

Insights into Adoption of TSM&O Systems

-TSM&O Focus Group Summaries-

Report Compiled By
Illumination, LLC
Syracuse University

Principal Investigators:

Dr. Michael Morris
Dr. David Van Slyke
Dr. Craig Watters
Nola Miyasaki
Mirza Tihic
April Murdoch

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INTRODUCTION

As part of the NTOC data collection effort, thirteen focus groups have been conducted with approximately ninety participants. Focus groups were conducted with the main associational groups suggested as part of a purposive sample through recommendations with Peggy Tadej, Valerie Briggs, Shelly Rowe, Matt Sundeen, Dale Bowen, Zia Burleigh, and Bill Anderson. In addition, Jeff Paniati and Joe Peters served as advisors to this sample selection of participants. The services of SAIC were also used as part of this contract. The main purpose in conducting the focus groups was to gather data from a selected group of stakeholders important to both NTOC's mission and the goals of disseminating information about the Total Operations Concept (TOC), Transportation Systems Management and Operations (TSMO), and the Intelligent Transportation System (ITS) products and services. A semi-structured focus group protocol consisting of six different categories of questions was administered to participants in groups of eight or less at their national association meetings by a member of the research team. In each case, with the exception of the National Council of State Legislators (NCSL) focus group, a research team member facilitated the focus group. Each focus group was digitally tape recorded, the recordings transcribed, and the data analyzed. The findings reported here are representative of both the individual association focus groups and the aggregate findings across the focus groups. This report is organized as follows: introduction, methods, analysis of the aggregate findings, differences by association group, and the conclusion and implications. In addition, the appendix includes the individual focus group summaries. The intent of this report is to be both analytical and parsimonious.

METHODS

To conduct the focus groups, respondents were pre-invited based on the recommendations of NTOC and SAIC personnel. The sessions were held at major conferences, in smaller meeting rooms. A structured protocol with flexible probing was used to address several key topics including:

- Important transportation issues
- Conceptualizing maintenance vs. operations
- Familiarity with and perceptions of TSM&O
- Major obstacles to TSM&O
- Decision processes and players
- Information and decision-support needs
- Perceptions of marketing materials and communications

Participants were guaranteed confidentiality though sessions were tape recorded and transcribed. The general duration of the groups was one hour and forty minutes. Each of the focus group facilitators from the research team has extensive training and experience in qualitative methodologies and in conducting interviews and facilitating focus groups.

The breakout of the focus groups by conference, location, number of focus groups, and number of participants is shown in the table below:

<i>Conference</i>	<i># of Focus Groups</i>	<i>Location</i>	<i># of Participants</i>
NARC	4	Washington, D.C.	29
ITE	2	San Antonio, TX	20
NCSL	2	Washington, D.C.	8
AASHTO	2	Jekyll Island, GA	17
PTI	1	Chicago, IL	8
ITSA	2	Philadelphia, PA	8

AGGREGATE FINDINGS

Overall Issues

Generally, the importance of transportation is directly tied to the rate of economic development. Economic development also influences the prioritization of transportation projects and issues and, ostensibly, the role of TSM&O products and services. Given transportation's integral role to a number of community issues, it tends to not be approached in isolation, but rather as a key piece of a complex puzzle. Despite this, there is currently too much of a reactive posture, a crisis management approach, to thinking about and operationalizing transportation issues. While transportation planning tends to receive a fair amount of emphasis, transportation system development tends to be more reactive, taken on in response to developments in traffic flows, accidents, housing developments, and funding availability. It would be far more powerful and strategically sound if the approach used was proactive, integrative, and strategic.

An overwhelming challenge which surfaced repeatedly throughout the focus group process was the shortage of funding. As a subcomponent of this shortage, one of the specific areas of hardship includes the difficulty in balancing maintenance and economic growth. It was evident, throughout the focus group process, that construction trumps operations consistently. This construction focus is mostly due to political pressures to build new rather than to maintain old, because of the associated spillover effects. This focus on construction compounds the need for maintenance funding due to the original lack of maintenance funds for upkeep of the aging extant infrastructure, but also for the newly constructed infrastructure. Political pressures and incentives tend to shape individual decision making toward a short-term orientation, crowding out opportunities for longer-term considerations with respect to funding priorities. Two additional issues further complicate the issue of short-term construction priorities relative to long-term costs of infrastructure maintenance and operations. First, the infrastructure is aging much faster than maintenance funding is growing. There is an obvious need for raised taxes or for other sources of funding to be channeled to maintenance. Second, in rural areas, where the tax base is significantly reduced, the transportation spending is undercut by other policy priorities, such as education, health, and social services, leading to a significant reduction in TSM&O investments and adoption.

Another example of where the funding shortages lead to complications is through the inadequate human resources. There is a shortage of personnel to handle current transportation issues, and as new infrastructure is added, or new TSM&O systems are deployed, transportation departments are encountering significant difficulties in recruiting and retaining qualified technical personnel; a problem that is a function of several factors including compensation differentials between the public and private sector; recruitment of technical personnel by private firms away from local and state government agencies; and insufficient resources allocated by government agencies for hiring of personnel. As a result, there is a sense that the current field workers are already stretched beyond capacity, and this leads to both delays in deployment, system maintenance, and personnel turnover. The loss of technically trained public personnel is especially problematic because of the steep learning curve and training costs. There are currently very few educational programs which prepare individuals for the technical responsibilities increasingly required in the area of transportation operations. Therefore, public agencies and municipalities incur significant training costs to prepare new employees for their responsibilities. If trained employees leave, the

significant investment made in those individuals leaves with them, creating a cycle of expenditure and human capital loss for government agencies and transportation departments.

Though transportation is inherently a network connecting people, regions, and systems, there is a lack of intermunicipal and intergovernmental cooperation focused on system collaboration and shared transportation corridor development. As a result, few integrative efforts are being made to improve interoperability and interconnectivity with each local government and transportation department concerned primarily with their specific needs.

Most respondents indicated that the major driver to considering TSM&O solutions was safety. However, some respondents acknowledged that other factors carry decisively more weight in the willingness of an area to pursue ITS solutions. Some of these other significant drivers included political priorities and funding availability. An interesting comment was that homeland security funding may provide an avenue of access to TSM&O solutions that has not been available before.

Maintenance vs. Operations

Overall, there was a clear and meaningful distinction between construction and maintenance, while the distinction between maintenance and operations was not as clear. One definitional way of distinguishing between construction, maintenance, and operations was to identify construction as the capital investment (creating the asset), maintenance as sustaining the life of the investment (condition of the asset), and operations as how well it is functioning (i.e., performance of the asset). Under the umbrella of how well the system is functioning, operations was associated with the day-to-day activities that make the system work, such as coordination of traffic signals and traffic control centers. In general, it was seen as trying to squeeze more out of what has already been built. There was tendency to view operations as a subset under maintenance or maintenance as a subset under operations. Where a distinction was made between maintenance and operations is through the result of a lack of investment. A lack of investment in maintenance results in deterioration of infrastructure thus leading to a need for replacement construction. In contrast, a lack of investment in operations does not have the resultant effect on construction needs, but may require more investment in maintenance due to inefficient use of infrastructure. With regard to the budgeting between these transportation categories, the maintenance and operations budget is seen as a long-term effort, while construction is a short-sighted effort, though they are not currently managed according to this idea. Sources of funding also vary based on project type with construction and some operations projects supported principally at the federal level, while the majority of operations and maintenance projects are supported at the state and local transportation department levels. Most respondents felt that it was relatively easy to acquire federal funding for construction projects, but that the local level transportation departments were left to their own devices to fund maintenance and operations projects.

Furthermore, there is sense that elected officials do not understand the life-cycle investment costs and benefits associated with TSM&O, but clearly understand the political benefits associated with construction spending. However, for those technologies that are more familiar to elected officials, such as toll road transponders, the dilemma is that the investment philosophy is consistent with the initial investments, but not with a sustained operational and maintenance focus over the long-term. A theme consistently echoed across a range of stakeholders is that

political officials and those involved with the transportation system do a poor job of explaining the importance of a balanced distribution among the three areas to the public.

Familiarity with and Perceptions of TSM&O

Familiarity with TSM&O programs across groups was relatively high, though a trend of lower awareness among local transportation and elected officials was also evident. Regulation of traffic signals seemed to generate the greatest familiarity and usage. The tendency, however, was to look at the suite of TSM&O programs from an integrated perspective, but funding availability often redirected consideration to an individual system perspective. Moderating the extent of integration was the size of the municipality, support from elected officials and transportation executives, community need, and the perception of deteriorating quality of life indicators especially those identified as highly correlated with air quality, traffic density, and traffic flow. Another key element highlighted by the stakeholder participants is the importance of packaged technology-based solutions that reflect the unique needs, requirements, and capacity of different locales. The identified need is articulated as based on a range of municipal variables such as population density, area (measured in square miles), demand, growth, and the degree to which there is evidence of intergovernmental coordination and collaboration on systems integration. A clear message was that a one-size-fits-all approach is both ineffective and undermines the larger goals of adapting TSM&O to ameliorate the transportation demands on governments at all levels. In spite of how they are viewed, TSM&O programs are generally not conceived of and approached strategically, but rather based on priorities of sponsoring agencies and funding availability and a “get what you can” attitude.

Major Obstacles to TSM&O

Beyond funding, the major obstacles cited by the groups were:

- Scale vs. benefits: larger metro areas realize significant positive results; for smaller cities & regions it's harder to achieve the same economy of scale benefits
- Historical disposition to build & maintain, rather than operate
- Historical lack of usage of computers & technology; requires technical personnel, training, and institutional culture change
- Some regions resist DOT involvement and TSM&O installment for fear of ceding authority and control to other governmental actors, notably state transportation departments.
- 'Institutional stovepipes' result in a lack of information exchange, collaboration, and strategic thinking about adoption, implementation, evaluation, and maintenance of TSM&O programs. Instead of sharing responsibility for the transportation network, there are intergovernmental disputes over authority and control.
- TSM&O approached like construction [by civil engineers], with lifespan of 20 years, but technology changes rapidly and requires continual investments and maintenance. The current mindset is that TSM&O is static and does not require internal operational and personnel capacity to maximize its effectiveness.
- Skill shortage, amongst current as well as new employees especially on technical implementation and operational maintenance issues associated with ITS
- Significant investments and high degrees of risk associated with being a “first adopter”; therefore many units of government and transportation departments wait, with the expectation that they will first see evidence of effectiveness before considering adoption

and implementation. This approach results in slower diffusion of information, and less overall capacity and acceptance for adoption.

- A history of using complicated phrases & terminology continues to inhibit communication and understanding.
- Newly elected and politically appointed government officials are not educated about TSM&O.
- A lack of interoperability with existing legacy systems is a result of a lack of standardization. This deficit has led to a failure of integration and therefore the inability to gain synergistic benefits across regions and corridors from system adoption and integration.

Decision Process and Players

The decision making process starts with several key considerations which can be summarized in the following six questions:

1. Who is paying?
2. What are the benefits?
3. Why do we need it? – Tell the story
4. What are the long term system needs and costs?
5. What are the targeted outcomes?
6. How will these targeted outcomes be measured?

The groups revealed that the decision-making processes do not vary significantly across the various TSM&O programs, but vary by the political dynamics and process by which issues become prioritized across municipalities, regions, and states. Evidence of this was provided by the listing of the various players contributing to the decision-making process. Though the state DOT and MPO's were consistently cited as extremely critical in the decision-making process, the remaining composition and degree of influence among the different stakeholder groups showed greater signs of variance. Some examples of the various other players in the process included joint transportation committees, regional transit authorities, and chambers of commerce. One of the reasons for the State DOT's central role is due to the flow of funding. Historically, funding has passed through the State DOT from the federal government to local governments and then to municipalities or regional coordinating bodies.

The duration of the decision making process from initial consideration to the decision to allocate funding for adoption, given the number of stakeholders involved, tends to be quite long, involving two years when only one jurisdiction is involved and growing exponentially as more stakeholders and units of government are added. The more complex and integrated the system design, especially if myriad vendors are potentially involved, the longer the delay in implementation, given issues of standardization and customization. Since the technology life cycle is relatively short and the decision-making process is long, the state of technology at the initiation of the decision-making process is often different from that at its conclusion. The implications of this disparity should be examined more fully by those stakeholders with the most influence and system knowledge, such as the ITS JPO and NTOC affiliated associations.

Long term planning efforts tend to provide the general framework by which transportation issues are dealt. However, it is the emerging needs and situational funding that actually determine what

is adopted, demonstrating the reactive nature of the process. Driving the process is public safety, via the highly visible problems of severity and frequency of accidents and citizen complaints. It is felt that if there were more financial incentives to examine, consider, and implement TSM&O programs, such as pass through grants with few or no restrictions (possibly those requiring a realistic match), adoption and implementation would be more effectively facilitated.

There are always and must be champions who play instrumental roles in implementing these systems. In some cases, there has been both a technical champion and a political champion. These champions facilitate the process through the formation of partnerships and alliances, work to make the project a priority, acquire funding, and set an implementation timeline. Where political champions exist (and they need to), adaptation and implementation are achieved with more success. Currently, political champions are lacking, though some can be found functioning as city managers and directors of regional MPOs. Technical champions can come from a larger variety of positions, but more often than not they are in positions of management responsibility within transportation agencies. Integral to the championing process is the ability to communicate complex information in a direct and easy to understand manner and explain the costs, benefits, life cycle investments, best practices, and benchmarks set by earlier adopters. Emphasizing the benefits and costs to a range of stakeholders with different motivations and incentives is critical to getting TSM&O issues on the table, debated, and considered for investments and adoption.

Info and Decision-Support

When making decisions regarding TSM&O programs, one key informational requirement is the ability to compare operations and construction solutions to the same problem. In support of this type of comparative analysis, there is a consistent desire to be able to review cost and performance data from the technology being used elsewhere, as captured and communicated by peer experiences. The city or region used for comparative purposes must have similar problems or characteristics; a degree of homogeneity in order for the comparison to be perceived as both valid and reliable. This demonstrates the sensitivity of these groups to the scale associated benefits based on system adoption.

