

**PERCEPTIONS REGARDING THE  
ADOPTION OF TRANSPORTATION OPERATIONS  
SYSTEMS: A NATIONAL SURVEY**

**Study Conducted By  
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## **Introduction**

As a follow on to the thirteen focus groups conducted with approximately ninety participants during the Winter and Spring of 2006, it was determined that further research insights were needed to guide the formulation of a marketing plan. While insightful, the focus groups were limited to qualitative inputs in a small group discussion context. Accordingly, a national survey was conducted with a cross-section of relevant role players in TSM&O system adoption. The purpose of the survey was to validate and expand upon some of the qualitative findings from the focus groups, and to probe more deeply into differences that may exist in attitudes, perceptions and other key variables depending on the type of individual responding. That is, we sought to determine if meaningful differences existed based on the type of job held by the respondent, the level of the organization (e.g., state versus local), and related descriptors.

## **Methodology**

The survey was conducted by an independent team from Syracuse University. A detailed questionnaire of approximately six pages in length was developed by the Syracuse team based on interactions with representatives from the National Transportation Operations Coalition and the Federal Highway Administration. The questionnaire sought to measure seven key variables: awareness of TSM&O systems, obstacles and facilitators of TSM&O adoption, decision processes for TSM&O, perceptions of marketing materials and information needs, and suggestions for the future. In addition, some personal background information was recorded. A complete copy of the survey instrument is attached in the appendix to this report.

The survey was administered over the Internet using the intelligent survey software available through SurveyMonkey.com. Hence, once it was designed and pre-tested, the survey instrument was posted to the Survey Monday website where it could be accessed by NTOC members. It took approximately twenty minutes to complete. Participation was solicited from members of the twenty-four member organizations belonging to the National Transportation

Operations Coalition. Solicitation of participation was coordinated by Peggy Tadej, Director of Environment and Special Projects, National Association of Regional Councils. The site was open for approximately six weeks, during which time a total of 323 surveys were completed.

A diverse mix of individuals participated in the study. As Exhibit I indicates, members of regional or metropolitan planning organizations made up the largest sub-group within the sample, followed by DOT employees, private companies, non-DOT government employees, elected officials, public interest groups, and transit agencies. A wide range of job titles were provided by respondents, the biggest category of which was transportation or traffic engineers. With regard to the geographic focus of their job responsibilities, the sample was divided as follows:

- Federal level --- 11%
- State level --- 26%
- Regional or major metropolitan area --- 38%
- Medium or small metropolitan area --- 17%
- Small town or rural ---8%

In terms of their principal responsibilities, 53% of respondents were primarily involved with highway or road issues, 14% were primarily involved with non-highway related transportation issues, and 33% were equally involved with highway and non-highway transportation issues.

**Exhibit I: Principle Organizations with which Respondents were Associated\***

RPOs/MPOs	43%
Government employee (DOT)	34%
Private company	24%
Government employee (non-DOT)	22%
Elected official	13%
Non-profit agency or public interest group	13%
Transit agency	13%
General public	11%
Toll authority	7%
Other	10%

*\* Note that numbers do not add to 100% because a given respondent could have fallen into more than one category*

Respondents can also be characterized in terms of the major transportation issues affecting them. The following represent percentages of respondents that indicate a given issue is a major problem applying to the region or area where they work:

- High volume of thru traffic via interstate or roadway 68%
- Serious traffic congestion and slowdowns 62%
- Lack of room for infrastructure expansion 57%
- Rapid economic growth 55%
- Very adverse weather conditions 32%
- Very high accident rates 32%

## **Survey Results**

### **a. Awareness and Perceptions**

Awareness levels of TSM&O systems tend to be moderate. Respondents were presented with a list of sixteen such systems and asked to indicate those with which they were very familiar. The results are summarized in Exhibit II. As can be seen, the proportion of the sample indicating high familiarity levels with the different systems ranged from 55% to 11%. Respondents were most familiar with arterial management systems (55.2% very familiar), freeway management systems (55.2%), traveler information (55.2%), incident management systems (53.3%) and road operations and maintenance (40.6%). The lowest familiarity was with collision avoidance systems (11.7%), inter-modal freight systems (11.4%), and driver assistance systems (11.4%).

A separate analysis was performed to determine if awareness levels differed based on respondent descriptors. A few significant differences were identified. For instance, familiarity with arterial management systems was significantly higher among those from major metropolitan areas ( $p < .05$ ). Other significant differences included: greater familiarity with freeway management systems by state-level and major metropolitan level respondents ( $p < .10$ ); familiarity with transit management systems was significantly higher among small town or rural respondents ( $p < .01$ ); familiarity with incident management systems was significantly higher among state level and major metropolitan area respondents ( $p < .01$ ); familiarity with travel information systems was significantly lower among small town and

rural respondents ( $p < .01$ ); familiarity with crash prevention and safety systems was low among all groups, but significantly higher among state-level respondents and medium to small metro areas ( $p < .10$ ); and federal level respondents were significantly less familiar with road operations and maintenance systems ( $p < .01$ ), but were more familiar with collision avoidance systems ( $p < .01$ ) than were other respondents.

With regard to job title, those from MPOs/RPOs were significantly less familiar with freeway management systems ( $p < .10$ ) and crash prevention and safety systems ( $p < .10$ ), while both elected officials and members of MPOs/RPOs were more familiar with incident management systems ( $p < .05$ ).

**Exhibit II: Familiarity with Different TSM&O Systems**

<i>TSM&amp;O System</i>	<i>% Very Familiar with System</i>
Arterial management systems	55.2%
Freeway management systems	55.2%
Traveler information	55.2%
Incident management systems	53.3%
Road operations and maintenance	40.6%
Emergency management systems	31.1%
Crash prevention and safety	28.6%
Transit management systems	27.3%
Information management	26.3%
Road weather management	24.4%
Electronic payment systems	20.3%
Commercial vehicle operations	15.6%
Collision avoidance systems	11.7%
Intermodal freight	11.4%
Driver assistance systems	11.4%

When asked for their general perceptions of these systems, respondents were generally positive. A set of ten adjectives were presented to the respondents, and they were asked to apply each of them to the TSM&O systems with which they were familiar. Findings are summarized in Exhibit III. The three most applicable adjective sets appear to be ‘valuable’ (with a mean rating of 4.11 on a 5-point scale, where higher mean scores indicate the adjective is more applicable), ‘currently relevant for our needs’ (mean = 3.02), and ‘highly effective’ (mean = 3.50). Also receiving relatively higher ratings were two more negative

adjectives. These included ‘complex’ (mean = 3.43) and ‘expensive’ (mean = 3.25). Surprisingly, elected officials tended to not see these systems as politically controversial.

