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The report provides the U.S. DOT Intelligent Transportation Systems deployment community with information describing transportation investment decision-making at the state and local level and specific insight into the ITS deployment opportunities and obstacles faced by local and state transportation managers. The goal of the report is to identify education, information and outreach strategies that the Department can use to accelerate ITS deployment among the 75 metropolitan areas targeted by the Secretary of the Department of Transportation in 1996.

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PREFACE

The Intelligent Transportation System (ITS) User Acceptance Research Program was created to explore issues affecting ITS purchase and deployment decisions among the actual consumers and end-users of ITS products and services. Building from earlier ITS market and user acceptance research at the Volpe Center, university research centers, and at the U.S. Department of Transportation (U.S. DOT) field operational tests, this program identified three critical end-user groups whose acceptance of ITS would be central to successful national deployment: commercial vehicle drivers, private travelers, and public sector transportation managers. The first study undertaken surveyed commercial vehicle drivers and was published in 1995. The second study is examining the purchase and use decisions of private travelers in response to advanced traveler information systems and in-vehicle safety and personal security products and services. Research on private travelers began in 1996 and will be completed in 1998. The following report addresses the issues and obstacles affecting public sector transportation managers when considering whether to purchase and deploy ITS infrastructure. It is focused on ITS infrastructure deployment in metropolitan areas to support the ITS deployment goal established by the former Secretary of Transportation Federico Peña in January 1996, and endorsed by the present Secretary of Transportation Rodney Slater in 1997.

Funding for this research was provided by the U.S. DOT Intelligent Transportation System Joint Program Office as part of the ITS User Acceptance Research Program.

The following staff of the Economics Analysis Division at the John A. Volpe National Transportation Systems Center in Cambridge, Massachusetts contributed to the preparation of this document: Jane E. Lappin, EG&G Services; Sari Radin, Volpe Center; David Jackson, EG&G Services; Anne Tallon, EG&G Services; Allan J. DeBlasio, Volpe Center; and John O'Donnell, Volpe Center. Also contributing to this document are Jeffrey W. Trombly, Ph.D., Claire Barrett, David Connell, and Lyn Pozzi from the Science Applications International Corporation in McLean, Virginia.

The authors would like to acknowledge the many transportation professionals in federal, state, and local agencies, metropolitan planning organizations, transit, ports and airports who gave their time to discuss the issues presented in this report. Without their ideas and generous cooperation, it would not have been possible.

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Overview

The purpose of this research project is to provide the U.S. DOT Intelligent Transportation Systems (ITS) deployment community with information describing transportation investment decision-making at the state and local level and specific insight into the ITS deployment opportunities and obstacles faced by local and state transportation managers. The goal of the report is to identify education, information, and outreach strategies that the Department can use to accelerate ITS deployment among the 75 metropolitan areas targeted by the Secretary of the Department of Transportation in 1996. This study:

- investigates motivations and obstacles for ITS procurement in typical metropolitan areas
- derives lessons U.S. DOT can use to stimulate deployment of ITS in these areas
- develops a marketing framework to support effectively targeted U.S. DOT outreach, training, and program policy decisions
- provides specific recommendations on the selection and focus of marketing venues and content of outreach materials to facilitate state and local ITS deployment decisions

The report is organized so that readers with different interests can go directly to the sections that have the greatest relevance to them. A private sector ITS integrator or application company may choose to skip to the second chapter for greater insight into their customer population and possible marketing approaches. A U.S. DOT staff person responsible for managing the ITS public awareness campaign may choose to read only the second part of Chapter II, and Chapter III. It is recommended that U.S. DOT staff with direct management responsibility for metropolitan area ITS deployment programs read the entire document.