The information must be convincing, as it will tend to be viewed skeptically, more so for the more recently developed and adopted technologies which have less of a track record for comparative performance assessment. Creating a database of information which is comparative, valid, and reliable is critical for addressing the trust, reputation, and quality factors that are implicit to the decision to adopt TSM&O systems. The general perception among the stakeholder participants, especially the vendors, that this type of data for a particular region to assess a particular solution are not available.

Some of this skepticism regarding data that comes from the FHWA and US DOT is due to a larger skepticism about federal authorities. As state and local entities have become more professional concerns about intergovernmental control and authority, especially federal agency direction, has created tensions. This is a natural result of fragmented governance, but one nonetheless that compromises the effectiveness of intergovernmental solutions. Hence, there was some sentiment that the people behind the data have not been “in the trenches” or dealt directly with citizens. A majority of participants suggested that information from AASHTO, state DOTs and think tanks is more relevant. Because of this belief, and the comparatively longer

time taken by the US DOT to compile collected information, alternative information sources, such as NTOC, have been more frequently sought out. This is a natural result of fragmented governance, but one nonetheless that compromises the effectiveness of intergovernmental solutions.

Other frequently accessed information sources included:

- consultants
- vendors
- peers
- trade associations
- TRB
- Federal Highway

Respondents indicated a desire for greater access to federal officials when attempting to evaluate TSM&O programs, as they felt that these officials are not typically participants in local-level discussions. A suggestion is to create a 'one-stop-shop' for accessing and acquiring information and data to support the decision-making process. Alternatively, there could be a central index that would quickly refer those involved in these decision processes to peers in other states and localities that have direct experience in implementing these systems at the community level.

In considering the core aim of the marketing materials, the decision influencers such as traffic engineers or vendors state that they generally do not need convincing as to the merit of TSM&O programs for consideration, but they need tools to aid in convincing others as to the investment benefits. Following on this, many of these groups do not feel as though they have access to relevant data, including the human capital costs associated with implementation and operation, and the knowledge of strategic marketing in terms of making the case for TSM&O investments. These groups are seeking help and guidance on their efforts to educate and involve stakeholders, especially those critical to the decision making process.

Perceptions of Marketing Materials & Communications

Overall, the perception is that there is information overload. The range of additional feedback and perceptions states that the materials are redundant, outdated, contradictory, not comprehensive, too generalized, objective but not representative, disorganized, difficult to access, use, and understand. Some also suggested that the material seems biased, because of the single-minded focus on success stories, with little attention and few examples to unsuccessful experiences which respondents suggest do exist. The materials are also perceived as representing large metropolitan areas with few comparative examples from areas considered to be less dense, more suburban, and rural in composition.. The degree to which participants agreed with each of these descriptors varied, so this statement of findings should only be interpreted as a representation of characteristics elicited in discussion.

Across focus groups, there was a communicated desire for publication approaches that make the information more interesting to the public and other stakeholders involved in the decision making process. Although the awareness of the website was low, when shown, it was perceived as more current and relevant, although questions of accuracy were expressed. We found that technical personnel preferred the website as a quick and accessible information source. In

addition, all the participant's recommended 3-4 page summaries/brochures (glossy) for elected, politically appointed, and senior managers and a desire to see more executive summaries with "wow" effect (cost-benefits, safety, and resulting effects on important issues to elected officials and senior department leaders with regard to economic development and quality of life indicators).

To aid in TSM&O marketing efforts, respondents suggested that FHWA add to their website information that includes instructions and applications for funding support for TSM&O programs, a listing of potential funding sources, and examples of successful and less successful applications for support. Complimentary suggestions for how FHWA can help different groups adopt and implement TSM&O included the development of a peer-to-peer training program and the availability of customizable brochures so that each audience can be segmented and addressed appropriately. For example, respondents would like to create short, catchy, one page glossy flyers for legislative officials.

NOTED DIFFERENCES BY GROUP

National Association of Regional Councils

Transportation Issues

The individuals in this group were more likely to view transportation issues in the context of the numerous competing regional interests vying for the same attention and funding. However, there was also a deeper understanding of the way in which transportation complements the needs and issues raised by other policy decisions that affect a communities quality of life ranging from congestion, air quality, mobility, land use planning, economic development opportunities, access to employment opportunities, goods, and services, as well as reduced and predictable commute time. It is through this acknowledgement of transportation as having multiple and interdependent impacts that allows it to garner attention and funding from policy makers. These respondents also felt that awareness of the integral nature of transportation in dealing with these other issues was increasing among the public and the elected officials. Another issue this group discussed was the desire for a “transportation network.” Since transportation connects regions and municipalities, these individuals believed that development and maintenance of the network of roads connecting areas should be a shared effort with increased cooperative efforts. Some efforts are currently underway across state and local governments regarding increased integration of TSM&O along specific corridors, such as in the Washington, D.C. metropolitan area which include the District of Columbia, Maryland, and Virginia.

Decision-Making Processes

There is a variable relationship between the MPO/RPO and the DOT in terms of the degree to which the MPO and RPO are influential in the decision-making process. The DOT is always seen as the director of the process, but the MPO may have a role in the projects it believes are both needed and feasible and for which information exchange and funding can be achieved in collaboration with the DOT. Another factor influencing the involvement of these regional participants is the size of the area. In the larger areas, there are more stakeholders which increases the costs and time it takes to reach consensus, and thus constrains some of the planning organization’s ability to drive the process. Most of the individuals from planning organizations are involved in environmental scanning, stakeholder involvement, and even decision making, but have significantly less involvement in the adoption, deployment, and implementation of TSM&O programs.

Information Needs

This group voiced a need for closer monitoring of public awareness, needs, and desires. They feel that they currently don’t have adequate systems or methodology in place for capturing the public’s perceptions and demands. In addition, these regional council members would like a more clear analysis of the human capital costs associated not only with adoption and implementation of TSM&O systems, but also for the continued operation and maintenance of these systems. Also, because of the pace at which technology becomes cheaper or outdated, these individuals would like a tool that makes it easier to weight the costs and benefits associated with immediate versus delayed adoption and implementation. There is a perception that waiting is generally beneficial due to the decreased cost of systems once the manufacturers are able to

realize scale benefits. As we know, lack of adequate funding is of extreme concern to transportation officials and applies significant pressure to delaying investment decisions.

American Association of State and Highway Transportation Officials

Transportation Issues

A significant source of stress and concern to the individuals in state DOTs is the lack of funding for maintenance. The participants feel pressed to overcome the deterioration of the existing state transportation infrastructure which is outpacing the allocation of funding for their repair. The main reason attributed to this disparity between funding and needs is traced to the legislative reluctance to impose new taxes and reallocate resources away from programs that resonate with citizens such as education and state funded health care costs. Participants suggest that elected officials are unwilling to advocate for tax increases because of the negative consequences with constituents.

Maintenance vs. Operations

Generally, the DOT receives funding for maintenance and operations in one lump sum. Then, it is the responsibility of the DOT to allocate the funding appropriately. The DOT views maintenance and operations as long-term strategic initiatives in contrast to the construction projects which can be driven by an immediate response to a crisis. However, an unintended result of new construction and one that does not attract new resources even though there are new costs is the pressure on the maintenance and operations budget. This expense is often underfunded and therefore left for DOTs to resolve, typically through resource allocation tradeoffs.

Familiarity With & Perceptions of TSM&O Systems & Services

This group is extremely familiar with these systems and services, and often takes a leadership role in advocating for TSM&O. The systems they are most likely to promote are those that they perceive to fall within their realm of responsibility, in that they are not currently considering the vehicle specific systems, such as driver navigation systems. The DOTs generally perceive these systems as definitely needed with staged implementation occurring first in highly populated areas and moving to the least populated areas over time based on assessed need and available funding.

Major Obstacles to TSM&O

For this group, the major obstacles which differed from the perspectives of others included:

- Difficulty communicating and persuading the public as to the merits of TSM&O
- Difficulty finding appropriate solutions for the state as a whole
 - Connectivity between city and regional systems
 - Cooperation among regions within the state
- Short technology life cycles

Decision-Making Processes

The DOTs acknowledged that TSM&O systems and services cannot be installed without their involvement. Therefore, the DOT plays a gate keeper role with respect to TSM&O priorities and funding. In the decision-making process, members of the DOT play many roles:

- As Advocate
 - As an advocate for the systems, the DOT decides which systems seem reasonable in a given context and work as the information disseminator. Through information distribution, the DOT serves two roles as educator and marketer. In this way, the DOT educates the public and MPOs among others as to the benefits that can be realized through the implementation of TSM&O systems. As a marketer, the DOT builds a persuasive business case for presentation to the various stakeholders. The members of the DOT work to make these systems relevant to the problems faced by different regions so that it will garner the needed political support and funding.
- Alliance Builder
 - As an alliance builder, the DOT must work to establish strong relationships with the regions it represents. Good relationships facilitate the adoption of recommended TSM&O systems through the development of trust and a shared mission across partners.
- As Coordinator
 - The DOT works to make sure that there is coordination across boundaries to connect transportation systems and ensure the link between rural areas and metropolitan areas within the same state are seamless.
- As Funding Allocator
 - The DOT is able to use its own discretion in the allocation of funds appropriate for maintenance and operations.

Information & Decision-Support Needs

The DOT looks to the Federal Highway Administration and the Transportation Research Board for information on TSM&O. They prefer the format that was presented via the website demonstration. In addition, this group prefers access to very detailed information should the need arise and that they be given the information before anyone else. They like to have the ability to filter the information and structure it before dissemination to other groups. For example, when they put together their marketing packages for legislative officials, they realize that very brief and flashy one-page brochures are an effective medium relative to longer publications with more technical criteria for field personnel. The ability to tailor information to each of the stakeholder groups is an important asset as well as communicating consistent messages.

National Conference of State Legislatures

Transportation Issues

Although the group members did have different perspectives on transportation issues, they agreed that capital construction and maintenance/preservation are the biggest transportation issues, with identifying the appropriate funding being their greatest challenge.. There is variation in how states spend funds appropriated for transportation issues according to the NCSL stakeholders but two general points of consensus emerged. They are 1) that some states expend a greater share of their funding on maintenance rather than construction and 2) that more densely populated states with larger urban areas steer their future transportation plans toward an expansion and improvement of existing highways rather than focus on operations and educating the public about public transportation alternatives.

Familiarity With & Perceptions of TSM&O Systems & Services

Most respondents were quite familiar with the various TSM&O systems and services. This group believes that implemented systems and services are useful and work well, but do not meet the expectations often associated with TSM&O. This is a result the participants believe of overselling the benefits and minimizing the costs (especially life cycle) associated with TSM&O and therefore creating expectations for performance and effectiveness that are unrealistic and difficult to achieve.

Decision-Making Processes

Overall, the participants agreed there needs to be a champion to move TSM&O to a position of priority on the decision and funding agendas. Legislators perceived their influence to be of consequence only in some aspects of the decision making process, but that in other areas of importance such as appointing members to transportation boards. The transportation board was identified as champion followed by state DOTs. Legislators are not considered to be the experts compared to those two champions, due to their lack of knowledge and understanding of technology, though those that are knowledgeable on transportation issues tend to emerge as champions.

The respondents suggested that legislators act proactively when they see operation systems and services implemented and where the benefits associated with these systems, such as congestion mitigation, are perceived as leading to overall improvements in their constituent's quality of life. Other respondents characterized the actions of legislators as more analytical in orientation with a focus on historically the role of TSM&O, the fit and need components of their municipalities current situation, and the range of possible solutions that can be implemented and the associated costs and benefits.

A major emphasis of the state legislatures is to generate and solicit as much public involvement as possible from as many different stakeholders as possible for purposes of building ownership and advancing TSM&O on the policy and public funding agendas. Effective stakeholder involvement communicates information and manages to express what the problem is, who is affected by the problem, and the alternatives that can be formulated and adopted to resolve the problem. The NCSL participants saw their own efforts as consistent with this strategy.

Information and Decision-Support Needs

The most critical information needs were those associated with the costs and benefits of TSM&O adoption and implementation. Key to the information needs of the NCSL stakeholders are being able to articulate answers to questions about the system costs, who the beneficiaries will be, how the systems will be operationalized, and what tradeoffs they will need to consider in other policy and program areas. Their preference for information is that which they receive from their peers, is visual, and to the extent possible, for pilot and demonstration projects so that risks associated with failure of fit are minimized. Interestingly, legislators perceive commercial vendors as more credible than federal agency personnel. One reason, among others, is the perception that agencies like the FHWA are considered to be overtly institutional, detached from field (local) level operations and needs, and therefore not particularly visionary in thinking about variability of need, integration issues, and understanding of local and state level political dynamics which affect TSM&O adoption and implementation. Too often, the stakeholders suggested, federal agency personnel use a sledge hammer for a nail – a metaphor for insufficiently thinking about local need and fit.

Public Technology Institute

Important Transportation Issues

Consistent with other stakeholder groups, congestion issues (and their symptoms) are seen as concerns, such as problems on ramps and freeways, controversy over willingness to share the road with cyclists or pedestrians, and road expansion and creation of sidewalks. Perhaps most important is that infrastructure assessments show significant deterioration. One reason attributed to this is the constant pressure to build new rather than maintain the existing infrastructure and system.

Maintenance vs. Operations

Among the respondents there is a belief that political officials do not understand the life cycle investments required for the infrastructure. In part, this is related to a second observation which is that it can be difficult to incorporate operations and maintenance into the long-term plans when agency budgets do not present many opportunities to plan beyond the present needs and demands.

Familiarity with and Perceptions of TSM&O Products and Services

Overall the group is very aware of all the TSM&O, though these respondents suggest there is a lack of awareness and understanding among their elected officials.