Significant differences in these perceptions were identified based on respondent characteristics. The tendency to see TSM&O systems as complex was greater among those from regional or major metropolitan areas. These systems were seen as less valuable among respondents from small towns and rural areas ( $p < .01$ ). Respondents that were federal employees were more likely to view these systems as highly effective ( $p < .01$ ). Small town or rural respondents were more likely to see the systems as not currently relevant ( $p < .01$ ). Finally, those who believed TSM&O systems represented a solution in search of a problem were more likely to be transportation engineers/ specialists and vendors/consultants ( $p < .05$ ).

**Exhibit III: Perceptions of TSM&O Systems**

<i>Adjective</i>	<i>Mean Score*</i>
Complex	3.43
Expensive	3.25
Valuable	4.11
Politically controversial	2.48
Highly effective	3.50
Currently relevant for our needs	3.92
Easy to Implement	2.52
Risky	2.24
More relevant to future rather than current needs	2.27
A solution in search of a problem	1.99

*\*Based on a five-point scale where 1= ‘Does not describe’, 3= ‘Moderately describes’, and 5= ‘Definitely describes’*

**b. Obstacles, Facilitators and Role Models**

Turning to the constraints or obstacles to adoption of TSM&O systems, respondents were provided a list of potential obstacles and asked to rate each of them. The biggest problem area is availability of funding (see Exhibit IV). Beyond this, serious concerns were raised about maintenance costs once a systems is installed, the lack of political support for a TSM&O solution, lack of a champion to push the system through the evaluation and funding approval

process, general resistance to change among the stakeholders involved, lack of awareness and understanding about these systems, and lack of inter-operability between systems.

**Exhibit IV: Major Obstacles to TSM&O Adoption**

<i>Obstacle</i>	<i>Mean*</i>
Resistance to change	3.28
Lack of funding	4.07
Lack of perceived need	3.10
Lack of knowledge	3.17
Lack of awareness	3.22
Lack of political support	3.34
Maintenance costs once installed	3.39
Lack of cooperation among key parties	3.05
Personnel with relevant skills	3.18
Compatibility with legacy systems	3.00
Interoperability between systems	3.21
Interconnectivity with neighboring areas' systems	3.12
Lack of coordination with neighboring areas	2.99
Lack of management support	3.01
Lack of a champion for the system	3.28
Lack of demonstrated business case or cost-benefit information	3.19

*\*Based on a five-point scale where 1= 'Not an obstacle', 3= 'Somewhat an obstacle', and 5= 'An overwhelming obstacle'*

Separately, in response to an open-ended question, respondents identified the major reasons hindering wider adoption of TSM&O systems. Similar responses were grouped, and the percentage of respondents mentioning a give reason is reported in Exhibit V. Again, funding availability was cited more than any other factor, by a wide margin. Lack of understanding and commitment and the lack of a champion again received considerable mention. Some of the other reasons identified by respondents included the lack of a clear plan or objective when considering TSM&O solutions, insufficient documentation of benefits, political support, and the lack of perceived need or priority.

A few differences were noted among sub-groups within the sample regarding the obstacles to adoption of TSM&O systems. Specifically, the “lack of a perceived need” among decision makers was more likely to be seen as an obstacle by those whose jobs were not principally involved in roadway management issues (p<.05). Similarly, the sense that TSM&O systems were not adopted because there was no perceived need was stronger among state-level, major

metro, small metro, and small town/rural respondents compared to federal-level respondents ( $p < .05$ ). Small town/rural respondents were less likely than others to see “lack of cooperation among key parties as obstacles, while federal-level respondents were more likely to see it as an obstacle ( $p < .05$ ). Small town/rural respondents also saw “compatibility with legacy systems” and “interconnectivity with neighbor area systems” as less of an obstacle than did others ( $p < .05$ ). For their part, state-level respondents were more likely than others to see “lack of coordination with neighboring areas as a major obstacle to TSM&O adoption ( $p < .05$ ). The tendency to see “lack of personnel with relevant skills” as an obstacle was significantly greater among those whose principal job responsibility was not roadway management ( $p < .05$ ). “Lack of management support” was viewed as more of an obstacle by both federal-level and small town/rural respondents compared to others ( $p < .05$ ). The medium to small metro respondents and the small town/rural respondents were less likely than others to see “lack of a demonstrated business case or cost-benefit ratio” as an obstacle ( $p < .01$ ).

**Exhibit V: Specific Reasons for Lack of Widespread Adoption**

<i>Reason Cited for Lack of Adoption</i>	<i>Percentage citing reason</i>
Funds	69.4%
Lack of understanding and commitment	26.3%
Lack of champion/leadership	22.0%
Lack of plan/clear objective	17.7%
Lack of benefit documentation	17.2%
Lack of political support	17.2%
Lack of perceived need	16.7%
Not a priority	16.7%
Lack of cooperation/coordination	13.9%
Lack of staff	12.9%
Lack of awareness	11.5%
Cost to implement and maintain	10.5%
Resistance to change	10.0%
Lack of expertise	9.1%
Lack of management support	6.7%
Lack of technology acceptance	3.8%
Lack of time to organize and implement	3.3%
Lack of training	2.9%
Rural vs. Urban	1.4%
Lack of experience	1.4%
Complexity	1.0%
Acceptance of status quo	1.0%
DOT not interested	1.0%

Lack of technology	0.5%
Past failures	0.5%
Lack of alternative routing	0.5%

On the alternative side, respondents identified some of the major facilitators of TSM&O adoption. Exhibit VI provides a summary of the findings from this open-ended questions. The single most cited factor is facilitating adoption is the presence of a champion. Next in frequency of mention were two financial issues, funding availability and clear evidence of a positive benefit-cost ratio. It was also recognized that State DOTs tend to play a fairly important is facilitating adoption. No significant differences could be identified among respondents in terms of these facilitators because of the form of the data.