Between July and October, 1996, project staff met with approximately 150 transportation managers from 13 metropolitan regions, employed by all levels of government and all surface transportation modes and authorities, to learn why they were or were not deploying ITS applications to solve their constituencies' transportation problems. A series of marketing questions were used to focus the inquiry:

- Who are ITS infrastructure customers?
- What are their needs?
- How do ITS infrastructure products meet those needs?
- What obstacles prevent potential customers from purchasing, deploying, and integrating ITS infrastructure applications?
- What is the best way to reach ITS infrastructure customers? What media? Which publications? And, what message?
- What action should they take once they become aware of the benefits ITS products provide?
- How best to organize limited financial and staff resources to accomplish the greatest level of ITS infrastructure awareness, commitment, purchase, and deployment?

Two research hypotheses were formulated and explored. The first research hypothesis asserted (and the interviews confirmed) that, in any given metropolitan area, there are a number of transportation managers, planners, engineers, and elected and appointed officials who influence ITS deployment decisions. Purchase decisions are dependent upon a number of critical "customers" deciding that the investment is worthwhile. Findings from the interviews provide insight into who these customers are, what motivates them to consider transportation investments, and how to reach these individuals and influence their opinions positively toward ITS infrastructure deployment and integration.

The second research hypothesis asserted that, in each metropolitan area, there are a variety of transportation and institutional factors that influence the speed of ITS adoption. These factors, once identified and understood, can be generalized to a larger number of areas, and used in a marketing strategy to assist in accelerating ITS deployment nationally. This report identifies these factors and discusses their relevance to the metropolitan areas' various stages of ITS deployment.

Approach

Twelve sites were chosen from a list of the 75 largest metropolitan areas in the United States.[1] A number of criteria were used to select areas for site visits, including:

- population size
- population growth
- population growth rate
- level of ITS deployment
- geographic distribution
- transit availability and use
- presence of toll facilities or ports
- age of infrastructure
- air quality non-attainment status
- other qualitative characteristics

Many of these criteria are surrogates for transportation needs. Population growth leads to traffic congestion. The age of the infrastructure provides an indication of the need for infrastructure replacement or renewal. Other criteria are measures of deployment opportunity or experience, both regionally and statewide.

Metropolitan areas hosting major ITS field operational tests, such as Minneapolis, Houston, and San Francisco, were eliminated from consideration, as were several atypical areas including Los Angeles and New York because of their size, and Atlanta because of the Olympics. These areas were eliminated because they would not be representative of a typical metropolitan area, that is an area that is not deploying ITS because it has received federal ITS funds. The regions that

1 These metropolitan areas are being surveyed on an annual basis in order to track deployment progress in meeting the Secretary's metropolitan deployment goal. The full baseline survey is being implemented during the summer of 1997. Information used in site selection was taken from an earlier survey completed in the spring of 1996. San Juan, Puerto Rico has been added as a 76th surveyed site since this effort began.

were finalists for ITS Model Deployment Initiative awards (San Antonio, Phoenix, Seattle, and New York) were similarly eliminated from consideration. The remaining metropolitan areas were grouped by population growth rate and current level of ITS deployment. From this stratification, five pairs of areas were selected along with two individual cities, resulting in twelve regions selected for site visits. The pairing was done for comparison purposes to isolate factors. For example, two cities in the same state share the same state government and FHWA Division, so it is likely that the cities will receive similar treatment from higher levels of government, and local factors affecting decisions could become more apparent. Other comparisons included similarly sized cities with relatively higher or lower ITS deployment. The sites selected and paired were:

- Buffalo, New York and Rochester, New York
- Charleston, South Carolina and Portland, Oregon
- Columbus, Ohio and Indianapolis, Indiana
- Dallas, Texas and San Diego, California
- Kansas City, Missouri and Memphis, Tennessee

In addition, Philadelphia, Pennsylvania and Salt Lake City, Utah were selected, but were not paired with any other areas.