Major Obstacles to TSM&O

Many of the stakeholders in this group view themselves as partially responsible for the slow adaptation of these systems and services, due to the ‘complicated’ categorization of the systems and services. This makes it more difficult for the decision makers (including elected officials) to understand what these systems and services are, how they can be effectively utilized, and what

their corresponding costs and benefits are. Furthermore, the phrases as well as the terminology within operation systems and services has changed a number of times since 1991 adding to the confusion among decision makers, stakeholders (including the media and professional information outlets), and the general public.

There has been and continues to be confusion over operations and management versus operations and maintenance. One argument often made is that there are no incentives for maintenance and that decision makers in charge of budgets and resources will not make operational investments unless there is a crisis, public outcry, or some other event which changes their own short-term orientation and incentives. For the PTI constituency, one of their significant frustrations is that the life cycle and maintenance cycles of operational investments are not at all understood and often ignored with respect to decision making.

Another obstacle identified by the group is the lack of technically trained personnel in public transportation departments and agencies. Many of the stakeholders in this group suggested that their own departments and those of their peers in neighboring communities and other professional networks are struggling to fill vacant positions (technicians, civil engineers, transportation engineers) and retain personnel being recruited by private firms. Moreover, the engineers currently on their staffs are older and were educated 20 years ago when such operations systems and services did not exist. On the other hand, they struggle with senior leaders and appropriate committees over compensation for new hires; often losing highly qualified candidates to private vendors. However, they suggest that the move to contract with private vendors for personnel is actually more expensive than offering a fair and competitive compensation to existing personnel and new hires.

Funding is cited as the other major issue confronting their agencies decisions on TSM&O adoption and implementation. An implication from this group is that crises have been used for acquiring funding as well as electoral cycle appeals. However, these stakeholders were also keenly aware of the tradeoffs and competing priorities for elected officials and council-manager forms of government. There are clear preferences for funding when comparisons are between arterial management systems and libraries. In this case libraries win. Several of the stakeholders suggested that whatever champions there are internally are not engaging the external stakeholder community as an effective leverage point on the issue of resource allocation and budgetary appropriations. They suggest that what is missing are stakeholders with legitimacy that champion on-going maintenance.

Another implication expressed by this group is that the life expectancy for ITS investments is not well understood by elected officials. This issue resonates with the feedback from other groups, but also highlights issues of time considerations (short vs long-term) and incentives for participation and engagement because of the politicized administrative environment in which transportation priorities and funding decisions are made.

Decision Processes and Players

The group predominantly identified the city manager/council as the champion of TSM&O on the city level, while MPOs were identified as champions on the regional level. The PTI group of stakeholders spoke about their championing ITS incrementally, continually scanning the

environment for an opportunity to press and advocate the issue, and acknowledging that opportunities can arise as a result of a crisis or because of other factors in the community, such as economic development, building and facilities expansion, or some other combination of community need and demand for government responsiveness.

There are competing uses of federal matching funds and the need, therefore, is to champion internally and raise ITS visibility to external stakeholders who often desire to use a federal funding match for other projects that are more capital intensive or more easily viewed, communicated, and appreciated by local constituencies. Frequently, low benefit investments take priority because of a misunderstanding between what the problem is and what officials think the appropriate resolution ought to be.

Information and Decision-Support Needs

The information perception of the group is of information and material overload with too many websites, too many emails, and too many files. Furthermore, the group would like to see more collaboration between the automobile industry, ITS and public municipalities.

In addition the group indicated that there is need to more effectively communicate maintenance costs of operational investments. There is also an urgent need to translate complex material and then incorporate it in realistic budgets scenarios with cost-benefit and life cycle data.

ITS America

Importance of Transportation Issues

For the near future, one of the issues for the next two years identified by the group is the interoperability between systems and the integration of systems across municipalities. The vendors interviewed identify a lack of experience, intermunicipal cooperation, and information dissemination as critical issues constraining TSM&O adoption and implementation. They see, as did all of the other stakeholders, a need to increase the priority of funding for ITS at the political level.

Maintenance vs. Operations

The group identified that at the federal level the funding priorities are to pay for construction and in some instances operations but not for maintenance. The reason suggested is political priorities and incentives and federal agency managers not wanting to take risks in advocating for other initiatives with their political representatives. The vendors, however, see their role as beginning to engage the political process to educate and develop support among elected officials for operations and maintenance funding.

Familiarity with and Perceptions of TSM&O Products and Services

The groups were generally very familiar with the TSM&O. A pattern was identified among these stakeholders with regard to their answers about the familiarity of the products listed on the handout provided them as a component of the individual interviews and focus groups. The first five systems and services on the list are the ones that the participants were the most familiar with

(Arterial, Freeway, Transit, Incident, and Emergency Management Systems), while the last 4-5 on the list were the ones that they were least familiar with (Commercial Vehicle Operations, Intermodal Freight, Collision Avoidance Systems, Driver Assistance Systems, and Collision Notification Systems).

The group indicated that the old systems are very complex and this creates barriers in the vendor community because of difficulty in creating integrative solutions with newer technologies. In addition, vendors do not achieve economies of scale when each client project is a customized design and therefore not easily replicated in other municipalities and transportation agencies. Additionally, the reasons to use or incrementally test and implement TSM&O have not really been accepted by the public.

Major Obstacles to TSM&O

The groups talked a lot about the human capital capacity and institutional memory deficits within departments of transportation especially in terms of skills shortages among personnel with respect to TSM&O programs.

Additionally, the participants pointed out the significant variability by states in TSM&O adoption based on need, fit, and budgetary resources. Again, from the perspective of vendors, such variability creates barriers to market entry and a challenging operating environment especially when the decision making process and political environment can result in long-term vendor investments that are vulnerable to the discretion and preferences of elected officials who may have very different priorities with respect to transportation funding from one electoral cycle to the next.

Also, with regard to the lack of interoperability and information exchange this group of stakeholders identified more unsuccessful examples and attributed the lack of success to the DOT trying to sell outdated technology, lacking a strategic vision for an integrated approach to TSM&O, and failing to focus on its range of customers and placating elected officials.

Decision Processes and Players

Identifying and building relationships with institutional champions is seen as the key entry point into the decision process. The vendors work at educating the champion(s) about the TSM&O as well as about the possibilities for acquiring funds. and impact the decision process. Additionally, they agreed that generally the higher the level of the official [the champion] the greater the probability of success. Another point was that the benefits of TSM&O are not well established and not well quantified in a way that allows soundbite translations.

Out of the interview and focus group discussions came an understanding that the vendors segment their market and act as educators on various TSM&O, decision processes, and funding mechanisms. The vendors do not rely on MPO to influence decision makers since there is a perception that MPOs lack champions; therefore they personally seek to outreach and educate, influence, and market their products and technologies at various levels in government and in the decision making process. Similar to other groups, the vendors suggested the decision process from initial consideration to adoption and implementation could take upwards of two years. Therefore, vendors take a long-term perspective to cultivating key personnel and elected officials

recognizing that elected officials and public agency managers as a group look to mitigate risk. As such, the vendors seek to lower the barriers to TSM&O adoption, especially given rapid changes in technology, by using data to demonstrate the benefits and costs of adoption and of maintaining the status quo.

Information and Decision-Support Needs

Five major information sources were identified that their [vendors] customers rely upon when making the decision to adopt TSM&O, namely

- 1) Consultants
- 2) Product information (from the group)
- 3) Peers (peer to peer network)
- 4) Customers and decision makers (frequently seen at trade associations)
- 5) Pilot tests and demonstrations

The vendors suggested that association meetings, such as the ITSA meeting, serves as a vehicle for creating peer to peer networking opportunities. Vendors with more experience, a greater inventory of TSM&O programs, a wider range of partnerships with other vendors, and greater financial resources are able to capture larger shares of the TSM&O market given their competitive advantages. Smaller vendors are cited as often using sales and marketing techniques that may misrepresent the firm's expertise, its capacity for system design and implementation, and its experience working with a range of government transportation departments.

The ITSA stakeholders viewed the TSM&O materials as inadequate and dated, especially the website because only successful examples of adoption and implementation are represented. Further, the vendors suggested the data is of questionable validity, lacks reliability, and is not representative of the continuum of adoption and implementation experiences. If the goal is TSM&O diffusion, adoption, implementation, and evaluation, then the vendors conclude the current emphasis on information exchange and dissemination is incomplete. The stakeholders think there is much potential, especially based on what they saw during the website demonstration, but that significant changes and additions need to be made before they would have confidence in the data and materials and more fully utilize them as resources in their own marketing and relationship development with government agencies. One option they suggested is involving a range of stakeholders in a beta test and analysis of the FHWA and ITS JPO websites. A recommendation is to potentially have FHWA connect the website material with vendor websites and materials to increase awareness and thereby more effectively disseminate information to government transportation departments.

Institute of Transportation Engineers

Transportation Issues

ITE group members indicated that their agencies are encountering significant challenges in developing the necessary human capital capacity for deployment and on-going maintenance of TSM&O programs. A number of reasons were cited that are consistent with those expressed by other stakeholders, such as a lack of trained technical personnel, compensation disparities between the public and private sectors, recruitment and retention difficulties, and developing the appropriate training protocols once new hires are in-house. Consistent with these challenges are the resulting costs associated with recruiting, training, and retaining qualified staff. Many of the participants highlighted the cyclical nature of this process and the corresponding loss of both capacity and institutional memory. A consequence therefore is a natural dearth of TSM&O champions within public agency transportation departments.

Construction vs. Maintenance vs. Operations

This stakeholder segment sees an imbalance in government funding which has resulted in inadequate maintenance and infrastructure deterioration with safety issues as a consequence. They believe this trend has begun to shift with a project evaluation focus on total life cycle costs as opposed to build costs only. Complementing the project evaluation shift, there has been a shift for some of the stakeholders in the prioritization of funding, with maintenance becoming a first priority, operations and matching projects second, and new construction coming last, based on residual funds. Although the respondents were able to clearly delineate operations from maintenance, budgeting for the two categories is not differentiated. One general fund is used for both types of projects. Funding for projects typically comes from a portion of gas taxes and a percentage of the sales tax.

Familiarity with and Perceptions of TSM&O Products and Services

Most respondents were generally familiar with the various TSM&O systems and services. The process is viewed as complex because of the myriad stakeholders involved and the fear of exceeding budgeted appropriations. Furthermore, there is also a perceived difficulty in integrating the disparate systems such as arterial management, incident management systems, and emergency management systems into a comprehensive system that can be effectively used by a range of related agencies with similar goals, such as first responders.

Decision Processes and Players

The group identified themselves as champions though acknowledged that depending on community scale effects they play more or less of a role depending on the number and influence of other stakeholders operating in the decision making and resource allocation environments. It was implied that champions can be anyone who has technical knowledge while others suggested that understanding how to effectively communicate and navigate the political and bureaucratic contexts is of greater value in championing TSM&O. Due to the risk averse organizational cultures of government agencies, most individuals who stated they had been a champion in the past also suggested that the implementation of TSM&O is incremental and often requires considerable creativity and adaptability, skills and leadership competencies not frequently rewarded in public agencies. One example of creative funding is the utilization by some

municipalities of Congestion Mitigation Air Quality (CMAQ) funding. CMAQ funds were used for the adoption and deployment of certain TSM&O programs in order to reduce congestions and other airborne pollutants which lower a region's air quality ratings. While this funding was short-term in its orientation, effective TSM&O champions found mechanism to use this funding and adapt their own environments and TSM&O priorities to the funding opportunities that exist at a particular point in time. In some way, these champions act as policy entrepreneurs.

According to the ITE stakeholders the public is an important driver of TSM&O implementation, but proper educational outreach and involvement is needed before the public will take an ownership role and become advocates for change. In addition the focus group participants saw several gaps in involvement including individuals with traffic engineering and policy as missing from the decision table, and a gap between engineers and elected officials in terms of each others ability to understand the others incentives, preferences, and motivations. , and once they see the benefits they will often become advocates. Networking with elected officials is seen as critical for successful initiation, consideration, adoption, and implementation of TSM&O.

The general decision process is identified as consisting of the following steps:

1. Begins with state and local officials and identifies a need as legitimate.
2. Engineers (various) become involved.
3. The case for consideration is presented and analyzed by MPOs, State DOT personnel, at times a representative from the regional FHWA agency, and representatives from ITS regional architecture planning committees.
4. Elected officials are involved and play a role in the approval and funding of the project.

Consistent with the views expressed by other stakeholders, it is implied that the length of the process depends on the size of the project, leadership over and in the process, and the budget. There is variation in funding requirements. If a match is required, implementation can take a longer period of time depending on the success of the municipalities in leveraging additional funding to meet the match criteria.

To implement TSM&O, the participants implied that one has to look for the window of opportunity and not to be afraid of failure or discouraged by rejections, to be persistent and have a concept plan, and to persist in getting and keeping stakeholders involved. Some of the group members discussed first trying to work within their own budgets appropriations before going out to identify federal funds, which are always seen as a principal funding source.

Information Needs

The group identified that TSM&O is perceived as a 'solution looking for problem', and their suggestions on a marketing approach would be to change this perception, Moreover, they emphasized the relevance of operations system and services with considerations of the average citizen who would be likely to ask how TSM&O applies to her and what are the benefits?

Perceptions of Marketing Materials and Communications

The website was identified as a great resource for someone who has the time and desires a more extensive set of information resources. However, the participants suggested that they do not have the time do go through the website and so an alternative communication medium and vehicle is

needed to reach them. One suggestion is for a monthly or bimonthly email that gives links to summaries and greater detail which can be accessed at a later time.

CONCLUSION & IMPLICATIONS

There are a number of important conclusions and implications to be drawn from this data collection process. The first concerns the value of TSM&O. For different reasons depending on the locale, maximizing performance of existing transportation assets is becoming an increasing economic, political and social necessity. TSM&O is generally viewed as being instrumental in this regard. For both dynamic growth regions and those that are struggling economically, TSM&O is recognized as a necessary part of the future, and yet, its adoption tends to be piecemeal, while the obstacles to adoption are significant. At the core is the question of whether TSM&O is the solution for tomorrow or the solution for today. While one would hope the answer is “both”, the reality appears to be that people see the value in these systems, but view adoption as something that should happen somewhere down the road. Stated differently, the challenge may be less one of creating awareness of these systems or even convincing people of the potential value of such systems, but rather, reinforcing the need to adopt them now rather than in the future.