**Exhibit VI: Key Facilitators of the Adoption Process for TSM&O Systems**

<i>Facilitator of Adoption</i>	<i>% citing reason</i>
Presence of a champion	26.0%
Benefits/cost ratio	14.9%
Funding availability	14.4%
State DOTs	9.6%
Politics and political support	6.7%
Need	6.3%
MPO	6.3%
Safety	5.8%
Staff and experts	4.3%
Crisis	2.9%
Education	1.9%
FHWA	1.9%
Interagency cooperation	1.9%
Mobility and congestion	1.4%
Peer example	1.4%
Federal regulations	1.0%
The only solution	1.0%
Private firms	1.0%
Academic influence	0.5%
ROI	0.5%
RPO	0.5%
First coast ITS coalition	0.5%
Desire to keep up with industry trends	0.5%
Prior experience	0.5%
Business opportunity	0.5%
User acceptance	0.5%

Initial TSM&O implementation failures	0.5%
Will and desire	0.5%

A clear inclination among those involved in adoption decisions is to consider case studies or the experiences of other states or municipalities when adopting TSM&O systems. As such, it is important to determine which states, cities, regions or other jurisdictions are considered the most progressive, or as leaders, when it comes to the use of these systems. When asked to identify these more progressive users, a total of 109 entities (including foreign countries) were cited. Exhibit VII provides a synopsis of those entities receiving at least five mentions. The States of Florida, California, Washington, Minnesota and Maryland received the most mentions. Among cities, the perceived leaders were Phoenix, San Francisco, Houston, Chicago and London.

**Exhibit VII: States, Cities, Regions, and other Jurisdictions Viewed as Leaders**

<i>Geographic Locale</i>	<i># of mentions</i>
Florida	36
California	30
Washington State	24
Minnesota	21
Maryland	19
Phoenix AZ	12
San Francisco	11
Houston	11
Chicago	11
London	11
Atlanta GA	10
Georgia	9
Texas	9
VA	9
NY-NJ	6
I-95	6
Seattle	6
Portland	6
State DOTs	5
Michigan	5
Delaware DOT	5
PA	5
Iowa	5

**c. The TSM&O Adoption Process**

A series of questions addressed the manner in which entities makes decisions to adopt TSM&O systems. Based on the earlier focus groups, respondents were presented with a model of the adoption process that distinguished five major steps or stages: i) Problem/ need/ opportunity recognition; ii) information search; iii) Technical assessment; iv) Political & budgetary approval; v) System implementation; vi) System maintenance & on-going evaluation. When asked whether these steps capture the adoption process as respondents are familiar with it, 90% of respondents indicated it was a satisfactory description (see Exhibit VIII). It is also noteworthy that survey participants believed the process is fairly similar across different types of TSM&O systems. In fact, 86% of respondents indicated that they perceived the process to be relatively similar across all systems. The exception was major metro/regional respondents, who were somewhat more likely to see differences in the process depending on the system in question.

**Exhibit VIII: Extent to Which Model Aptly Describes Adoption Process**

This is a good description of the steps in the process	53%
This is a somewhat satisfactory description of the process	37%
This does not really describe the process	5%
I am not familiar with the process	5%

Other steps in the adoption process not explicitly captured in these six steps were identified by respondents. In order of mention, these included the following:

- Stakeholder buy-in (other than the public)
- Public outreach or education and marketing
- Assessment other than technical (cost benefit, pilot demonstration, post implementation, etc.)
- Communication, interaction and coordination within and between groups
- Identify a champion
- Design, plan, contract/MOUs before implementation

Respondents were also fairly involved in the adoption process. When asked about which stages they were most heavily involved with, the leading answers were problem or need recognition, information search, and technical assessment and cost estimating (see below). With regard to these stages, those at the federal-level were less involved in the initial stage (problem or need identification) and the information search stage compared to other

respondents ( $p < .01$ ); state-level respondents were more likely than others to be involved with technical assessments ( $p < .01$ ), political and budgetary approval ( $p < .01$ ), system implementation ( $p < .05$ ), and system maintenance ( $p < .05$ ); those from major metropolitan areas/regions were also more likely to be involved with technical assessment and cost estimates ( $p < .05$ ). With regard to job categories, elected officials were more likely than were others to be involved with political and budgetary approval ( $p < .01$ ); those with state-level jobs were more like than others to be associate with system implementation ( $p < .05$ ) and systems maintenance and ongoing evaluation ( $p < .10$ ).

**Exhibit IX: Stages of Adoption Process in Which Respondents Were Heavily Involved**

<i>Stage in Adoption Process</i>	<i>% of respondents mentioning</i>
1. Problem/need/opportunity recognition	74%
2. Information search	60%
3. Technical assessment and cost estimates	60%
4. Political & budgetary approval	43%
5. System implementation	47%
6. System maintenance & on-going evaluation	40%

Separately, an identifiable champion plays an instrumental role in facilitating system adoption 62% of the time. However, it is noteworthy that in over a third of the cases, there was not particular champion. The most frequently mentioned TSM&O systems in which a champion played a critical role were incident management and arterial management. When asked for the job title of the champion, a wide range of responses were produced. By far, the most prevalent was someone at the State DOT (again, with a range of different job titles, from commissioner of transportation to district engineer to ITS engineer). Others receiving more frequent mentions were distinct or traffic engineers, ITS coordinators, and mayors or other political figures. A full listing of the systems champions and job titles of champions is available upon request.

An open-ended question was used to determine the most effective ways in which a given state, county, city, municipality, transit agency, or toll authority can determine which of the

TSM&O programs fit their needs and are worth considering for adoption. The leading answer was documentation of best practices, successful case studies, and peer reviews.

**Exhibit X: Leading Ways in Which Entities Determine if TSM&O Fits their Needs**

<i>Method Relied Upon</i>	<i>% mentioning</i>
Best practices, case studies, successful peer reviews	27.4%
Engineering evaluations, operational analysis, modeling, data analysis, impact assessment, needs assessment	19.9%
Cost-benefit analysis, cost avoidance studies, business process review, feasibility study, product review, performance goals	8.2%
Peer-interaction, regional discussion, public meetings, public reaction, peer-group meetings/briefings	5.5%
Pilot programs, demo programs	2.7%
On-site review, field review	2.7%
Customer feedback, stakeholder outreach	2.1%
Trade shows, conferences	1.4%
Education	1.4%
Public/private partnerships	1.4%
Research	1.4%

**d. Information Needs and Perceptions of Marketing Materials**

When evaluating TSM&O systems, decision-makers require an array of information. Consistent with findings above, respondents suggested that the greatest needs in terms of information include cost/benefit analysis of individual systems, insights regarding possible funding sources, data on best practices, examples or cases of both success and failure, lists of others who have deployed similar systems, and comparable case studies (see Exhibit XI). A few significant differences were noted in the importance of different information across the respondents. Descriptive information on how TSM&O systems work was more important to small town/rural respondents and least important to federal- and state-level respondents ( $p < .05$ ). Information on past successes and failures was viewed by federal-level respondents as more significant in decision-making, while small town/rural respondents were more likely to view it as less relevant ( $p < .05$ ). Medium or small metro area respondents placed more emphasis than did others on lists of others who have deployed similar systems. Small town/rural respondents emphasized possible funding sources more than did others. In terms of job titles, best practice information mattered more to executive directors of transportation

agencies/departments and to vendors (p<.01). Elected officials and those from MPOs/RPOs placed more emphasis than did other respondents on comparative case studies (p<.01).