Findings

As expected, the decision-making process that precedes a metropolitan area's commitment to procure and deploy an ITS infrastructure system generally involves many different individuals at various levels of authority within the deploying organizations and across several different jurisdictions. With the occasional exception of coordinated traffic signal systems (which may be contained within one political jurisdiction), no system can be deployed without some involvement with another transportation authority or planning agency. Deployment decisions are made most effectively in regions where all affected parties in the transportation and planning community:

- have experience working together on projects of mutual interest
- understand the benefits that the ITS application will provide
- believe that the ITS application serves the interests of their electoral or organizational constituency
- have the endorsement of the elected and/or appointed officials

The following list provides a summary of the *critical agencies and decision-makers* who are party to the ITS deployment decisions, the messages that they would find influential with regard to the benefits of ITS, the actual information needed, and the most effective outreach venues for relaying the information.

- State elected and appointed officials
  "ITS has tangible benefits: demonstrable improvements that are visible and obvious to the electorate, bring federal tax dollars into the state, and create jobs."

The information these decision-makers need is contained within success stories from other states with comparable issues, and are best delivered through venues sponsored by the American

Association of State Highway and Transportation Officials, the National Governor's Association, and (where they are qualified) their own senior transportation staff.

- Local elected and appointed officials

  "ITS is a money-savings investment, a tool with which mayors can improve the quality of life of their constituents, and a cost-effective approach to improving mobility for the people, goods, and services that are requisite for a healthy business climate."

As with their state-level counterparts, local elected and appointed officials need to hear from colleagues in other cities or counties that have successfully solved similar problems. The most credible and effective venues for delivery of information are the local Chambers of Commerce, National Conference of Mayors, International City/County Management Association (ICMA), the National League of Cities, and well-informed, astute, senior transportation managers within their own transportation department.

- State departments of transportation

  "ITS is a cost-effective means of improving highway system performance, especially with respect to congestion and safety."

The information that state DOTs need in order to consider an ITS investment is cost-effectiveness and benefit/cost information; examples of cooperative agreements for operations; how to do design-build contracts; and, standards and specifications for ITS technologies. The venues cited most frequently for delivering credible information includes FHWA, local chapters and publications of the Institute of Transportation Engineers (ITE), American Association of State Highway and Transportation Officials (AASHTO), ITS America, Transportation Research Board (TRB) and American Society of Civil Engineers (ASCE), and the publications Traffic Technology and ITS World.

- Metropolitan planning organizations (MPO)

  "ITS is a cost-effective means of solving transportation problems related to the economic growth and livability of the metropolitan area."

MPOs require cost-effectiveness and benefit/cost information, and evaluation tools for comparison purposes. MPO staff refer to most of the same organizations and publications cited by other transportation organizations for transportation information, especially FHWA, ITS America and ITE.

- Transit authorities

  "ITS can save money through improved operational efficiency or reduced fare evasion."

Managers at transit authorities cite need for information addressing standards, boilerplate specifications, model interagency agreements, and experience of other systems in addressing problems with unions. Information sources mentioned most frequently were the American Public Transit Association, ITS America and a range of publications, such as Metro, Railway Age, Mass Transit, and Passenger Transport. The Community Transit Association of America is reported to be an important source of information for smaller transit properties, particularly for paratransit and in rural areas.

- Local traffic engineers

  "In the experience of many cities, ITS can be an affordable way of upgrading their current traffic signal control systems, while improving coordination across jurisdictions, in order to address traffic flow, safety, and economic development issues."

City and county traffic engineers were most interested in decision-support information on other cities' and counties' experience with the technologies, procurement issues, such as specifications, and model interagency agreements. Their most frequently consulted sources for information were ITE publications and regional meetings, peer-to-peer programs, scanning tours, and any organized program that matched the expressed interests of the cities' transportation community with the experience of a similar city's transportation community.

- Toll Authorities

  "ITS can save money by reducing personnel while improving customer service through reducing delay at toll booths and providing better information about incidents."

Management and staff at authorities were most interested in information on interagency agreements, and the experience of other authorities, especially with union concerns. Their primary source of information is the International Bridge, Tunnel and Turnpike Association.

- Ports

  "ITS can help facilitate logistics and offsite/onsite traffic flow."