The focus groups make clear the critical need for a more strategic approach to the fostering of TSM&O adoption. Although significant effort has gone into TSM&O promotion and information dissemination, and much progress has been made, there is a need for a more integrated and targeted approach that is predicated on specific communication goals. It also became evident through this study that the adoption of TSM&O varies by state, region, and municipality, with each area playing a role as adopter, innovator, or laggard. Given that there is variability in the receptiveness to TSM&O, it is apparent that a blanket, or one-size-fits-all, approach is inadequate to meeting the various needs. An effort to segment the marketplace and use that segmentation to facilitate the dissemination of the right information to the right people will be a useful first step in the process of offering more customized information. To determine if there is a right time at which these individuals should receive this information, a deeper understanding of the adoption process is in order. This study has revealed that the process has many idiosyncratic steps and stages, and it will be valuable to create a generic buying process and test its validity among these groups. In addition, respondents can be asked if their information needs change according to the stage in the process. The identification of the assortment of information requirements of the various parties at the various stages of the process will allow for the development of a marketing plan. This marketing plan will allow Federal Highways to move towards more effective development of material which will also be more supportive to the needs of the readers.

The findings suggest that, in general, transportation management efforts are plagued by the following challenges:

1. Inadequate funding allocation to all transportation activities, though maintenance seems to be of specific concern at this point in time.
2. Significant funding challenges in managing TSM&O once a solution is installed.
3. Lack of coordinated effort among officials within the same region as well as across geopolitical boundaries, including a lack of incentives or perceived benefits to such coordination and participation

4. Reactive management of transportation problems, instead of using a long-term strategic approach. This tendency limits flexibility in resolving transportation issues, and results in inadequate attention given to TSM&O solutions.
5. Inconsistent terminology used in relation to aspects of transportation from simple distinctions between construction, operations, and maintenance to the more challenging distinctions between TSM&O, ITS, etc.,
6. Lack of political awareness and understanding of TSM&O solutions
7. Difficulty shifting from historical patterns of behavior and perceptions to incorporate new innovations and technology into operational practice, leaving the transportation network behind the times compared to most other industries. To learn to incorporate technology into transportation management is a challenge for these many locales, requiring not only investment in training but also a cultural shift or a new way of thinking about technology and the realization of its capabilities.

A more strategic approach might help change the current state of affairs. Specifically, the focus group results would seem to support the following kinds of priorities:

- Development of product/market strategies:
While it is important to encourage a “total operations concept” the meaning of such a concept is not universal. There are clearly segments within the larger set of potential adopters, and these segments have differing needs, perceptions and abilities to pay. The implication is that different product packages should be developed based on the segment being targeted. Goals should be established in terms of TSM&O product penetration by market segment.
- Bringing an integrated and targeted approach to communication efforts regarding TSM&O:
A plethora of information exists regarding virtually any facet of TSM&O. Yet, a surprising lack of knowledge exists regarding the audience or user of this information, how they use information, what information they require and when, the credibility they place on different information sources, and so forth. The challenge is one of crafting a communications strategy that is tailored to the adoption process and set of players involved when a given authority has a need to better manage their transportation assets. Further, the integrated set of communications that is effective with one user segment will need to be varied with other user segments. Hence, communication efforts should be designed with the product package and target audience in mind.
- Thinking in terms of a communications mix:
Part and parcel to accomplishing the above is the need to look at the entire range of communication tools, communication approaches, and information resources from the vantage point of how they (or certain ones of them) might complement and reinforce one another in a coherent way across the stages in the adoption process. Creating such synergies will allow for a much more dynamic communication effort.

- Movement to more reliance on personal information sources:
 From a marketing vantage point, adoption of TSM&O by a given state or municipality represents a type of organizational buying behavior that involves considerable complexity, political and economic implications, and meaningful risk. The ability to influence adoption decisions is severely limited if the communication approach is relatively passive. In addition to written reports, descriptive brochures, and a variety of on-line materials, it is important that communication efforts include a human dimension, with one-to-one personal interaction.

- More reference points that are relevant and timely reference points:
 More case studies are needed regarding the experiences of different types of regions, cities, etc. with different TSM&O solutions. Such case studies should address not simply cost and performance issues, but decision processes, decision contexts, unique challenges and developments and how they were dealt with, and related insights. Users need to understand the contexts in which these solutions have worked.

- Creating local “role models”
 Establishing a “role-model” county in each state which will have federal support to implement ITS. This county will then serve as the educator and demonstrator to other counties. This would be equivalent to creation of a best practices benchmark to which demonstration monies are allocated and then progress and data are collected, analyzed, and evaluated, with the intention of disseminating this information.

- Culture change
 Finally, beyond piecemeal adoption of TSM&O, there is an overarching need to change the culture that surrounds transportation system management at regional, state and local levels. The cultural priority must be that of maximizing the performance of existing assets. Examples of efforts that will reinforce such a cultural shift include:
 - a) Creation of a shared set of goals in which federal resources are used to incentivize more intergovernmental cooperation on transportation planning and integration. This effort is intended to stimulate programs and activities that are more collaborative in nature and thus away from an individual community specific focus.
 - b) Creation of a plan for communities and officials to leverage their resources to maximize the benefit to the network. For example, if one community develops software that might be of use in other geographic areas, working to make this available to others would be valuable. Also, when a certain county’s transportation officials have been involved in TSM&O program

implementation, they should be available to train/teach neighboring counties based on their experience. Since human resources are very constrained right now, sharing the training burden through pooling of employees may be a viable solution.

- c) Creation of an incentive system to aid in the shift in perspective required to achieve national goals. Possible incentives may include matching funding to develop corridor collaboration around arterial and freeway management with surrounding communities, or even incorporating and integrating intermodal options in areas where there is already TSM&O implementation, such as around the ports in Baltimore and Savannah.
- d) Creation of a national plan requiring a shift to computer operation and connectivity. Perhaps the US DOT could develop a national plan with leadership from FHWA and with TSM&O funding from the ITS JPO. This national plan may involve use of a demonstration project (test site) approach to study information exchange, strategic planning with goals focused on inter-municipal cooperation on transportation operations systems implementation. With successful and exciting demonstrated results, this type of plan would aid in the encouragement of all regions to incorporate technology into their operations procedures and connect to neighbors.
- e) Efforts are needed to change institutional cultures to ones that are not only comfortable with technology usage in the transportation context, but welcome it. Recipients should learn of the capabilities technology lends in the areas of problem assessment, solution identification, implementation, and connectivity.
- f) It seems the state DOTs would also benefit from the creation of instructions on how they may modify any or all of this information for appropriate marketing purposes within their states.

APPENDIX

NARC Focus Group #1

Below is a synthesis of the patterns and trends in answers from Focus Group #1 led by Michael Morris and Nola Miyasaki on February 6, 2006 at 1:40 p.m. The session was held at the Omni Shoreham in Washington, D.C.

I. Importance of Transportation Issues

Transportation generally ranked second or third among governmental priorities, following economic stability and education. Its importance tends to be highly associated with economic development, with areas experiencing higher rates of economic growth ranking it higher. Economic development also influences the relative transportation priorities and, ostensibly, the role of TSM&O products and services. Jobs, housing, overall economic development, and availability of federal funds tend to combine to determine the priorities in terms of transportation. Density and mobility (getting people to and from work) were the leading problem areas. Private development of roads and the creation of more toll roads were also seen as important trends impacting the larger transportation picture. Transportation tends not to be approached in isolation--- it is a key piece of a complex puzzle. While transportation planning tends to receive a fair amount of emphasis, in general transportation system develop tend to be more reactive or in response to developments in traffic flows, accidents, housing developments, and funding availability, as opposed to proactive.

II. Construction vs. Maintenance vs. Operations

This is a meaningful distinction and there was a clear understanding of the differences between the three. One perspective from the group that most agreed with was that construction represented the capital investment (creating the asset), maintenance is sustaining the life of the investment (condition of the asset), and operations is concerned with how well it is functioning (i.e., performance of the asset). Operations itself was associated with day-to-day activities that make the system work, such as coordination of traffic signals and traffic control centers. In general, it was seen as trying to squeeze more out of what has already been built. There was some tendency to view operations as a subset under maintenance or maintenance as a subset under operations. Failure to invest in maintenance ultimately results in a need for more construction spending, such that longer time horizons are build into maintenance planning. There was also a sense that political officials and those involved with the transportation system do a poor job of explaining the importance of all three areas to the public.

III. Familiarity with and Perceptions of TSM&O Products and Services

Most respondents were quite familiar with the various TSM&O systems and services. Regulation of traffic signals seemed to generate the greatest familiarity and usage. The tendency, however, was to look at the suite of TSM&O systems and services from an integrated perspective, but funding availability often found them focusing on them individually. However, the extent of

integration was also driven by how large versus small and how urban versus rural was the community in question. Traffic density was the key. A key point here is that technology-based solutions need to be packaged in ways that reflect the unique requirements of different sized locales. One size does not fit all. In spite of how they are viewed, TSM&O systems are generally not approached strategically, but rather based on priorities of sponsoring agencies and funding availability. If anything, respondents reported that they are slowly moving toward integration (excepting in less densely populated areas where integration either did not apply or was integration of a smaller set of services). There was also a general perception that once such systems are installed, communities (or whoever comes to 'own' the systems, are on their own in terms of ongoing maintenance. The George Bush Parkway was cited as an interesting laboratory for observing the ongoing decisions and developments surround construction, maintenance, and operations.

Investing in technology that rapidly becomes outdated was also a concern. Related perceptions include the sense that investing in some of these TSM&O technologies should be done with an eye towards technology developments inside of automobiles (e.g., smart cars and GPS capabilities).

Some respondents felt that fewer dollars for new highways combined with growing congestion can only increase the attractiveness of intelligent transportation systems. Alternatively, none of the participants tended to associate TSM&O systems with safety.

IV. Major Obstacles to TSM&O

The major obstacles (beyond funding) cited by participants included:

- roads that travel through multiple municipalities, where each would have to buy in to the TSM&O system or service, and multiple layers of government get involved; A related issue is whether it is a county, city, state or federal road;
- the tendency for states or particular municipalities to only be concerned with their role in the infrastructure (e.g., a state road versus an arterial), not with the total transportation system;
- the tendency at the city and county and state DOTs to have more expertise in civil engineering than is found with traffic management or traffic maintenance personnel. Civil engineers are more concerned with 'design and build';
- Politicians that see things differently, and consider different informational inputs, from those operating the transportation system; Politicians also confront higher risks and a more diverse mix of stakeholders;
- The fact that road systems in a given community evolve over time in idiosyncratic as opposed to optimal ways, such that needs for TSM&O solutions tend to involve customized solutions that are not as integrated or comprehensive;
- A tendency for people who have worked in the transportation system for a long time to believe it is their job to build and maintain, as opposed to operate, the system. So there is a need to create more of a sense of ownership of operations---where people believe it is their job to make the transportation system operate better;
- A need for better forecasting and calibrating capabilities in terms of transportation

system demand.

V. Decision-Making Processes

A major implication from the group is that decision-making processes differ meaningfully from region to region, and also based on the type of decision (.e.g, the type of TSM&O system) being considered. While MPO's were widely cited as extremely critical in the decision process, the structures and players vary, with joint transportation committees, regional transit authorities, and hybrid structures mentioned by various participants. Even where it does not have a formal role, the state (i.e., state DOT) is a frequent influencer on decision processes---principally because funding tends to flow through the state level and then down. The processes also tend to be quite long, involving two years when only one jurisdiction is involved, and growing exponentially as more are added. Lengthy decisions mean the technology itself has changed during the process.

Consistent with the earlier point, the process tends to be reactive in nature. Improvements are in response to numbers of accidents, citizen complaints. Sometimes it is a frustration factor, and an affordable solution that solves the problem is sought. Yet, it is difficult for the public in a region to influence the state. The key is when the complaint or problem gets in front of someone in position of responsibility. Another factor is when key transportation or political role players see something being used effectively in some other locale. This tendency to look at what analogous cities or regions have done is quite prevalent---the risk factor is critical with systems that cost money and have high public visibility.

There is a difference between operations investments at the planning level versus reality. In many instances, it appears that transportation projects and priorities are set many years in advance, but then adjustments are made based on current realities. That is, there was some sentiment that problems of the moment tend to take resources away from longer-term, planned priorities. Adaptations and adjustments to these planned priorities then have to be made to keep them on the planned list. An interesting distinction was made between transportation problems that get managed and transportation problems that get solved. There is a bias toward the latter, as they create ongoing jobs for people---and solving them eliminates jobs. The smaller, lower priority problems get solved, but the big problems get managed. It was also noted that the process can be driven by capacity limits that cannot be overcome by construction even if you had the money and political support---in this sense TSM&O becomes a default solution.

Decision processes ultimately involve a set of trade-offs made in terms of state and local priorities. Decision processes are always political, and involve collisions between multiple agendas. An agenda that involves TSM&O systems must be made to fit into or support the agendas of others.

There are always champions who play instrumental roles in implementing these systems. In some cases, there is both a technical champion and a political champion. The latter will tend to be authority in the chain of command. Champions form partnerships and alliances, work to make the project a priority, achieve funding, and set an implementation timeline.

VI. Information and Decision-Support Needs

When making decisions regarding TSM&O systems and services, key informational requirements include the ability to compare the cost of implementing and maintaining the technology to the cost of spending money on construction or maintenance to address a problem. There is a consistent desire to be able to review cost and performance data from the technology being used elsewhere. The city or region used for comparative purposes must have similar problems or characteristics. The information must be convincing, will tend to be viewed skeptically (especially the newer the technology in question), and must be combined with personal selling. The trust factor--- in the data and the source of the data --- is vital. Data quality is often judged by state-level transportation engineers. The general sense is that the right kinds of data for a particular region to assess a particular solution are not available.