**Exhibit XI: Most Critical Types of Information or Research when Evaluating TSM&O Systems**

<i>Information Type</i>	<i>% mentioning</i>
Cost/benefit analysis	55%
Possible funding sources	53%
Best practices	36%
Past successes & failures	36%
A list of others who have deployed similar systems	34%
Descriptive information about how the system works	32%
Comparative case studies	29%
Lifetime cost	19%
Technical specifications	8%
Other	8%

Availability of information does not appear to be a major problem. Specifically, when asked whether they had ever encountered a situation where they could not find information regarding a particular TSM&O system, 77 percent of respondents indicated either ‘no’ or ‘not sure’. A disparate set of examples of unavailable information was provided by the other 23 percent of the study participants, including the following:

- Lack of verifiable current deployment data, i.e. cost-benefit analyses, performance measures
- Incomplete information for pricing/ system comparisons
- Limited, non-technical, user-friendly information on systems
- ITS vendor technical support
- Marketing information overly optimistic
- Potential limitations of innovative proprietary systems
- Information on adaptive traffic signal systems
- Transit service providers and ridership data
- Difficult to find real-world, field experienced advice
- Outsourcing of software/hardware for centers
- Difficult to figure out how software driven systems work
- Non-compatibility issues between vendors
- Legislative and funding issues on TSM programs
- Lack of federal leadership
- Staffing requirements (operations and maintenance)
- Better JPO search engine
- HOV lane effectiveness
- Conflicting information

The information major sources most commonly relied upon by respondents were also identified. Exhibit XII summarizes the results. As can be seen, the most heavily relied upon sources included peer experience, the expert community, interactions and presentations at conferences, published articles, and evaluation reports. It is noteworthy that information from personal interaction features prominently among the answers. Virtually no significant differences were identified among respondents in terms of this question, with the exception that ‘peer experience’ was overwhelmingly emphasized by all respondents except vendors ( $p < .05$ ), as one might expect.

**Exhibit XII: Information Sources Most Heavily Relied Upon by Respondents**

<i>Information Source</i>	<i>% of respondents mentioning</i>
Peer experience	76.5%
Expert community	68.9%
Conferences	66.7%
Articles	61.2%
Evaluation reports	54.1%
National data	47.0%
Word of mouth	34.4%
Surveys	19.1%
A non-transportation organization committed to getting TSM&O information out	7.7%
Other (please specify)	15.8%
FHWA Website	2.7%
Web search	2.7%
Vendor	1.6%
AASHTO	1.1%
ITS America	1.1%
ITS NY	0.5%
CSNJ	0.5%
ITSMA	0.5%
Personal experience with scaled down trails	0.5%
US Gov statistics	0.5%
National organizations	0.5%
Manufacturers	0.5%
TRB Reports & publications	0.5%
Public Input & State Universities	0.5%
Own Research and judgment	0.5%
Transportation Communication Newsletter	0.5%
Technical Papers	0.5%
Project experience	0.5%
News	0.5%
TMC Pooled Fund Study	0.5%

When seeking information on TSM&O systems, a number of shortcomings were identified with the currently available materials. Only 5 percent of respondents indicated there were no shortcomings. As summarized in Exhibit XIII, study participants were especially concerned with biased presentations and a focus only on success stories, insufficient evidence regarding public benefits and cost-benefit analyses, insufficient information on funding sources, and information that is out of date, too generalized, not trustworthy, too detailed, not well-organized, and not representative, among other concerns. There was also a strong need for more of the types of information that can be used to convince others of the benefits of TSM&O systems.

**Exhibit XIII: Shortcomings of Existing TSM&O Descriptive Materials**

<i>Problem Area</i>	<i>% mentioning</i>
Biased presentation (only success stories)	45.9%
Need clearer identification of public benefits	39.3%
Insufficient cost-benefit analysis	36.1%
Need help identifying funding sources	26.8%
Need tools to convince others	24.0%
Information is dated, or out of date	20.2%
Information is too generalized	19.7%
Information doesn't address human cost	18.6%
Lack of trustworthy sources	14.2%
Information is too detailed and don't have enough time to review	14.2%
Information is not well-organized	14.2%
Information is not comprehensive	13.1%
Information is difficult to access	11.5%
Information is not representative	10.9%
Information is contradictory	9.8%
Information is difficult to use	7.7%
Information is redundant	4.4%
Other (please specify):	16.9%
Relativity to smaller urban areas	1.6%
Improper use of Simulations (doesn't reflect the real world)	1.6%
None of these stand out for me	1.1%
Lack of good cost / benefit data	1.1%
Available resources not well consolidated	0.5%
Not sufficient in educating decision makers	0.5%
Lifetime cost, not just capital cost	0.5%
Lack of representative case studies	0.5%
Difficult to follow	0.5%

Lack of Human Factors information	0.5%
Cost to maintain systems	0.5%
Applications may not be relevant to all regions or communities	0.5%
Unclear value proposition	0.5%
Lack of guidance on how to apply to 'MY' situation	0.5%
Only information on large projects with a lot of money	0.5%
Difficult to use due to transferability issues	0.5%
Needs training	0.5%

It would seem that different role players need different types of information regarding TSM&O programs at differing times. As such, respondents were asked where they see the biggest gaps in terms of the right kind of information to the right person at the right time. While 28% of participants did not know, the remaining 72% provided a wide range of answers. The leading responses were:

- Non-technical, concise, accessible information for decision/policy-makers, DOT staff, and public
- Cost-benefit analyses, empirical information for decision-makers
- Information reflecting a better understanding of field operations
- Information on available funding sources
- Communications tools to convince others

The manner in which information is disseminated was also addressed (see Exhibit XIV). When asked how they would prefer that information on TSM&O programs be made available, without prompting any answers, the Internet featured prominently. Placing information on a national website received the most mentions, while email and webinars were also frequently cited. However, fact sheets, case studies, personal discussions, and public forums also received emphasis.