Port staff and management need examples of relevant ITS technologies, and experience of other ports with technologies and coordination. The most frequently cited sources for information were the MPO, MARAD, Waterways Journal (for shallow water ports), Marine Log and Marine News (for deep water ports), and trade associations such as the National Waterways Conference, American Association of Port Authorities, and the American Waterways Operators.

- Airports

  "ITS can help manage facilities to address bad weather conditions, as well as improve groundside logistics and offsite/onsite traffic flow."

Airport management and staff need examples of relevant ITS technologies, and experience of other ports with technologies and coordination. The most frequently cited source of credible information were the American Association of Airport Executives (AAAE) and the Airports Council International--North America (ACI).

Certain issues consistently emerged from the interviews as *regional factors* influencing the speed with which ITS is being deployed and integrated locally and by the state. The degree to which these factors are present (or absent) in the region appear to predict the speed with which the region is deploying and integrating ITS into its transportation system. Later in the analysis, the regional factors identified through the interviews are used to create a profile that enables all 75 metropolitan areas to be sorted into four market segments, based on their stage of ITS infrastructure adoption: Market Leaders, Lead Adopters, Late Adopters, and Uncommitted. These segments are useful categories for organizing the delivery of such marketing information as education, training, and technical assistance.

- Transportation Needs

Regions with higher levels of deployment, plans and momentum tended to express a greater need for ***managing congestion***. Places with medium or low levels noted greater ***infrastructure repair and replacement*** needs. ***Weather conditions*** were motivators for some places with low levels of deployment, plans or momentum. The decision of a region to address congestion with ITS, as opposed to investing in infrastructure repair also appears to correlate strongly with population and economic growth. This last point is discussed in the community factors section.

- Institutional Factors

Support of state and local elected and appointed officials **and** ***regional experience with other inter-jurisdictional projects*** correlated strongly with higher levels of ITS deployment. State officials and DOT leadership influence the rate of deployment both for projects on state facilities (highways) and for local projects where state expertise, leadership, and funding can help. Similarly, the presence of a mayor or other strong local political leadership who understood how ITS applications could be applied to address an urban transportation agenda, was positively correlated to any amount of ITS deployment. Regions where transportation and related agencies do not work together well are the least likely to adopt more advanced technology strategies. Of the twelve sites, those with the highest level of ITS deployment and momentum were the best organized, and demonstrated a minimum of inter-agency and inter-jurisdictional tension. The ***presence of a local champion*** was a useful, but not necessary precondition for higher levels of ITS deployment. The majority of high deployment regions frequently have multiple champions distributed among the transportation and planning agencies.

- Budget and Procurement

In regions with ***a coordinated ITS plan that responds to well-articulated local needs***, funds can usually be assembled from a variety of local, state and federal sources. By contrast, in areas where ITS priorities are vague, uncoordinated or non-existent, funding is often cited as a major impediment. There are higher levels of ITS deployment in regions where there is a ***sufficient transportation budget***, and especially where there is a separate revenue stream dedicated to transportation (such as curb-cut fees in a Portland suburb) which protects transportation projects from competition for general funds. Major construction, such as rebuilding and widening I-15 in Salt Lake City or expanding the highway system in the Dallas area, creates an ***opportunity to include ITS in a larger budget project.*** High price tag projects can include ITS technologies that would look too expensive if introduced separately. This strategy is also used effectively in smaller projects, such as the replacement of traffic signal systems, where the additional increment of cost that allows the system to support more advanced signal timing functions is small relative to the overall cost of the system.

- Community Factors

The public nature and high cost of infrastructure investment can inhibit risk-taking, so unless the advocates of ITS systems can demonstrate that the systems perform better or are lower cost alternatives, managers may prefer solutions that have been successful for them in the past. The lowest ITS planning and momentum exists where the proponents of advanced technologies have been unsuccessful in ***managing information about technology to positively affect decision-makers.*** Where ***local government and business leaders relate transportation and mobility to economic vitality***, and especially in cities which are experiencing economic growth, they are

more actively involved in advocating for transportation system improvements, including ITS. In several cities, ***very high profile accidents were the catalyst for ITS.*** The incident works as a catalyst by causing transportation and incident management groups to work together toward a shared goal. The events led to a search for improved communications among public safety agencies and the traveling public, focused on incident management systems, variable message signs, or roadside call boxes.