Skepticism regarding data that comes from the FHWA and U.S. DOT is due, in part, to a larger skepticism about federal authorities as state and local entities have become more sophisticated and professional. Hence, there was some sentiment that the people behind the data have not been “in the trenches” or dealt directly with citizens. Some participants suggested that information from AASHTO, TRB, and think tanks is more relevant. At the same time, it was felt that federal agencies have the big picture and the ability to integrate, sort and interpret the relevant data from different parts of the country.

Greater access to federal officials when attempting to evaluate TSM&O systems was stressed. It was felt that these officials are not used to participating in local discussions. Another suggestion is that there be a ‘one-stop’ place for getting information and data when making decisions about investments in operations. Alternatively, there must be a place that can quickly refer those involved in such decision processes to people in other states and localities who have direct experience in implementing these systems at the community level.

Emphasis was also placed on the need for more financial incentives to look at and implement TSM&O systems. Pass through grants with no strings is an example. There may be a required match, but these incentives will get things started.

NARC Focus Group #2

Below is a synthesis of the patterns and trends in answers from Focus Group #2 led by Michael Morris and Nola Miyasaki on February 6, 2006 at 3:20 p.m. The session was held at the Omni Shoreham in Washington, D.C.

I. Importance of Transportation Issues

What comes out of this focus group, compared to others, are more acknowledgements that other policy issues crowd out transportation for the top spot. However, it is admitted that transportation, and solving some of the negative externalities resulting from an inadequate transportation infrastructure, is seen as interdependent and therefore integral to dealing with issues of growth and economic development. In areas experiencing extremely high growth rates, transportation issues were a much more significant area of concern. Some specific areas coming up as a priority transportation issues were that of development of a light rail transit system as well as streamlined freight logistics.

II. Construction vs. Maintenance vs. Operations

There is a very significant and recognized distinction between construction, maintenance and operations. It was overwhelmingly true in this group that most of the funding and effort is directed towards construction efforts. In those areas of high growth, this was especially true. These rapidly developing areas felt that only new construction was sufficient for keeping up with the population demand, and funding was severely lacking for that. This was further limiting their ability to apply any funds towards the maintenance or operations areas of transportation.

Currently it is clear that “operations” does not resonate as a term of distinction. Some interpreted “operations” as systems operation, such as signal coordination, signal timing, etc., while others interpreted it as snow removal. In addition, this lack of clear distinction is demonstrated by the fact that few indicated that there was a specific budget tied to operations management, in contrast to construction and maintenance. Often times, operations tasks, not associated with ITS systems, were lumped in with maintenance budget items.

III. Familiarity with and Perceptions of TSM&O Products and Services

Participants expressed positive perceptions and general familiarity with some of the ITS products. But usage and exposure to these systems was somewhat limited. Examples of systems used were highway helper programs, traffic signalization, light synchronization, ramp meters and cameras, and some freeway management systems. Unfortunately, not a lot of detail was forthcoming on specific systems beyond the highway helper programs.

V. Major Obstacles to TSM&O

For many of the stakeholders in this group, which appear to be smaller, the ITS systems have less salience for them, which appears to be a function of funding and scale effects. Asphalt and

concrete continue to be the dominant investments for most. This appears to be the case especially with West Virginia. The continuous nature of operations, in that you have to keep paying for it by continuing to upgrade the technology and educate the personnel to maintain the systems, also makes ITS systems more challenging to invest in. This notion of the “capacity to maintain” the system and those associated lifetime costs were the issues echoed throughout this focus group. The major obstacles to TSM&O are perceived need, competing priorities, technical expertise, capacity to maintain system, and FUNDING.

V. Decision-Making Processes

Given the limited funding available to address transportation issues, proper allocation of funds is a very significant task. It requires clear articulation of needs and a priority ranking system. Issues get to the table based on public awareness and demand, identification of need, data which clearly demonstrates that benefits exceed costs, and elected officials awareness that operational investments, while lacking the ribbon cutting or more visible contribution, can also provide positive outcomes for them as sponsors and for citizens as constituents. Growing regionalization seemed to be an issue complicating the process, echoed by several of the participants, but we need to explore its role in the decision making process further, perhaps it deals with growth, land use planning issues, or the complication of transportations decisions as they have become shared decision making processes.

The main decision makers mentioned in this group were State DOTs and divisional representatives, elected officials, transit authority stakeholders, district engineers, highway boards, transportation boards, and planning organizations (including MPOs and RPOs). One clear stage in the decision making process is to seek federal funding. Elected officials are clearly perceived as the major stakeholder of interest and decision making authority.

There needs to be a champion in order to get a project going from introduction through implementation, but too often there is not. You need to have capacity to push forward many of the ITS products. In some of the states represented in this group, this capacity is quite small and stretched thin. This is especially the case with Ohio and West Virginia where there are small numbers of technical experts, but very little capacity beyond that in terms of human capital. Some suggested a “technical” expert is who is needed to champion the ITS services. Despite this awareness of the importance of the technical expert, it became pretty clear that political champions are currently missing from the process. This might suggest that “operations” and ITS style investments are below the radar screen of most politicians.

What comes out in this focus group is that construction and maintenance simply trump operations in every way from individual motivation to perceived and actual need. There are all kinds of political externalities discussed, but none more so than the incentives derived from construction projects. This includes everything from the public perception and media attention (ribbon cutting) to job creation. It’s tangible, and operations appears less so among these participants, though they clearly acknowledge the need for wider adoption of ITS technologies.

There is some similarity in the decision making process, regardless of the system, but nothing could be generalized as the typical process. Most of the process focuses around stakeholder involvement and public participation.

VI. Information and Decision-Support Needs

Current information is good, but could use information that documents the experiences of peers. Any information such as best practices or other types of “Lessons Learned” or benchmarking would be much appreciated. Unfortunately in order to make use of the information provided, staff, time, and funding are required, which again is a capacity issue. A few alluded to the existence of too much information that might be redundant, contradictory, and/or difficult to understand.

NARC Focus Group #3

Below is a synthesis of the patterns and trends in answers from Focus Group #3 led by David Van Slyke and April Murdoch on February 6, 2006 at 1:40 p.m. The session was held at the Omni Shoreham in Washington, D.C.

I. Importance of Transportation Issues

Transportation issues compete for attention with a variety of other local concerns. These other concerns are often entirely unrelated, such as jail funding. The competition for dollars is more extreme in rural areas where funding is in much shorter supply and is less able to be used in a balanced way across issues. Frequently, transportation issues are seen as complimentary to other efforts, involving the array from economic development, improved response to hurricane threats, better intermodal connectivity, to encouraging new air service. When it is acknowledged as a complimentary expense, it is more likely to receive needed attention. Though the desired state is to resolve transportation issues according to long-range plans, a few regions confessed that transportation is currently handled from the perspective of crisis management.

II. Construction vs. Maintenance vs. Operations

With the demonstrated effectiveness and quick source of financing that toll roads offer, there is a push towards their construction. These construction projects tend to yield faster results, due to the use of private construction contractors. As a result, this process has won favor, being seen as more efficient than the traditional and more bureaucratic process of old. Due to the shift in focus towards such rapid construction efforts that offer revenue streams, operations projects have taken the backseat. The operations projects are still discussed and are the subject of dreams because of the improvements that would result. Unfortunately, due to funding shortages, operational improvements are neglected. Most had a clear definition for construction, defined as adding capacity. Maintenance and operations were not as clearly defined, however, with the two often being lumped together. Generally, the district engineer's office is viewed as the center for highway operations and handles the new improvements, whether maintenance, operations and/or construction projects.

III. Familiarity with and Perceptions of TSM&O Products and Services

Most acknowledged that they were familiar with most to all of the TSM&O products and services listed. The operations systems and services are perceived as very expensive, acting as a huge barrier to implementation, even though they may be associated with future cost savings. There is a positive reception to TSM&O, but many feel like these systems are out of their reach. They'd really like to implement them, but the host of obstacles prevents them from doing so.

VI. Major Obstacles to TSM&O

There are a variety of obstacles to greater adoption of TSM&O. First, it is difficult to sell TSM&O projects because of the math involved. When safety issues are involved, it is a clear

problem and solution equation. But, when it's a "local math" problem, looking at improved efficiency or other calculations, it is much harder to sell those projects. Even for some with demonstrated air quality or major congestion issues, it took a very determined champion to sell the signalization project to alleviate the problems. Also, for many of the projects, as found in the other focus groups, there is a major shortage of funding. Even local match projects are difficult, because it is increasingly a challenge to raise the local funds. This is especially true in regions where other competing interests can garner transportation funds. Political focus is another challenge. If the politicians are more interested in other activities, it is very difficult, if not impossible, to sway them back into the direction of operations. Part of this is due to a lack of understanding of operations and the benefits that can be derived from such projects.

V. Decision-Making Processes

A few examples were given as to the variety in decision-making processes and distribution of power or levels of activity.

- 1) The MPO/RPO works with the DOT and a contracted transportation consultant to create a regional transit plan coordinating with all of the transit providers within the region for an effective transit system. Though this pattern brings in an external consultant, the DOT still directs the type of solution the consultant is to develop, whether construction or operations.
- 2) In some areas, the MPO played a very active role in trying to promote a desired project and obtain funding.
- 3) Some areas admitted that the DOT makes all the decisions, and that this is probably influenced by the size of the DOT in that state.
- 4) And, in other areas the MPO and the DOT form a close working partnership to make transportation decisions.

A more generic decision-making process was discussed for the local level. To get a decision or a solution to the table in the first place, traffic count, accidents, deaths, and tourism demand were key methods of recognizing the need. Then priorities are set for dealing with each of these needs. This priority will be used in the annual planning process which will also include a budget line with associated costs to implement that plan. Based on that planning process, within the city management, the city manager's office would present the plan to the council and to the mayor for adoption at the annual budget meeting.

Key players involved in the decision-making processes include city and county officials, the chamber of commerce, local elected officials, MPOs, and RPOs. Typically champions are needed due to the number of competing needs. Some identified the economic development authorities, such as the chamber of commerce as excellent potential champions, due to the shared interest by all in economic development.

VI. Information and Decision-Support Needs

Many different types of information needs were discussed, but it could be summed up as information that clearly demonstrates which tools resolve which sorts of issues, and data

succinctly portraying those effects. For example, several mentioned that there should be information that associates ITS systems to cost savings, air quality improvement, and quality of life improvement, such as time saved in daily commutes. Not only should the cost of the systems themselves be made transparent for implementation and maintenance, but also the human cost associated with the installation and maintenance of those ITS systems.

Sources of information has been greatly varied including studies by the DOT, public transportation services, the district engineer's office, and social service agencies. Overall, there was a feeling that the information available was lacking in organization, access, ease of use, and robustness.

NARC Focus Group #4

Below is a synthesis of the patterns and trends in answers from Focus Group #4 led by David Van Slyke and April Murdoch on February 6, 2006 at 3:20 p.m. The session was held at the Omni Shoreham in Washington, D.C.

I. Importance of Transportation Issues

All agreed that transportation is the top-ranked issue. It ranks so highly because of how integral it is to other quality of life issues, such as congestion, air quality, mobility, land use planning, economic development opportunities, access to employment opportunities, goods, and services, as well improving the quality of one's family life by reducing the time spent commuting. One of the most significant issues regarding quality of life was the consistency of commute time. Having a predictable drive time reduces stress associated with knowing when to leave for work and not wasting time or being late. Growth management is a related issue most frequently discussed, as related to zoning, land use, and general mobility issues. Obviously, growth management has considerable implications for economic development and planning. The development of "transportation networks" was also seen as a critical issue influencing transportation. Transportation networks would be networks of all transport providers that work together to coordinate and cooperate in the development and maintenance of connected transportation systems. This type of network would certainly require developing the capacity to incentive cooperation and coordination and manage these types of networked relationships.

Overall, there seemed to be general agreement that consumer/citizens and elected officials are becoming savvier in seeing the interdependent relationship between transportation and all the other issues identified above.

Some of the near future transportation initiatives involve mass transit and light rail systems for a commuter rail and looking for new ways of acquiring transportation financing. The mass transit and light rail systems are seen as new potential ways to reduce congestion caused by commuters. The new sources of financing are desired as tight budgets present decision making challenges in how to pay for the infrastructure and public maintenance needed based on the resources available.

II. Construction vs. Maintenance vs. Operations

There is a huge distinction made between construction, maintenance, and operations. Maintenance is needed, but it's not glamorous; you don't get to cut ribbons for it or the public perception and media attention that you do for construction. This polarity in glamour has direct implications for political support.

Operation improvement was described as the "low hanging fruit." Participants spoke of operational improvements as the middle ground between lacking the necessary resources for new construction and not doing anything at all. Some folks distinguished between road operations,

transit operations, systems operations, etc. ITS systems seem to fit into “Systems operations.” A clear definition beyond this did not emerge in this group.

III. Familiarity with and Perceptions of TSM&O Products and Services

Everyone was very familiar with most of the systems. Fewer were familiar with the intermodal freight, driver assistance, collision avoidance, and collision notification systems. There was an overwhelmingly favorable reaction to the familiar systems.

Operations systems or services which have been used, or invested in, included incident management systems, arterial, freeway, and other emergency management systems, electronic payment systems, and road weather management systems. There was a lot of interest expressed in the electronic payment systems, especially after expressed positive experience by those who have employed them. Electronic payment systems were especially effective where the use of transponders was associated with open-road toll ways, where drivers using the transponders did not have to slow speeds. The discussion of the use and versatility of transponders was quite positive.

VII. Major Obstacles to TSM&O

Cost and lack of good data to convey the costs and benefits, as a result of these types of investments, were seen as the major obstacles to TSM&O adoption. Scale effects certainly come through loud and clear in this part of the discussion. Larger metropolitan areas believe they will see a positive return over time from their ITS investments, in contrast to the medium and smaller areas which were more sanguine about the payoffs associated with the technology costs.