With a separate question in which eight particular means of information distribution were mentioned, the most preferred were:

- website (mentioned by 74% of respondents)
- e-mail (53%)
- print publications (50%)
- public forum (30%)
- personal discussions (30%)
- other (7%)

**Exhibit XIV: How Respondents Prefer to Receive Information on TSM&O**

<i>Preferred Method of Information Dissemination</i>	<i>% mentioning</i>
Website	72.7%
Fact sheets	56.8%
Case studies	55.2%
Email	36.6%
Webinars	33.9%
Discussion	28.4%
Public forum	25.7%
Brochures	22.4%
Other (please specify)	12.0%
Peer exchange	2.7%
Conferences	2.2%
Talk to other agencies who have experience	0.5%
Cost/benefit showing cost/fees/fines	0.5%
On a need to know basis	0.5%
Site Demonstrations	0.5%
Discussion in public interest group	0.5%
Audio and video pod casts	0.5%
Briefing with before after metrics	0.5%
Simulations	0.5%
All should be available from one source	0.5%
University programs followed by real world experience	0.5%
Report	0.5%

Very few significant differences were identified among respondents in terms of preferred information distribution methods. Small town/rural respondents placed a heavier weight on email than did others, while federal level respondents placed less emphasis than others on peer experiences.

Given the emphasis placed on personal communications, do respondents perceive that an organized network of easily accessible individuals is currently available? These would be individuals from whom potential TSM&O program adopters could access information on the experiences of states, counties, cities, municipalities, toll authorities, transit agencies, or others who have adopted these systems. As can be seen from the results below, this represents a potential area for improvement

- yes, definitely 15%
- somewhat 40%
- not really 45%

When asked if such forums exist, a relatively small number of respondents mentioned one of the existing professional organizations. In order of frequency of mentions, the most mentioned forums or networks were NTOC (twelve mentions), ITS America, TRB, AASHTO and ITE. Respondents felt that such forums should especially include government organizations, engineers/technical experts, and users including the public. These kinds of discussions can best be achieved through conferences/meetings, webinars, and national organizations. The usage of such personal networks can best be encouraged through public forums, tech communities, workshops, product demos, and state/government organizations.

Finally, when asked whether TSM&O systems should be marketed collectively, as part of a total operations concept, or individually, 48 percent of the sample argued for collectively marketing TSM&O, 37% indicated TSM&O systems should be marketed individually, and 16% did not answer.

**e. Suggestions for the Future**

A series of open-ended questions addressed how TSM&O adoption might be fostered in the future. The first of these concerned how adoption of the “total operations concept” could best be encouraged. By far, the need for more documentation regarding the advantages or benefits of a total operations approach, including case studies of the implementation of this concept, was emphasized (see Exhibit XV).

**Exhibit XV: How to Encourage Adoption of ‘Total Operations Concept’**

<i>Method for Encouraging Total Operations Concept</i>	<i>% mentioning</i>
research, case studies, best practices, benefits analyses	30%
public officials, champions, orgs	15%
tie adoption to funding, incentives	15%
open public forums	10%
legislation, policy	8%
education, training	8%
advertising, promotion	4%
no response	10%

In addition, questions were asked regarding what NTOC could do to encourage adoption of TSMO&O systems in general. Similar answers were generated to the preceding question, but with some differences in emphasis (see Exhibit XVI). Advertising/promotion features more prominently.

**Exhibit XVI: What Should NTOC be Doing**

<i>Activity</i>	<i>% mentioning</i>
research, case studies, benefit analyses, best practices	30%
advertising, promotion	14%
tie to funding/incentives	12%
education, training programs	10%
open discussion forums	10%
communications with public officials, organizations	4%
pushing legislation, policy changes	1%
no response	20%

Separate from NTOC efforts, respondents indicated the most important things that federal highway authorities could do to facilitate greater adoption of TSM&O systems. A wide range of answers were provided, with the leading one concerning increases in available funding. Exhibit XVII provides a complete listing of these suggestions.

**Exhibit XVII: What Federal Highway Authorities can do to Encourage TSM&O Adoption**

<i>Priority Area</i>	<i>% mentioning</i>
Increase Funding	41%
Educate public, policy makers, and agencies on social and economic benefits	11%
Unsure/Don't Know	8%
Encourage performance measurements	7%
Strengthen state/local interagency relationships	3%
Showcase pilot projects and/or best practices	3%
Conferences	3%
Increase communication of successes and failures	2%
Mandate projects and/or standards	2%
Clarify funding guidelines and tie into planning	2%
Increase technical guidance and training	1%
Case studies/articles	1%
DOT/federal leadership	1%
Decrease overlap with emergency management initiatives	1%

Make information less technical	1%
Stress cost effectiveness	1%
Make TSM&O required in order to fund other projects	1%
Recognize need for project flexibility after funding	1%
Form a steering committee	1%
Increase R&D	1%
Federal prioritization	1%
Increase marketing	1%
Simplify implementation	1%
Guidance on how planning/congestion management can be leveraged to increase interagency and interregional support	1%
Add penalties for funded, but uncompleted projects	1%
Develop training and implementation specifically for small MPOs	1%
Better strategy	1%
More guidance	1%
Provide more cost-benefit analysis	1%

Looking out the next three years, respondents indicated where (i.e., states, regions, counties, cities, authorities, or agencies) they saw the greatest opportunities for adoption of TSM&O programs. This was an open-ended question. As captured in Exhibit XVIII, those most likely to invest in these systems were believed to be major metropolitan area, state-level adopters, and the most congested regions.