- Access to ITS Information

Access to information by all levels of transportation and planning staff affects the rate of ITS adoption in a region. Several different means of obtaining information were explored, including written information, active membership in professional organizations, access to others with ITS experience, information provided by FHWA field offices, and travel for first hand observations. On average, there is ***better access to and use of written information*** in areas with greater levels of ITS deployment and momentum. In general, managers and others prioritized review of those publications which they felt to be most credible, such as American Public Transit Association, ITE and Transportation Research Board publications. While mentioned as a source of information relatively often, the Internet does not appear to be readily available in the workplace and, in most cases, Internet research was conducted at home. In tandem with access to information, ***interaction with others who have actually procured and operated ITS*** is a major factor in its eventual adoption. Many of the cities which have moved toward procurement and deployment have been involved in FHWA "scanning tours" where high level decision-makers are taken to visit installations in other cities. For staff who could not travel, innovative ways of obtaining information and contact with knowledgeable peers included inviting vendors for demonstrations on a regular basis (even when there is no intent to buy), accepting high staff turnover so that new up-to-date staff can be hired frequently, relying heavily on consultants, and taking advantage of touring technology demonstrations by the FHWA, Public Technologies, Inc., or other organizations. State DOTs, local traffic engineering offices and MPOs seem to rely for information more on ***regional chapters of national professional organizations***, in which they are members. Transit agencies seem to rely more on transit publications than attendance at professional organizations; the American Public Transit Association was cited most frequently as a source of information. Finally, the ***U.S. DOT regional and division offices*** were cited as credible sources or purveyors of useful ITS information.

In this way, it is possible to understand the challenges of ITS deployment from the perspective of the individual decision influencers within the deploying agencies. This information then forms the basis for the development of outreach strategies that can be tailored to address their concerns, and informs them about those benefits of ITS that are most relevant to their concerns.

Conclusions

A marketing strategy builds from a complete understanding of the product and the benefits it provides, and an equal understanding of the customer and their decision-making context. This research paper has addressed the public sector transportation manager as customer and ITS decision-maker, and the ITS purchase and deployment context. The conclusions and recommendations provide a framework that uses this insight to create an ITS marketing strategy.

By looking at the metropolitan regions as customers and the transportation managers and staff who make the actual ITS purchases as decision-makers, it is possible to observe commonalities by employment position across the regions that describe their interests and concerns as it relates to the ITS purchase, deployment, and integration process. Specifically, public sector transportation managers and staff can be categorized according to the type of agency they work for, the position they hold, and their level of interest in acquiring ITS applications. Using this information, an outreach matrix can be created in which each decision-making position, at each level of interest in ITS, can be matched to the appropriately influential ITS benefits message and accessible media. The following chart describes the four positions that each ITS decision-maker progresses through as they are increasingly influenced and motivated by ITS deployment information.