V. Decision-Making Processes

Again, scale effects can be recognized as a factor. In larger regions, participants at the focus group are involved but they’re just one of many stakeholders, whereas the participants from the smaller and medium size areas have more significant involvement, in part because there are fewer stakeholders with which to contend and negotiate. In these smaller areas, they are seen as having more expertise. Most participants indicated that they are involved in the environmental scanning, stakeholder involvement, and even decision making, but have significantly less involvement in the deployment or implementation stage of the process.

To get the ITS system to the table, there needs to be a demonstrated need, knowledge that the ITS system is a low-cost solution, public acceptance of the product, a clear cost-benefit tradeoff in which benefits obviously outweigh the costs, and clearly communicated life cycle costs to keep the system updated. Awareness, however, is the most significant element here because of the cascading effect it has on support from a range of stakeholder interests. This is certainly the case among elected officials who see investments in these types of systems as doing something as opposed to doing nothing. The follow-on to this should look at awareness levels of the stakeholders and perceived system attractiveness.

There is a wide variety of stakeholders in the decision-making process, including locally elected officials, city councilors, state DOT decision makers, MPO and RPO leaders, authority personnel, such as those who serve on thruway/expressway authority boards, city and district engineers, and regional transportation coalitions.

VI. Information and Decision-Support Needs

Past sources of information have been the internet, word of mouth, conferences, occasional publications, and elected officials. The information needed does seem to correspond to an idea of market segmentation based on socioeconomic and demographic characteristics.

The types of information requested includes cost/benefit data based on empirical rather than anecdotal studies, costs of integrating the technology, benefits of the new technology relative to the existing technology, and the projected rates of decrease in cost of the technology as it is improved and further developed. Several participants mentioned not investing in technological solutions until after the costs have come down to a more reasonable threshold.

In general, respondents stated a desire for more market research on the products and how they fit with respect to the public's needs. They felt that they also needed to know better methods of determining and understanding what the public wants, needs, and knows.

AASHTO Focus Group #1

Below is a synthesis of the patterns and trends in answers from Focus Group #1 led by Michael Morris on May 5, 2006 at 2:00 p.m. The session was held at the Jekyll Island Convention Center.

I. Important Transportation Issues

Several issues were ranked as priorities in this group. Among these were aging infrastructure, inadequate funding, demands of growth, 25% of bridges that are structurally deficient, difficulty influencing legislatures and other public representatives, and funding IT. It is becoming increasingly difficult to balance maintenance with economic development. Needs are there, but the funding is lacking. Part of the problem includes a political challenge: there needs to be an increase in taxes, but the politicians know this would likely damage their political career.

II. Construction vs. Maintenance vs. Operations

It was strongly indicated that most people want to focus on shiny new objects rather than on maintenance of the existing systems. This makes a clear distinction between construction and maintenance. Most included maintenance as a subcomponent of operations and defined operations as efforts or methods to make the system work, such as signalization, utilization of IDS, EMS signs, maintenance, and system optimization. They felt the main considerations of operations were the facilitation of movement from A to B safely, smoothly, and predictably. Others kept maintenance and operations distinct, defining operations as maintaining the daily flow, which thus included activities such as snow removal. However, the distinction between operations and maintenance is not made in the budget. As in other groups, both aspects are lumped together and it is the responsibility of the DOT to allocate funds to maintenance or operations appropriately.

III. Familiarity with and Perceptions of TSM&O Products and Services

All respondents were extremely familiar with the various TSM&O systems and services, and indicated this was their duty as the DOT. These respondents generally feel that they are advocates for these technologies, even acting as marketers or educators, promoting them to other stakeholders and building awareness.

Generally, the group felt that though they may not currently have needs for some of the TSM&O systems and services, that they can foresee a need for them sometime in the future. They explained that the general pattern for adoption would start at the coasts, or even the more populated areas, and move into the Midwest over time. Some areas, such as in the Midwest, felt the technology far exceeded the need at this point and indicated a desire to avoid investment in these technologies until a much later date. For those in more populated areas where there is no way to add capacity to an area, operations is the only solution.

Perceptions of the operations systems included descriptors such as complex, expensive, valuable, and somewhat politically controversial. There was some polarity regarding relevant to needs with about half stating that they were relevant for their needs and half saying they are more relevant to future needs. The perceptions of the decision makers that the respondents work with regarding ITS decisions were presumed to be that these systems are valuable, complex, expensive, and relevant.

VIII. Major Obstacles to TSM&O

Several obstacles, besides funding, were cited as preventing more extensive adoption of TSM&O systems and services. Four main ones included:

- a. There needs to be a project champion that has a vision of how these kinds of technologies can work together with all of the other components and be able to move it forward incrementally.
- b. Most of these solutions are not separate, but rather require a great deal of integration. This type of integration requires significant planning and research into which components and manufacturer's systems are compatible and the relative life spans of these components.
- c. These systems have to connect to a variety of different agencies, not just the state highways. Others that want to have access to these systems are the MPOs, local governments, emergency responders. Since there are so many involved, it takes great skill in coordination.
- d. Sometimes there are regional issues associated with implementation. Some of the extreme examples included that these systems can become targets for shooting practice, or can be the focus of a "Big Brother" protest.
- e. Another challenge is to communicate the benefits and earn trust that the benefits of these systems outweigh the costs.

V. Decision-Making Processes

This group proclaimed that there is really no way to get ITS systems in a region without DOT involvement, indicating intimate involvement in the ITS decision making process. They consider themselves advocates of the systems, but also mentioned the highway patrol as more effective advocates. This was believed to be true due to the influence the patrol has when pulling over public officials. The DOT makes its advocacy efforts through marketing strategies to the legislature and the general public.

The main factor that gets an ITS solution to the table is a safety issue. Other factors can be important, but play a much lesser role. The respondents in this group indicated that the intention was to have a strategic plan for implementing these systems over time, but only a few regions have had some success with this. Given the funding shortages, these respondents claim to have been forced into a more reactive, rather than proactive stance. They now fight fires instead of being able to take preventative measures. One indication of this shift is the inability to meet maintenance funding shortages. Each of the respondents is well aware of the increased cost of replacing infrastructure rather than maintaining it properly. Unfortunately, they feel forced into

this reactive position, of waiting until it becomes a big problem and then gets the attention it deserves. Also, given that operations components, such as these ITS systems, only comprise about 2% of their overall budgets and aren't something that people come pounding on their door demanding, these systems are not the center of their focus.

The DOT often makes decisions on how to present these solutions to the legislature or the public. For example, they have chosen to "market" components such as traffic counters and speed detectors as a tool for hurricane evacuation management, rather than as a tool to manage traffic. In this way, they have to be aware of the multiple uses for the same tools and market it appropriately based upon the perceived needs of that area. Other respondents indicated successful strategies by marketing the systems to garner Department of Homeland Security support. There was an understanding in the group in getting the public and users "dependent" on the systems. By showing the public what a system is capable of and getting them hooked on the benefits these systems can provide, the public will not allow that system to disappear. And, if it does, they will fight to keep it. In one instance, a state used Florida's system as an example of the benefits and was able to garner support through such a demonstration. Though these respondents consider themselves advocates, they were cautious to communicate that this is only the case when they really perceive a need for these systems, not simply due to thinking it's a "feel good thing to do."

VI. Information and Decision-Support Needs

This group of DOT respondents felt that there was a wealth of information available to them that far exceeded their abilities to access or use it. They've indicated the TRB and Federal Highways as sources for this information.

Most felt the website format is most useful, rather than having huge documents on their desk. Based on the information they find useful, they will fashion their own miniature brochures or pamphlets to send in letters to legislative officials. The respondents spent a great deal of time explaining that these pamphlets need to be extremely brief, catchy, and complete with pictures, similar to an advertisement, in order to get any attention. Also, persistence in sending these materials to the officials is needed.

Some of the needs the respondents indicated, in terms of information, included how to market these services, different past successful strategies, and the various applications each tool might have. They also find that they have to fight a battle for consistency in the image surrounding these systems by making sure that everyone within DOT delivers the same message.

AASHTO Focus Group #2

Below is a synthesis of the patterns and trends in answers from Focus Group #2 led by Michael Morris on May 5, 2006 at 3:45 p.m. The session was held at the Jekyll Island Convention Center.

I. Important Transportation Issues

This group expressed intense stress over inability to appropriately maintain existing infrastructure in a responsible and timely way. There is the belief that taxpayer support for those projects initially included a respective agency commitment to maintaining that infrastructure. The respondents also indicated a great desire to keep roads and bridges unlimited so as not to restrict commerce. It seemed that despite the obvious need for maintenance funding, legislative funding patterns did not match this need by allocating huge sums of money for entirely new projects, such as commuter rails, instead of towards preservation.

II. Construction vs. Maintenance vs. Operations

This is a meaningful distinction and there was a clear understanding of the differences between construction and operations and construction and maintenance, however the distinction between operations and maintenance was less clear. Some defined operations as ITS systems and methods used to keep traffic moving while maintenance was defined as infrastructure preservation and snow and ice removal. Others considered maintenance and operations as interchangeable terms, in that both were concerned with all facets of systems maintenance including keeping traffic moving, snow and ice removal and incident response. The distinction between the two areas is blurred with regards to budgeting as well, with the DOT having both elements of maintenance and operations included in one pool of money for allocation. There was an overwhelming agreement that when it comes to budgeting for maintenance and operations that it takes place as a long-term effort, as part of a strategic plan. This is in contrast to the more sudden plans put together for new construction, which is often the result of crisis management. Obviously these sudden new construction plans increase the demand for preservation, further escalating the funding mismatch conflict.

III. Familiarity with and Perceptions of TSM&O Products and Services

All respondents were extremely familiar with the various TSM&O systems and services. These respondents generally feel that they are advocates for these technologies, even acting as sales people promoting them to other stakeholders. The systems and services most likely to be promoted are those that the respondents feel are within their realm of responsibility. The car navigation systems are less important to them, as an example. Some suggest that these solutions can be viewed as a solution looking for a problem until your region expresses that need, then they become noticed as viable solutions. Most expressed an understanding that these technologies are only as good as the application, where appropriate applications yield extremely positive results.

General perceptions of the operations systems included descriptors such as complex, expensive, valuable, and relevant to their needs. These perceptions were presumed to be the same for the decision makers that the respondents work with regarding ITS decisions.

IX. Major Obstacles to TSM&O

Several obstacles were cited as preventing more extensive adoption of TSM&O systems and services. Five main ones included:

- a. These services are hard to sell to the public. It is difficult to get them to see the benefit of systems that are often times invisible when they are working properly.
- b. Most solutions are centralized or regionalized, so there is a conflict in desire to support these systems at the state level. Also, some regions are really apprehensive or unwilling to allow DOT involvement and installation of TSM&O solutions because they fear conceding control of their region to the DOT.
- c. Legislative promotion of these systems is a positive force, but they don't realize that support for these systems requires reallocation of funding from other projects' life-long resources.
- d. Legislative officials generally are only concerned with flashy contributions during their time in office, while transportation issues are life-long. This also adds to the strain on preservation funding which not only involves infrastructure but TSM&O systems as well. The respondents have a great fear of damage to credibility of TSM&O through implementation without adequate life-long funds.
- e. Technology changes so fast, making the life of each wave of these systems shorter and cheaper. It's important to be able to manage both the short and long-term issues associated with these systems as well as realizing the importance of integration between the systems. In addition, it is difficult to match training of technicians with the constant changing technology and maintain operations at 90% reliability.

V. Decision-Making Processes

The DOT seems to have extensive involvement in the ITS decision making process. The DOT is concerned with synchronization of these tools with neighboring areas to make the transitions between them efficient and effective. As advocates of the systems, they often work to sell these systems to both legislative officials as well as the public, and MPOs. The DOT makes a concerted effort to build strong relationships with the MPOs to aid in the selling and implementation of these systems and working closely with the traffic engineers of the MPOs. Together they discover solutions that works and doesn't work in the various regions.

Key factors leading to consideration of various ITS solutions include traffic volume, number of incidents, and the strategic plan for an area. Often public safety is the first concern, followed by convenience.

The DOT often makes the case for an ITS solution, and must do so successfully, in order to garner support. Some strategies mentioned included tours to help bring various people up-to-

speed with the possible solutions, usage of variable message signs to advertise new 511 system, and working with the media to spur public demand of legislative attention.

VI. Information and Decision-Support Needs

Overall, the DOT respondents felt satisfied with the Federal Highway Administration's, as well as AASHTO's, information dissemination related to the ITS systems. Sometimes they feel the desire to have the information faster, but they understand that they have to wait until the results come in from the initial implementations.

Order of receipt seemed somewhat important to the respondents. They felt that they should, as the DOT, receive the information available and be able to then choose what information gets passed on to MPOs. They like to have control over the information getting passed on and can use it to customize their presentation of the systems to align it with their sales pitches. Most felt the website shown was ideal. The exceptions were for those older individuals that have difficulty reading the text on the monitor and those agencies that are still operating without computers today.

In terms of content of information available, they felt the information should be richest for the DOT to aid in planning, while a less sophisticated version should be available for the general public and a very short and flashy version would be most useful for legislative bodies.

Another aspect of interest was a desire for publication tools to make this information more interesting to the public. These tools should express in clear terms, that the public can understand and relate to, the benefits of these systems. Some examples given by the group included reduced commute time and service patrols.

NCSL Focus Group #1

I. Importance of Transportation Issues

Overall the biggest transportation issue is finding funding for construction and maintenance followed by congestion, and major maintenances and preservations. In some states (3 out of 4) most of the money is spent on maintenance causing a shortage for construction. The transportation issues in the near future in states like KY and VA are the expansion of major highways, corridors and (re)building of bridges. While WA is struggling to rebuild and upgrade its infrastructure due to expired life time of their roads and bridges.