**Exhibit XVIII: Most Likely TSM&O Adopters in Next Few Years**

<i>Entity Most Likely to Adopt</i>	<i>% mentioning</i>
Metro/urban areas	19%
State level	18%
Congested areas	9%
Regions	6%
Counties	6%
Rapidly growing areas	6%
MPOs/RPOs	4%
Everywhere	3%
Localities	3%
Rural areas	3%
Corridors	3%
Mid-size cities	2%
Federal level	2%
No opportunities	1%
Southeast U.S.	1%
Gulf Coast	1%
Suburban	1%
Don't know/unsure	15%

Two questions focused on which TSM&O systems should receive greater emphasis in terms of communication and promotional efforts. The first of these concerned the priorities that respondents believed applied *within their own state/region/community* over the next few years. Based on frequency of mentions, the following priorities were specified:

1. Arterial management systems
2. Incident management systems
3. Freeway management systems
4. Traveler information
5. Crash prevention and safety
6. Transit management systems
7. Road operations and maintenance
8. Emergency management systems
9. Intermodal freight
10. Collision avoidance systems
11. Road weather management
12. Information management
13. Commercial vehicle operations
14. Collision notification systems
15. Electronic payment systems
16. Driver assistance systems

Given NTOC's limited resources, respondents separately indicated the priorities for NTOC efforts as the organization works to encourage TSM&O system adoption around the country. As indicated in Exhibit XX, arterial management, incident management, freeway management, traveler information, and crash prevention systems received the most emphasis.

Lastly, inputs were requested regarding what the central theme or message should be for communication efforts with potential adopters of TSM&O systems. Exhibit XXI provides a listing of the suggested themes or central messages. While a number of these suggestions clearly overlap, the most popular messages concerned value for the money, especially relative to construction, and the efficiency and effectiveness of these systems.

**Exhibit XX: TSM&O Systems that Should Receive Priority from NTOC**

<i>TSM&amp;O System</i>	<i>% mentioning</i>
Arterial management	23.6%
Incident management	21.0%
Freeway management	17.2%
Travel information	13.4%
Crash prevention & safety	7.6%
Intermodal freight	7.0%
Transit	4.5%
Road operations & maintenance	3.8%
Emergency management	3.2%
Road weather management	1.9%
Info management	1.3%
ITS	1.3%
Advanced traffic management	1.3%
Education	1.3%
Performance measures for operations system	1.3%

**Conclusions**

This study provides valuable insights into the issues surrounding TSM&O system adoption. A cross-section of professionals that represent different stakeholders and user segments have made clear some of the major challenges and opportunities as we move forward in attempting to promote the adoption of TSM&O systems and the ‘total operations concept’. Implications can be drawn in at least seven key areas.

First, it is striking that familiarity levels with TSM&O center on four major systems. That is, a little over half of these professionals claim to be very familiar with arterial management, freeway management, traveler information, and incident management systems. One might expect higher proportions of the sampled individuals to be highly familiar with these systems. Moreover, the numbers drop off significantly as we move to other TSM&O systems. Not surprisingly, then, when asked which systems are priorities for adoption in their own state/region/community, and which systems NTOC should emphasize in its marketing and communication efforts, these same four received priority. These findings suggest there is a way to in raising awareness levels of TSM&O systems Further, these rather focused familiarity levels suggest real challenges in promoting a ‘total operations concept’.

**Exhibit XXI: Suggestions from Respondents Regarding Communication Messages for TSM&O**

<i>Key Communication Message</i>	<i># of mentions</i>
Cost/advantage/value benefits	23
Communication on political & technical level - interoperability	14
Higher cost/benefit ratio compared to construction	10
Have a clear plan of usage, implementation, and impacts	9
How TSM&O improves the existing transportation system	8
Saves time and money	6
The need is now	6
Improved safety and customer services	5
They work	5
Learn from others (both success and failures) Real World Benefits/Scenario	4
Educate drivers/users/stakeholders	3
Improved operations save money and time, improve safety	3
Improve system efficiency	3
It is worth every penny invested	2
Efficient and effective investment	2
Compatibility	2
Resolve real performance problems and show results to public	2
Will need continuous funding/budget sources	2
Allow increase in efficiency without physical increase	2
Ease of use	2
It is implementable	2
Systems are as good as they are maintained, managed, and operated	2
Show benefits in plain/simple language	1
Create a community	1
Low cost - short & long term benefits	1
Improve reliability of transportation systems	1
Stay realistic about benefits of ITS	1
Intergratable with capital investment	1
Timely maintenance & update of information	1
Operations are important	1
TSM&O has to be integratable with other TSM&O	1
Congestion management, asset management	1
Leverage of technology saves and improves	1
Needed for safety and economical vitality	1
Faster short term solutions	1
Quantify the benefits of TSM&O	1
Should be implemented not as stand alone	1
Long-term benefits	1
Support from FHWA and other federal agencies	1
Benefits to traveler	1
Where TSM&O systems are available at	1
Get serious and drop what has not been working	1
Not the silver bullet to reduce congestion	1

Second, TSM&O systems are perceived both positively and negatively. They are clearly seen as valuable, effective and relevant to respondent needs, as these were the three highest rated attributes. They were not viewed as being that risky. Yet, they were also viewed as complex and not easy to implement, and somewhat expensive. According, it may be important to move on three front: a) more support for developmental work that further simplifies these systems, b) the provision of more support during the implementation phase of system adoption, and c) heightened emphasis on system simplicity and ease of implementation (and the investment to date in achieving both) in marketing materials and communication efforts.

Third, the obstacles to TSM&O adoption are significant. A theme of the focus groups that preceded this survey was the need for more funding support both for the adoption of these systems. This theme was also evident in answers to a number of different parts of the survey. Lack of funding was clearly the most emphasized obstacle to adoption, and, in a consistent vein, respondents were very concerned about the maintenance costs once a TSM&O system was installed (the second most emphasized obstacle). Beyond budgets, the emphasis was placed on people. Political support, presence of a champion, and general resistance to change featured prominently among the perceived obstacles. This finding reinforces the need for more personal methods of communication in marketing/communication efforts. Following this came a system feature, the challenges of inter-operability between systems.

Fourth, the data suggest that the adoption process as conceptualized following the earlier focus groups is a reasonably accurate description of the key stages or step involved, and that this process is relatively common across different TSM&O systems. However, respondents indicated the process should be augmented to include marketing and communication efforts, first, to achieve stakeholder buy-in and, second, to better educate the public. For their part, the respondents were fairly involved in the adoption process, and reinforced the role of a champion in about two-thirds of the adoption situations.