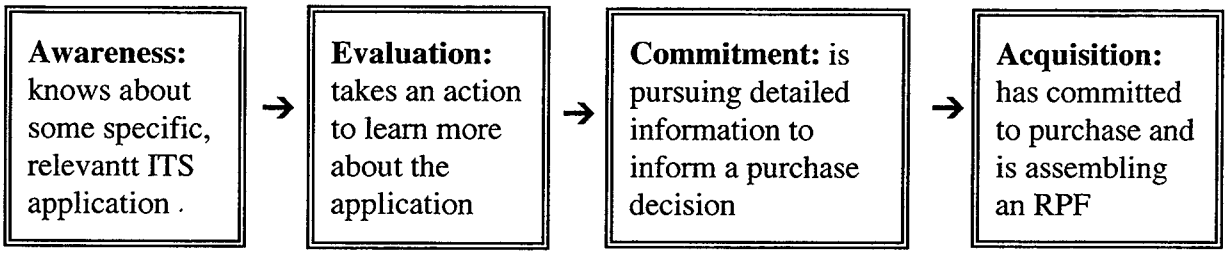


Figure 1. ITS Adoption Stages

Similarly, by approaching the metropolitan regions as customer units, and examining the factors that can be generalized across all 75 metropolitan areas to various levels of ITS infrastructure deployment, it is possible to categorize, or segment, the regions into markets according to the momentum level of ITS deployment. Segmentation variables enable more efficient targeting of limited staff and financial resources to those potential customers who are most likely to deploy ITS infrastructure. The regional segmentation factors described in the findings provide a benchmark against which to measure the nearness of a metropolitan region to fuller ITS deployment, as well as benchmarks for the evolution of a region from uncommitted observer to active ITS deployment. The following chart summarizes the regional factors that characterize a metropolitan area by market segment, or momentum toward ITS adoption.

Recommendations

The following recommendations to the U.S. DOT are intended to support the development and delivery of a comprehensive, national ITS deployment marketing strategy. Many of the activities included in the recommendations have already been undertaken by the appropriate U.S. DOT office, as part of the existing awareness, outreach, and technical support programs. A large part of what is being recommended here is the organization of these related efforts into a centralized and focused strategy.

Market Leaders:	Lead Adopters:	Later Adopters:	Uncommitted:
• Sustained high or moderate population growth • significant network congestion and constraints on physical expansion • well-maintained existing infrastructure • state and local political support • sufficient transportation budget or dedicated funding • well-established inter-agency working groups • strong transit authority • significant installed base of ITS applications • well informed managers and staff, with high access to ITS information	• High or moderate population growth • increasing network congestion and constraints on physical expansion • well-maintained existing infrastructure • state and local political support • sufficient transportation budget or dedicated funding • well-established inter-agency working groups • some installed ITS applications • strong transit authority • well informed managers and staff, with high access to ITS information	• Low population growth • tolerable congestion levels • constrained transportation budget • limited political support • some experience with inter-agency working groups • competing infrastructure repair needs • some well informed staff with good access to ITS information • ITS applied along with replacement of old equipment, such as signal systems • other ITS applications considered as a response to an incident or accident	• No population growth • limited or sporadic network congestion • high infrastructure repair needs • insufficient transportation budget • ITS applied along with replacement of old equipment, such as signal systems

1. Develop and maintain an ongoing national ITS awareness campaign targeted to decision-makers who are just entering the awareness stage of the ITS applications, using established and regularly consulted venues such as the national and regional conferences and publications of ITS America, ITE, National Association of Mayors, National Governors' Association, the American Public Transit Association, AMPO, and cited ITS trade magazines.

2. Inventory existing ITS outreach activities and materials, and sort them according to the decision-maker they are intended to reach, and the stage of the ITS adoption cycle they are designed to address. Develop new ITS outreach materials to address the categories that are lacking, and amend existing materials found to be a mismatch for the outreach category it had been intended to address. Ensure that all materials are tailored to the interests and level of ITS commitment of the decision-makers, and that the method for delivery also matches the objective of the material.

3. Sort the targeted 75 metropolitan areas into market segments according to their level of ITS adoption, and prioritize deployment outreach, education, and technical assistance to the second tier Lead Adopters.

4. Develop service plans for the delivery of outreach, education, and technical assistance materials to the metropolitan areas that fall into the Lead Adopters segment. Utilize existing FHWA/FTA field support and service delivery structure to monitor the progress and requirements of these targeted areas to ensure that the best information is being provided and at the appropriate time.