II. Construction vs. Maintenance vs. Operations

There is meaningful distinction between the three. Though when defining the Transportation operations there were three differences. First, it was defined as working and operating budget, which means getting the roads and equipment maintained. Second, it was defined as TRIMARK system [cameras]. And thirds, it was defined as both maintenance and operation, including snow removal, emergency responses, ramp meter reading, and better managing facilities. IN general, some are having hard time separating operations from maintenance.

III. Familiarity with and Perceptions of TSM&O Products and Services

Most respondents were quite familiar with the various TSM&O systems and services, especially those who apply to their regions.

There was an emphasis that when public education is done, the systems and services are perceived positively by the public. Overall, the perception is that operations systems and services are useful.

A lot of emphasis is to develop good freight/commercial transportation by implementing intermodal freight, which has been received positively by the group members who have implemented it.

V. Decision-Making Processes

Personally, these individuals are minimally involved in making a decision to invest in management operations systems and services. They are involved only in the legislative aspect of the decision making, while some of them are aware what the transportation planning committee is doing.

State DOT was identified as the decision maker. Issues such as congestion are brought up either by public or working group to state DOT, which analyzes the benefits of the TSM&O solutions. Legislators have indirect influence such as appointing a transportation board. Overall VA and DE said that the legislative are not interested in building operations centers.

Majority agreed that systems implementation is based on both long-range as well as immediate crisis. One of the problems emerging is that they used to build more capacity than needed, though they have run out of it now, so the question is how to better manage the existing. Only DE said that it is based on long range since they know that growth and expansion is coming.

Overall, all agreed that needs to be a champion. The transportation board was identified as champion followed by state DOT. Legislators are not the experts compared to those two champions, due to their lack of knowledge and understanding of technology, but the ones that are knowledgeable and tend to emerge as champions.

Major factor when considering operations systems and services is congestion and mobility, followed by incident mitigation and traveler information [in large rural areas].

They [legislatures] appear to act when they see these operation systems and services in action and their benefits with regard congestion improvement. Moreover, some would take an approach where they would analyze the history [how it was], analyze current situation [how bad it is] and analyze possible solutions with best cost/benefits.

VI. Information and Decision-Support Needs

The major sources of operations systems and services information were peer to peer examples, consultants, conferences, constituents, as well as internet and printed brochures. There is tendency to rely on state DOT and FHWA information.

Overall, the legislators were aware of the existing information, though only one was familiar because she worked 16 years in state DOT. They, as legislators, prefer small brochures, and recommend to turn the big blue book into 4 pages glossy brochures.

They recommended that USDOT educates local government since they can contribute to decision making and bring it up to the legislators. Additionally, provide peer examples, and educated the users [riders] about these systems and services and what they do. Additionally, USDOT should send information to all transportation board members, so they gain better understanding of current trends and technology.

The legislators perceive the vendors to be more credible than federal, since FHWA has been perceived as too institutional.

NCSL Focus Group #2

I. Importance of Transportation Issues

Overall the biggest transportation issue is congestion, preservation, and capital construction, followed by funding for major projects. Additionally, there are barriers of improving the rail when other states are not cooperating, thus interoperability and communications are additional issues. Another issue would be expansion of existing ITS systems and finding the funding for that.

The priorities in the near future were major capital projects, such as expanding and finishing the highways and rail road improvements. There is indication that the goal in certain states such as DE, is to convince people to use public transportation, thus improve and expand public transportation. In rural states such as SD, there is need to upgrade and improve highways because their industry depends on it.

II. Construction vs. Maintenance vs. Operations

There is meaningful distinction between the three. There is general agreement when defining operations. All agreed that operations can be defined as a flow of traffic. Smooth flow of people, commodities, and products.

III. Familiarity with and Perceptions of TSM&O Products and Services

General perception is that these systems and services work well. In WA they work well, though are not as good as initially expected to be. Overall, the group is familiar with TSM&O but not with all of them, since some of do not apply to their region, such as in SD there are no highway congestion, though they are familiar with real time information, such as weather and wind information. Electronic signs were successful in WA by educating the traveling public. One gets sense that implemented systems and services work well, but did not meet the expectations.

There is emphasis to educate the rider [travelers] about existing operations systems and services.

V. Decision-Making Processes

Majority of the group members is personally involved in the decision making process. Decision makers that were identified in this group were state DOT, governor, and transportation committee, as well as local authorities that are appointed by governor and transportation committee/board. One person was not personally involved, in this case the head of DOT brings issues to bond board, which than passes to funding committee which makes money decisions [budgeting], thus state DOT, bond board and funding committee were the decision makers [State of Delaware].

Overall, the decision making is currently long-range projects. There are crisis planning, and some of the existing long-range plans are the result of a crisis situation, where ITS was implemented and due to the results they have been made into long range.

The key stakeholders identified by the group are the public, transportation people, business communities. Major emphasis is to sell it to the citizens first, convince them, and they'll buy into it. Everyone has to be on the table [public, business communities] and if they are on the table it will be done/implemented.

Congestion seemed to be the major factor when considering TMS&O, how to improve the flow, or how to improve/update/add new ITS to existing to make it more efficient.

VI. Information and Decision-Support Needs

The most critical information needs were cost-benefits. How much will it cost and who is going to benefit and how. Most of the information is preferred to be received from peers, they prefer to take a look [visualize] at existing projects and compare to their issues and analyze the benefits of existing systems and services. They prefer visualizing, seeing the systems and services in action. One individual emphasized that a pilot project is preferable, because of the easiness to receive funding for these pilot projects.

Majority relays on information received from their state DOT, though they do not relay on federal media due to fact that it takes the federal government about 2-3 years to compile the information, thus it is outdated by the time they receive it. Also they relay on trading lobby and presentations of agencies such as NCSL.

PTI Focus Group #1

I. Important Transportation Issues

The most significant transportation issue amongst the respondents in this group was the issue of congestion. Another issue of significant interest was infrastructure condition. Symptoms of congestion issues are showing up as problems on ramps and freeways, controversy over willingness to share the road with cyclists or pedestrians, in the case of sidewalk creation or road expansion. Infrastructure condition seems to be deteriorating through constant pressure to build new rather than maintain the old.

II. Maintenance vs. Operations

This is a meaningful distinction between the two, with the shared perspective that maintenance is preservation of the ability to use infrastructure while operations manages its use. Again, we see that failure to invest in maintenance ultimately results in a need for more construction spending, such that longer time horizons are built into maintenance planning. There was also a sense that political officials don't understand the life cycle investments required for infrastructure, but rather manage the complaints of the public. Another problem is that it's harder to incorporate operations and maintenance into the long-term plans when the budgets don't give them that ability to plan beyond the present.

III. Familiarity with and Perceptions of TSM&O Products and Services

Overall the group is aware of all the TSM&O, though there is lack of awareness [understanding] among their elected officials. Arterial, freeway, and transit management systems seem to be most commonly adopted TSM&O in their regions.

Perception is that there are no on-going maintenance costs associated with operational improvements. Therefore, there is a need to more effectively communicate maintenance costs of operational investments.

X. Major Obstacles to TSM&O

Many of the stakeholders in this group see themselves as responsible for the slow adaptation of these systems and services, due to their 'complicated' categorization of the systems and services, thus making it more difficult for the decision makers (legislators) to understand what these systems and services are. Furthermore, the phrases as well as the terminology within operation systems and services have been changing since 1991 adding to the confusion of decision makers as well as of the public.

Another obstacle identified by the group was the lack of personnel. Many of the stakeholders in this group are struggling to feel in their vacant positions (technicians, civil engineers, transportation engineers). Moreover, the engineers that they have now are older individuals who were educated 20 years ago when such operation systems and services did not exist. On the other hand, they can not compensate the college graduates at the level that the private market does.

Funding is another major issue. An implication from this group is that the crises have been used in order to get the funding, the group identified election time and economical opportunity as fund release. Further argument being made is that there are no incentives for maintenance and that decision makers in charge of budgets and resources will not make operational investments unless there is a crisis, public outcry, or some other event which changes their short-term focus. For the PTI constituency, one of their significant frustrations is that the life cycle and maintenance cycles of operational investments are not at all understood.

Additionally, full-time vs. part-time legislatures (regional variation) is a constraint because it can be difficult to get time from elected officials [the south is used because of the PT orientation of the legislature].

Similar to other groups public safety plays a big role in adaptation and implementation, but the indication from this group was that the ‘public safety’ benefits of ITS and TSM&O have not been well communicated to the public and variety of stakeholders – limiting the electoral appeal of operational investments.

V. Decision Processes and Players

With regard the process of gaining commitment, making the decision, and implementing TSM&O the group sees themselves in this position as well as the city manager and the commission (commission director). Due to the lack of funding there has to be a trade off, something else has to be given up in order to implement specific TSM&O. Additionally, partnership with state constituencies, first responders and other departments is needed, in order to create credibility and necessity of the solution (TSM&O), where also problems exists due to the different interest of each group.

Another implication is that the funds come from the fed to state and state allocates based on budget and needs.

The group predominantly identified the city manager/council as the champion of TSM&O on the city level, while MPO was identified as champion on the regional level.

VI. Information and Decision-Support Needs

The information perception of the group is that there is overload of information material, too many websites, too many emails, too many files etc. Majority of them would prefer to see more of executive summaries with a ‘wow’ effect. The ‘wow’ effect would cover cost-benefit [long and short term], safety, and will be ‘green’ (environment friendly). Additionally, the group recommends forums and conferences where new trends can be exchanged among the different groups and regions. Furthermore, the group would like to see more of collaboration between automobile industry, ITS and public municipalities.

Additional, since the group identified language as one of the major problems, in order to solve the problem, they recommend translation of complex material; then incorporating realistic budgets with cost-benefit and life cycle data.

ITSA Focus Group 1

I. Important Transportation Issues

The group identified funding as major issue when it comes to operation and transportation; it seems that the funds are drying out. Mobility is considered another issue – private motorist (including the group) are beginning to live with congestion rather than dealing with it. Currently, there has been a focus on safety, according to the group it needs to be shifted to safety and mobility. One of the issues for the next two years identified by the group is the inter-operability between cities, due to the current lack of cooperation and information experience. Furthermore, the group identified lack of information dissemination at the state level. The group raised another issue, the need to increase the priority of funding of ITS involvement at political level.

II. Maintenance vs. Operations

When it comes to definition of maintenance and operation the group did not distinguish between these two, though when it comes to their treatment with regard the budgeting then the group identified that these two are treated differently. With regard the budget, it is different from state to state due to different structures [state and local entity] since every has different ways of how they get their funding.

III. Familiarity with and Perceptions of TSM&O Products and Services

Overall the group is familiar with the TSM&O. The first five systems and services on the list are the ones they are most familiar with (Arterial, Freeway, Transit, Incident, and Emergency Management Systems), while the last 4-5 on the list are the ones that they are least familiar with (Commercial Vehicle Operations, Intermodal Freight, Collision Avoidance Systems, Driver Assistance Systems, and Collision Notification Systems). The group identified that the TSM&O are complex in terms of the system as well as in terms of implementation. Furthermore, the group identified that there is distinction between different TSM&O from the technical point of view, but from political standpoint it is just ‘transportation management’.

XI. Major Obstacles to TSM&O

As an immediate obstacle the group identified funding and lack of skills to implement TSM&O. Furthermore, there is a lot of risk involved when being the first adopter, risk meaning a lot of equity and money is being risked when adopting new technology, so everybody clamors to be third or fourth trying new technology, which makes it take so long to get new product out or changes.

Furthermore, the group brought up that there is skill shortage within the department of transportation, [not labor shortage but skill shortage].

V. Decision Processes and Players

The group was not able to identify a decision process, though they indicated that in order to have TSM&O adopted there must be a champion; additionally, they agreed that generally the higher the level of the official [being champion] the more success or the more the chance of success will be. Another point was that the benefits of TSM&O are not well established, not well quantified [either they are ahead of time or retrospect].

The group identified that they have segmented their market and that they act as educators on various decision making levels. They can not rely on MPO to influence the decision makers since there is a lack of champions within MPO, therefore they personally influence (market) at various levels. Moreover, there are multiple people who are the key drivers of their decision making process [depending from situation to situation], although there is one champion who will make decision he or she still needs a consensus/support from the panel, thus for the group it is important to identify the key influencer/decision maker. The marketing approach identified by the group was visiting multiple conferences like ITS America, advertise in trade rags, and also call on the consultants that influence specific decision makers.

The elected officials do play a big role especially if they are the champion, then things get done faster, though they are not always the target since it varies from situation to situation. The decision making process according to the group can be anywhere between 6 months and about two years. The group indicated that they help agencies or organizations to find and get funding. Funding and costs drive the decision making process as well as the perception or modification of benefits.

VI. Information and Decision-Support Needs

Group identified four major information sources that their customers rely upon when making the decision to adopt TSM&O, namely 1) consultants, 2) product information (from the group), 3) peers (peer to peer network), and 4) their (customers/decision makers) trade associations. Additionally, with regard the peer to peer network the group sometimes acts as a bridge between these peers. The information that the group needs when selling TSM&O is how much money the customer has, it would benefit both of them, since the group can assist the customer with finding and getting the funding.

Overall the material presented to them (internet) is considered as not adequate, since it does only represent the successful examples, they do not think that it is comprehensive and accurate; furthermore, they think that the material can be objective but it is not representative.

The group prefers website, where they can download a report and provide it to the customers themselves, while the tri-fold is only useful for the elected officials, especially since it says US DOT on the back, which adds credibility. The group recommends that FHWA can help marketing TSM&O if they could place on this website the instructions and application to get the money for TSM&O. And finally, they recommended that FHWA trains their people [who will go out and talk and educate all the agencies] on the regional basis.

ITSA Focus Group #2

I. Important Transportation Issues

The group identified congestion [highway traffic congestion, need for more capacity, better information, emergency response, getting through to think that block the road], data collection accuracy and interoperability as major transportation issues. The major issue for the next two years identified by the group is funding shortage that will have an impact on capital improvement programs as well technology.

