance measures or data?




Which of the following performance areas does your agency currently measure?
Number of Agencies
0
1
2
3
4
5
6
Interstate travel time reliability (TTR)
Non-Interstate NHS TTR
Interstate & non-Interstate NHS peak-hour travel times
Commercial vehicle/truck TTR (TTTR)
Interstate congestion for general purpose and truck traffic
Excessive user delay