I. INTRODUCTION

1.1 Overview

The purpose of this research project is to provide the U.S. DOT Intelligent Transportation Systems (ITS) deployment community with information describing transportation investment decision-making at the state and local level and specific insight into the ITS deployment opportunities and obstacles faced by local and state transportation managers. The goal of the report is to identify education, information, and outreach strategies that U.S. DOT can use to accelerate ITS deployment among the 75 metropolitan areas (Appendix A) targeted by the Secretary of the Department of Transportation in January, 1996. This study:

- develops a marketing framework to support effectively targeted U.S. DOT outreach, training, and policy decisions
- investigates motivations and obstacles for ITS deployment in typical metropolitan areas
- derives lessons U.S. DOT can use to stimulate deployment of ITS in these areas
- provides specific recommendations on the selection and focus of marketing venues and content of outreach materials to facilitate state and local ITS deployment decisions

Project staff met with approximately 150 transportation managers from 13 metropolitan regions, employed by all levels of government and all modes and authorities, to learn why they were or were not deploying ITS applications to solve their constituencies' transportation problems.

1.2 A Marketing Approach to ITS Deployment

One of the central deployment challenges facing the national ITS program is that, unlike the National Highway System, it is not being extensively funded by the U.S. DOT separately from other programs such as the Surface Transportation Program and there are not design standards to the same degree. Instead, deployment is more dependent upon the purchase and use decisions of the local and state transportation authorities choosing how to allocate the federal, state and local funds available. Such purchase decisions are usually subject to a complex recommendation and review process involving many different members of the agency, sometimes several different agencies, and elected or appointed officials. To develop an effective understanding of how to influence and motivate these complex organizations, this research project adopted a marketing research approach.

Marketing is how companies or agencies make their potential customers aware of the benefits of the purchase or use of their service or products. A marketing research study addresses several questions:

- Who are our customers?
- What are their needs?
- How do our products and services meet customer needs?
- What obstacles prevent potential customers from purchasing and deploying our products and services?

- What is the best way to reach[1] these potential customers?
- What actions do we want potential customers to take once they become aware of the benefits our products provide?
- What is the best way to allocate our limited marketing resources to accomplish the greatest level of product awareness, commitment, purchase, and deployment?
- What are the components of the marketing strategy?

Putting the state and local public sector partners in this context of being customers to federal government programs, these questions can be interpreted in the following fashion:

Who are our customers? When the customer (the individual who makes the purchase decision) is not an individual acting alone but part of a complex organization, or even part of a multi-agency cooperative effort, as can be the case in a metropolitan region, it is critical to understand how the purchase decisions are made and who influences the final purchase decision. This information enables the marketer to create an influence framework onto which to map each of the purchase-influencers, their role in the purchase decision, what they must know about the product to affirmatively influence the purchase decision, and how best to reach them with information that will affirmatively influence their decision.

What are the customer's needs? Effective outreach and marketing depends upon a full understanding of the customers' work responsibilities, the challenges they face in fulfilling those responsibilities, and the larger organizational (or political) context in which they work. All marketing (including outreach and education) must address the customer's needs from the customer's perspective.

How do our products and services meet customer needs? In order to consider approval of an ITS investment, an elected official needs to know that the product is a proven technology which is cost-effective and will support the broader community goals endorsed by local constituents. A traffic engineer must understand the product's functional capabilities in great detail before making a deployment commitment. Different outreach strategies must be developed to reach, inform, and motivate the many different players who are part of the larger customer organization.

What obstacles prevent potential customers from purchasing and deploying our products and services? As critical as *why* a customer will benefit from the use of ITS, is understanding *what* obstacles may interfere. Where a lack of understanding of product benefits or function is the primary obstacle, outreach or educational programs can eliminate this obstacle. Similarly, if it is a mismatch between the requirements of an advanced technology and the existing acquisition procedures, the obstacle may be addressed through access to several "best practices" acquisition procedures used by other government agencies in a similar situation. When undertaking a national marketing

[1] The term "reach" refers to using credible and effective venues to get and hold the attention of the potential customer to communicate the benefits of the product or service being marketed.

campaign, it is useful to identify the full range and frequency of obstacles faced by potential customers. With this information, materials can be created systematically to address commonly occurring obstacles.