Fifth, implications can be drawn from the information search activities that support TSM&O adoption. In assessing needs, the greatest emphasis is placed on materials or inputs that describe best practices, case studies of system implementation and use, and successful peer

reviews of systems. The single most emphasized informational input concerns evidence regarding benefit/cost ratios, stressed even more than information on possible funding sources. Perhaps most interesting is the finding that accessibility or availability of information did not appear to be a problem for most respondents, with rather heavy use of websites. The bigger issue may well be the manner in which marketing and communication efforts are managed. Respondents made clear that those most important information sources were peer experience, the expert community, conferences, published articles, and evaluation reports. These communication vehicles reflect a concern for source credibility, on the one hand, but also indicate the importance of personal communication. In this vein, much more needs to be done to develop networks of easily accessible individuals having expertise and experience with particular TSM&O systems

Sixth, the findings make clear that there are perceived leaders in terms of TSM&O adoption, and more might be done to engage these leaders in marketing and communication efforts. These leaders might also be targeted in efforts to more aggressively promote the total operations concept. Further, the findings indicate that major metro/urban areas and states should be the priority in terms of targeting efforts for TSM&O systems, and that arterial management, incident management, freeway management, and traveler information systems are the areas that should be focused upon more heavily.

Finally, the differences identified among respondents on a number of the questions have important implications, especially for ongoing communication and marketing efforts. It is clear that familiarity levels with TSM&O systems, perceptions of these systems, perceived obstacles, participation in the adoption process, information needs, and relevant information messages varies across the sample, particularly as we distinguish federal, state, major metro/regional, medium/small metro, and small town/rural respondents. The implication is that more proactive and timely marketing and communication efforts are needed that reflect different target audiences and different stages in the adoption process.

## **Appendix A: Adoption of Transportation Operations Systems: A National Survey**

We are at a crossroads in terms of Transportation System Management and Operations. While much progress has been made in developing these systems, the results in terms of adoption rates are mixed.

To gain greater insights into the variability in adoption, a major survey is being conducted by an independent team based at Syracuse University. The online internet survey is available to all NTOC members, and your input is critical. However, if you have been a participant in a one-on-one interview or a focus group with Syracuse University representatives in the past six months, you are ineligible for this survey. An executive summary of the findings will be shared with all participants.

**Estimated Time: 15-20 minutes**

**Please provide your candid responses to each of the following questions. Your responses will be treated with the strictest confidentiality. This survey is concerned with transportation systems management and operating systems (TSM&O). The following is a list of systems to be considered when thinking about TSM&O (to access descriptions of each system, visit [www.itsoverview.its.dot.gov](http://www.itsoverview.its.dot.gov)):**

- Arterial management systems
- Freeway management systems
- Transit management systems
- Incident management systems
- Emergency management systems
- Electronic payment systems
- Traveler information
- Information management
- Crash prevention and safety
- Road operations and maintenance
- Road weather management
- Commercial vehicle operations
- Intermodal freight
- Collision avoidance systems
- Driver assistance systems
- Collision notification systems

### **Awareness & Perceptions**

1. Please select the TSM&O systems which you are very familiar with. (Check all that apply) \_\_\_\_\_

**2. Thinking about the systems you selected above, please indicate on the scale below whether you agree or disagree that each of the following adjectives accurately describes TSM&O. Please use the following 5-point scale to rate the adjectives:**

**1= does not describe, 3=moderately describes, 5=definitely describes**

○ Complex	1	2	3	4	5
○ Expensive	1	2	3	4	5
○ Valuable	1	2	3	4	5
○ Politically Controversial	1	2	3	4	5
○ Highly Effective	1	2	3	4	5
○ Currently relevant for our needs	1	2	3	4	5
○ Easy to Implement	1	2	3	4	5
○ Risky	1	2	3	4	5
○ Relevant more for the future than present	1	2	3	4	5
○ A solution in search of a Problem	1	2	3	4	5

**Obstacles**

**3. Please indicate the extent to which each of the following is a substantial obstacle to future adoption of TSM&O systems and services in YOUR area. Please rate the items using a 5-point scale where 1=Not an obstacle, 3= A moderate obstacle, 5=An overwhelming obstacle:**

a) Resistance to change	1	2	3	4	5
b) Lack of funding	1	2	3	4	5
c) Lack of perceived need	1	2	3	4	5
d) Lack of knowledge	1	2	3	4	5
e) Lack of awareness	1	2	3	4	5
f) Lack of political support	1	2	3	4	5
g) Maintenance costs once installed	1	2	3	4	5
h) Lack of cooperation by others	1	2	3	4	5
i) Personnel with relevant skills	1	2	3	4	5
j) Compatibility with legacy systems	1	2	3	4	5
k) Interoperability between systems	1	2	3	4	5
l) Interconnectivity with neighboring areas' systems	1	2	3	4	5
m) Lack of coordination with neighboring areas	1	2	3	4	5
n) Lack of management support	1	2	3	4	5
o) Lack of a champion for the system	1	2	3	4	5
p) Lack of demonstrated business case or cost-benefit information	1	2	3	4	5

**Current Adoption**

**4. In your experience, when these systems are adopted, what tend to be the major facilitators of the process? What are some of the key factors that drive the process?**

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**5. Where you haven't seen widespread adoption of TSM&O programs by states, counties, cities, municipalities, transit agencies, and/or toll authorities, what do you see as the three major reasons?**

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**6. In your opinion, who are the real leaders in terms of adopting TSM&O programs? Which cities, regions, or other jurisdictions do you view as the most progressive when it comes to Operations? After the locale, please list the TSM&O program you are referring to (ex: London, Incident management)**

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_

**7. Where you have seen adoption of one of these TSM&O systems, was there a particular person who played the role of champion? If so, what was this person's job title? Please indicate the job title and the TSM&O program that they championed.**

- a. No champion
- b. Yes, there was a champion. Their job title was: \_\_\_\_\_ The TSM&O program was: \_\_\_\_\_

***Decision-Making Process***

**8. Consider the steps or process that a state, county, city, municipality, transit agency, or toll authority goes through when adopting a given TSM&O system. Below is a summary of six fairly basic steps.**

- i. Problem/need/opportunity recognition**
- ii. Information search**
- iii. Technical assessment**
- iv. Political & budgetary approval**
- v. System implementation**
- vi. System maintenance & on-going evaluation**

**a. Do these steps describe the adoption process as you are familiar with it?**

- \_\_\_ this is a good description of the steps in the process
- \_\_\_ this is a somewhat satisfactory description of the process

- \_\_\_ this does not really describe the process
- \_\_\_ I am not familiar with the process