II. Maintenance vs. Operations

They clearly distinguish construction and maintenance, though maintenance and operations is being seen separately predominantly when it comes to budgeting. One group member talked about transit, where until now it used be capital investment that lasted about 20 years and only thing that had to be done was maintaining it (cutting grass, paint white lines, etc), thus there really had not been much of operations focus. Operations was defines as stuff and resources involved in the day-to-day operation of agencies' transportation systems.

The group also identified that at federal level they want to pay for construction and in some instances today they want to pay for operation but they (U.S. DOT) do not want to pay for maintenance.

III. Familiarity with and Perceptions of TSM&O Products and Services

Overall the group is very familiar with operation systems and services. Electronic toll collection was identified to be the best known publicly and success story the industry has. The group indicated that the old systems are very complex and this gives the vendors and vendor community a tough time to integrate with new solutions, while new solutions were developed at the time where technology started to evolve. Furthermore, it seems that the problems between agencies with regard the interoperability is that their Legacy Systems do not talk to each other, their interfaces are not in common, lack of standardization. Additionally, the reasons to use or incrementally test and implement TSM&O have not really been accepted by the public.

XII. Major Obstacles to TSM&O

The major critical issues for the group's government customer are funding and acquiring quality data for the systems. Furthermore, there are two addition issues identified, (1) the so called 'institutional stovepipe', where one person controls freeway system and somebody else the arterial system, one control can stop at county line or region while others do not, which seem to be irrational and unreasonable, and (2) the DOTs have they maintenance stovepipe, where the guys who used to cut grass are now maintaining these systems [lack of experience, skills, training].

The group identified that in the bigger states with bigger budget it is possible to implement all TSM&O, while in smaller states with smaller budgets they tend to be more selective.

Furthermore, the new technology that has been selling seems to be more a road test as opposed a full implementation. Additionally, an obstacle is that TSM&O has been approached as construction [by the civil engineers], which has life time of 20 years; this approach is totally wrong, since technology is changing and needs constant updates and improvement.

Also, a lack of interoperability and communication is a big obstacle. The group identified that there are more horror than success stories predominantly due to the fact that DOT tries to sell outdated technology, and additionally the agencies try to meet their needs instead of meeting the needs of travelers, who travel across institutional lines (different institutions have different systems, which are difficult to be integrated or can not be integrated at all).

V. Decision Processes and Players

Funding was identified as major factor in the decision process.

The process of adoption is sometimes caused by crisis, and predominantly that crisis is an act of God [i.e. snow storms in NYC].

Additional factor was finding the champion, an internal track. The group indicated that there has to be a champion, especially an internal champion [within DOT]. The vendors [the group] usually research the government's internal environment, they identify the champion and educate the champion about the TSM&O as well as about the ways and possibilities to acquire funds and impact the decision process.

The elected officials according to the group have rarely made a major decision, especially if the elected official was in the tenure, too risky.

The constant change in the technology and changes in needs and trends in transportation can cause adaptation barriers for decision makers, namely which vendor provides a better system and services, which will better fit my area and is there something new and better coming out, etc.

VI. Information and Decision-Support Needs

When it comes to marketing, the bigger vendors [global] have the resources to approach different levels in decision making process, while smaller vendors utilize 'bloodthirsty' sales force.

With regard the critical information needs, the pilot tests and demonstrations are great source for marketing TSM&O, also the customers want to see peer examples.

With regard information needs for vendors, they would like to know the numbers, the budget of the customer, which gives them a lot information with regard how serious is the project or how big it could be, they need more specificity which is lacking currently.

The material presented to the group seems to be new for them, and for the short period they saw it they thought it was extremely beneficial to know that there is easy access to such a data. Group recommended another group to test the website about half day and then give feedback. Furthermore, the group questioned who the audience for the web site is, they think that not everybody can be the audience, thus different readers need different information.

The website is good source for the group in order to get the needed material quickly, while the brochure is good for any decision maker that they need to get attention in 5 minutes. The DOT symbol on the back is very accepted, it gives credibility.

Recommendations from the group to FHWA were to interconnect the website material with theirs (vendors), to increase awareness of such information (website) and one way to increase awareness was through Bernie Wineglass who sends out one page bullet email with links.

ITE Focus Group #1

I. Major Transportation Issues

The major transportation issues faced in this group were traffic congestion, shared roadway management and safety, highway safety, and funding, especially in relationship to matching federal funding for projects. This year has seen an increase in pedestrian fatalities in a number of areas which has put a lot of political pressure on increased safety. Another issue that has not been voiced before was that of personnel shortages. This group indicated significant pain related to a lack of candidate engineers for positions. Further exacerbating this shortage, the lack of available funding prohibits use of consultants in the place of engineers. The engineer role has broadened recently as well, with additional responsibilities relating to financial and legal issues and associated paperwork. Another financial pressure has been the increase in energy costs, while tax funding has not increased to match. Looking for new ways to fund transportation projects is a critical near future issue.

II. Construction vs. Maintenance vs. Operations

The distinction between construction and the maintenance and operations pair is very clear. However, the line is blurred between maintenance and operations since often times these two types of projects come from the same money pool. Some defined operations as including anything the traffic office would be responsible for, while others considered those same components as maintenance and operations as roadway operations patrol and the energy costs to run the system. Another distinction for construction is the relative ease by which funding and support can be garnered. The federal and state agencies are able to come up with aid for construction efforts, but maintenance and operations responsibility falls to the local agencies. This imbalance in funding results in inadequate maintenance leading to deteriorating infrastructure and severe safety issues over time. This has started to shift the focus of project evaluation from build costs alone to total life cycle costs. Complementing the project evaluation shift, there has been a shift for some in the prioritization of funding; maintenance gets covered first, operations and matching projects is second, and new construction is last with leftover funds.

III. Familiarity with and Perceptions of TSM&O Products and Services

Most respondents were generally familiar with the various TSM&O systems and services. Some regions felt that they were aggressively pursuing some of the items on the list, but may have neglected other areas which could be of great benefit. TSM&O systems commonly mentioned as currently employed or to be employed in the near future included freeway management, incident management, congestion, and traffic signalization and synchronization. There was concern expressed with project management when dealing with implementation of TSM&O, because of the various agencies involved. The process is seen as complex and associated with credibility hazards of going over budget.

IV. Decision Processes and Players

Major implication from this group is that their involvement in the decision to invest in TSM&O depends on the project and the level, if regional they are one of many if local they are one of couple. The group identified themselves as champions and they agreed that there must be a champion. It was implied that champion can be anybody who has technical knowledge. Major problem is the lack of staff, thus lack of time, so being champion involves a lot of risks (failure risks) and therefore the implementation of TSM&O is incremental. The group strongly agreed that money is the major factor that is considered when making the decision to invest in TSM&O. Major funding that has been used by the focus group for TSM&O is the CMAQ fund.

In order for TSM&O to be considered there has to be a legitimate need that usually comes either from the public or politicians due to safety issues. The group implied that most of the systems are implemented based on a long-range plan, though sometimes it can be implemented due to a crisis i.e. if there is high death rate, this is where politicians usually get involved with funding and implementation. Additionally, the group identified following stakeholders: MPOs, city engineering staff and management, members of ITS regional architecture planning committee, fire department, police department, first responders, and elected officials.

The group identified the decision process in following steps: 1. It starts with local or state, where a legitimate need is identified 2. it goes through the engineers [focus group folks] 3. then the case is presented and analyzed by MPOs, State DOT folks, sometimes Federal Highway Regional Rep and/or ITS regional architecture planning committee. 4. From there it goes to elected officials for approval and funding. It was implied that the length of the process depends on the size of the project, the leadership of the process as well as the budget, if federal funding required it can take up to 5 years, while if it is on city level (funded by city) it can be done in one year.

V. Information Needs

The group identified that TSM&O are perceived as ‘solution looking for problem’, and their marketing approach would be to change this perception, Moreover, they emphasized on the relevance of operation system and services with regard Joe Q. Public, how does TSM&O apply to him; what are the benefits to a regular person?

When making decisions regarding TSM&O systems and services, key informational needs include the ability to review benefits quantified in terms of cost/benefits, saving lives, life-cycle cost-benefit, ability to share systems and services between different stakeholders, as well as experiences of other regions. The group implied that the information needs differ for the various role players involved in decision process.

VI. Perceptions of Marketing Materials and Communications

Only few people have been to the ITS website and majority has not seen the hard copies that were handed out. Emphasis was placed on developing a 4 page [glossy] executive summary in a plain language, giving an overview of costs and benefits with references on there to detailed information; “The Kiplinger Letter” and “The Bottom Line” were used as an example how the

material should look like. Additionally, politicians and the head of traffic operations division were identified as target audience.

The website was identified as a great resource for someone who has time and needs to drill down for information, but the group [engineers] does not have time do go through the website. A monthly or bimonthly email that gives links to summaries and more detail was also recommended.

ITE Focus Group #2

I. Major Transportation Issues

The major transportation issues faced in this group were traffic congestion, managing and expanding arterial roadways, upgrading signal systems, funding, staffing shortages, and multijurisdictional coordination. Managing growth has been difficult and construction efforts have not kept up with the rate of growth. Currently, several respondents are looking for other ways to improve efficiencies, particularly with the application of technology as a growth management tool. This group, similar to ITE Focus Group 1, indicated significant pain related to a drastic shortage of well trained ITS device technicians, which were characterized as individuals with training somewhere between common labor and having an engineering degree. The respondents struggled to find employees with the appropriate skill set and it seems that there are no institutions training individuals for these particular types of positions. Agencies have to hire people that can train new hires in the line of work, while manufacturers that used to provide that training and development are no longer doing so. This sort of employee development represents an additional cost and puts greater pressure on the traffic agencies. With regard to funding and growth, as the infrastructure expands, with more lights and more signage, there are fewer workers to service these areas and the agencies are required to do more with less.

II. Construction vs. Maintenance vs. Operations

The distinction between ‘construction’ and the ‘maintenance’ and ‘operations’ pair is very clear. Construction, in the minds of these individuals, is associated with multimillion dollar projects and the potential to outsource to save money. Maintenance on the other hand is much less glamorous but something that has to get done. A few respondents felt that they have an unusual situation with strong political relationships empowering them to get the financing they need for maintenance projects. But, most feel that construction projects are significantly easier to articulate and get political backing for. These respondents were better able to distinguish between maintenance and operations by establishing group accepted definitions. They defined maintenance as anything related to keeping things in working order. Operations, on the other hand, was defined as interacting with the users or using technology to improve results.

Though the respondents were able to clearly delineate operations from maintenance, budgeting for the two categories is not differentiated. One general fund is used for both types of projects. Funding for projects typically comes from a portion of gas taxes and possibly a certain percentage of the sales tax.

III. Familiarity with and Perceptions of TSM&O Products and Services

Most respondents expressed familiarity with the various TSM&O systems and services. Issues associated with these products and services included difficulty of coordination across agencies and localities, difficulty finding the necessary funding and personnel resources, dealing with unreasonable expectations from the public and the media, and understanding the lifetime cost implications. There was also a perceived difficulty in integrating the disparate systems such as arterial management, instance management systems, and emergency management systems into

one cohesive package that can communicate to related agencies as necessary, such as police and fire departments.

IV. Decision Processes and Players

All but one respondent said that they are very involved in the decision to invest in TSM&O. The group identified key benefits (cost savings, positive direct impacts on the budget, maintainable and easy upgradeable) to be the major consideration when considering operations systems and services. However, funding was identified as the single most important factor when making the actual decision to invest in TSM&O. Staffing and other resources were also an important factor. The majority agreed that these systems and services are implemented based on an immediate problem or crisis, and if there is long-range plan in many cases it is an outgrowth of an immediate crisis or problem. The group implied that the key role players in decisions to implement TSM&O vary among the different projects. They identified emergency responders and the people who control their budgets, State DOTs, MPOs, and transportation engineers as key role players. Additionally, the group said that the traffic person is missing on the decision table, implying a lack of dialogue (forum).

The group identified themselves as champions and all agreed that the elected officials need to become champions as well as a money source. A gap between engineers and elected officials was identified, and the ones who have luncheons with elected officials tend to present the systems and receive funding and support (they have to see it before they believe it). Furthermore, they implied that it is risky to become a champion, and that one has to be realistic and do the best to set reasonable expectations (and to manage expectations). The public was also identified as an important driver of TSM&O implementation, but the proper education is needed, and once they see the benefits they will often become advocates.

To implement TSM&O, the participants implied that one has to look for the window of opportunity and not to be afraid of failure or discouraged by rejections, to be persistent and have a concept plan, and to persist in getting and keeping stakeholders involved. Some of the group members discussed first trying to work within their own budgets before going to out and look for federal funds.

V. Information Needs

The group implied that the people on their level do not have to be convinced. Rather, it is the people that are next in the hierarchy within their communities that really need to see TSM&O and be convinced. If they were to market TSM&O, they would visualize it to the decision makers and show the benefits for the end users. The state-level-folks need to be targeted, since city traffic engineers do not have time and resources to explore TSM&O materials. One way to better target these individuals (state-level) is to have pre-packaged materials (videos, PowerPoint's, etc) that they can use and utilize it when given the opportunity to meet with state-level-folks.

The critical information needs identified by this group were peer to peer (county to county, region to region, and city to city) case studies, information about staffing requirements for each

technology, as well as more information about potential funding sources (what funds can be used for what purposes).

VI. Perceptions of Marketing Materials and Communications

Very few of the participants were aware of the available materials and only two have been to the website. The group preferred the website and web seminar formats as information sources, and recommended a small brochure with pictures and less wording (referring to the orange work zone brochure that was handed out) for the elected officials. They recommended a peer to peer trainer and trainee program (people who have implemented TSM&O should train ones who want or need to implement). Additionally, one person recommended that the potential funding sources should be introduced on the website. The group identified a related problem. They suggested a need for adequately paid tech people otherwise the resources/information will never get to the elected officials/decision makers.