**b. What other steps are frequently involved in these adoption processes?:**

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**c. Which stage(s) of the process are you, or the group you are associated with, heavily involved in?: (Check all that apply)**

- i) Problem/need/opportunity recognition
- ii) Information search
- iii) Technical assessment
- iv) Political & budgetary approval
- v) System implementation
- vi) System maintenance & on-going evaluation

**d. Is there a specific TSM&O program you are thinking about when responding to the above, or does it apply across all TSM&O programs? If a specific program, please identify which one.**

- a. My response applies across all programs
- b. My response applies to a specific program
  - i. \_\_\_\_\_

**9. Based on your experience, what are some of the more effective ways a given state, county, city, municipality, transit agency, or toll authority can determine which, if any, of the TSM&O programs fit their needs and are worth considering for adoption?**

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**Resources & Marketing Materials**

**10. What kinds of information or research, up to three, are most critical for decision-makers when evaluating TSM&O programs?**

- a) Descriptive information about how the system works
- b) Comparative case studies
- c) Possible funding sources
- d) Cost/benefit analysis
- e) Lifetime cost
- f) Past successes & failures
- g) Best practices
- h) Technical specifications
- i) A list of others who have deployed similar systems
- j) Other (please specify) \_\_\_\_\_

**11. Have you ever encountered a situation where you have not been able to find the information you were seeking regarding a specific product/service? If so, please describe.**

\_\_\_\_\_

\_\_\_\_\_.

**12. What sources do you typically look to for information on TSM&O programs? (Check all that apply)**

- a) Articles
- b) Word of mouth
- c) Peer experience
- d) Conferences
- e) Surveys
- f) National data
- g) Expert community
- h) Evaluation reports
- i) A non-transportation organization committed to getting TSM&O information out
- a) Other \_\_\_\_\_

**13. If you have looked for or used information that describes TSM&O programs, what do you see as the major shortcoming(s) of current informational materials if any?**

- a) Need clear identification of public benefits
- b) Insufficient cost-benefit analysis
- c) Contradictory
- d) Doesn't address human cost
- e) Dated
- f) Biased presentation (only success stories)
- g) Redundant
- h) Not comprehensive
- i) Too detailed and don't have enough time to review
- j) Not representative
- k) Difficult to access
- l) Too generalized
- m) Need help identifying funding sources
- n) Difficult to use
- o) Lack of trustworthy sources
- p) Not organized
- q) Need tools to convince others
- r) None
- s) Other, please specify. \_\_\_\_\_
- t) I don't know

**14. It would seem that different role players need different types of information regarding TSM&O programs at differing times. Where do you believe the biggest gaps are in terms of the right kind of information to the right person at the right time?**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_.

**15. How would you prefer the information on TSM&O systems to be made available to you? (Check all that apply)**

- a) Email
- b) Case studies
- c) Brochures
- d) Fact sheets
- e) Website
- f) Public forum
- g) Discussion
- h) Webinars
- b) Other \_\_\_\_\_

**16. In your opinion, is there an organized network of easily accessible individuals currently available where potential TSM&O program adopters can access the experiences of states, counties, cities, municipalities, toll authorities, transit agencies, or others who have adopted these systems?**

- a. Yes, definitely
- b. Somewhat
- c. Not really

**17. What forum or network have you found useful, and is that network only for a specific TSM&O program? If it is, which one?**

- a) Network name: \_\_\_\_\_
- b) TSM&O programs (put "all" or name of specific system)

**18. Do you have particular suggestions in terms of which individuals or groups should be included within such a network, how to foster its usage, and what forum would be the best for accessing this network?**

- a) Individuals/Groups to include? \_\_\_\_\_
- b) How to foster usage? \_\_\_\_\_
- c) What forum? \_\_\_\_\_

**19. Do you believe that TSM&O systems should be marketed collectively, as part of a total operations concept, or individually, to address specific needs? A total operations concept can be defined as a holistic plan of adopting various TSM&O programs in an integrated way to realize synergistic benefits. Please explain your thinking.**

\_\_\_\_\_  
\_\_\_\_\_.

**20. What is the best way to get cities and municipalities to think about a total operations concept?** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_.

### **Future Efforts & Opportunities**

**21. Based on your professional experience, please identify the most important**

thing that an organization like NTOC can do to enable greater adoption of TSM&O systems where they are appropriate solutions:

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22. Separate from NTOC efforts, what are some of the most important things that federal highway authorities can do to enable greater adoption of these programs? Please be specific: \_\_\_\_\_

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23. Where do you see the greatest opportunities for adoption of TSM&O systems over the next three years? Which types of regions, cities, authorities, or agencies are more likely to invest in these systems? What is the basis for your thinking?

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24. Based on your state's, agency's, city's, county's, municipality's needs, if you were to prioritize the various TSM&O systems in terms of which should receive more emphasis from NTOC and federal authorities for promotional efforts, related research, and information dissemination, which three systems would you prioritize over the next few years? {or "Please indicate the systems you would be most interested in learning more about."

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

25. Given limited resources, which TSM&O systems should receive the greatest emphasis in efforts by NTOC to increase adoption levels around the country?

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26. When thinking about communication efforts for TSM&O programs, what do you think is the most critical central message that must be conveyed to potential adopters?

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**Personal Background**

27. What is your current job title? \_\_\_\_\_

**28. Below is a list of agencies, organizations and groups that are in some way involved with TSM&O adoption. Which, if any, are you associated with or do you identify yourself with? (check all that apply)**

- RPOs/MPOs
- Elected official
- Government employee (DOT)
- Government employee (non-DOT)
- Private company
- Non-profit agency or public interest group
- General public
- Transit agency
- Toll authority
- Other (please specify) \_\_\_\_\_

**29. Are you more involved with highway management issues or other transportation modes?**

- a) Both highway and other equally
- b) Primarily other
- c) Primarily highway

**30. Which of the following BEST describes the principal focus of your job responsibilities?**

- a) Federal-level
- b) State-level
- c) Regional or major metropolitan area
- d) Medium or small metropolitan area
- e) Small town or rural

**31. Which, if any, of the following conditions DEFINITELY APPLY to the region or area where you work? (Check all that apply)**

- a) Lack of room for infrastructure expansion
- b) Very adverse weather conditions
- c) Serious traffic congestion and slowdowns
- d) Very high accident rates
- e) Rapid economic growth
- f) High volume of thru traffic via Interstate or roadway

***Thank you for sharing your insights with us!***