What is the best way to reach potential customers? The best way to reach potential customers is through information sources that they already consult and respect, and to frame the message in relation to problems and benefits that they understand. To get your customer's attention, you must attach the appropriately framed messages to an established source, such as trade publications or professional associations. Some complex and expensive products require a personal presentation. While traditional sales presentations are useful, much more can be accomplished if the presentation is made by a respected colleague dealing with similar problems. For example, a mayor, or other chief elected official, is much more easily influenced when the information is presented by a respected peer who has had to solve similar problems. When your customer is comprised of one or more agencies, each with its own needs and decision-making processes, an integrated, multi-phased marketing plan must be developed that reaches each of the involved individuals and agencies.

What actions do we want potential customers to take once they become aware of the benefits our products provide? Marketing serves specific goals: for each outreach activity to each member of the customer organization, there is a specific purchase and deployment action that is desired. It is this action goal that determines the choice of outreach venue and the content of the message. When the marketed product is complex, as with ITS, there are many stages of awareness, interest, understanding, and commitment that the marketing strategy addresses (each in turn) to move the customer to a commitment to deploy. A separate marketing activity is developed to move the customer through the stages toward purchase.

How best to allocate limited marketing resources to accomplish the greatest level of awareness, commitment, purchase, and deployment? In answering this question, the focus of the strategy shifts from the individuals who comprise the customer organization, to the bigger market of discrete customer organizations.

Marketing strategies frequently prioritize those segments of the potential customer population that are believed to be lead adopters, that is, those customers who are experiencing the most acute problems that the product is designed to solve or are most willing to try new things. An ITS example of a lead adopter would be a region that is growing too quickly for even an ambitious road construction plan to accommodate, where new strategies must be deployed quickly to prevent economic deterioration. While there are exceptions, these are the most likely first customers.

Prioritizing marketing resources toward likely lead adopters is based on the observation that new products diffuse through the marketplace partly due to the specific marketing activities of the company, and partly due to a more social process in which early adopters "sell" the product to others who have similar requirements. Assuming these lead adopters

make a purchase and then talk about the product with unconverted colleagues, one gets greater mileage out of the marketing investment.

In some markets, the purchases of the market leaders are actually out ahead of the marketers. When this is the case, the marketing strategy can build from the existing deployed product base, and target second-tier customers. Over time, the second-tier adopters become product-literate and move into more advanced stages of product deployment and integration, enabling marketing resources to be directed to the next tier of potential customers. Over time as the customers who are experiencing less need for the product's benefits begin to adopt the product, the original lead adopters develop more advanced and innovative applications for the early products.

One of the challenges of this study is to identify those characteristics of a metropolitan area that distinguish it as a market leader, lead adopter, a second tier adopter, or an area which has very low real needs for the benefits that ITS products and integration confers.

In summary, the decision to deploy ITS technologies within a metropolitan area is complex. It requires the involvement of many different planners, engineers, and managers, from different agencies, looking toward support from different constituencies. This study focused on discovering whose support is needed to deploy ITS in a metropolitan area and how to reach them.

1.3 Study Methodology

The questions that this study was designed to answer are best addressed by qualitative research. Such an approach allows the researchers to explore complex purchase and deployment issues. The study approach included six steps: hypothesis formulation, site selection, interview guide development, site visits, data analysis, and reporting.

Research Hypothesis

The research hypothesis has two primary parts. First, there are a number of transportation managers, planners, engineers, and elected and appointed officials who influence any given area's decision to pursue ITS deployment. Second, in each metropolitan area, there are a variety of transportation and institutional factors that influence the speed of ITS adoption, and that these factors, once identified and understood, can be generalized to a larger number of areas, and used in a marketing strategy to assist in accelerating ITS deployment nationally. The selection of subjects for interview, and the content of the interview guides, respond to the first hypothesis. The second hypothesis required further articulation, which is discussed below, and those sub-hypotheses informed the selection of the twelve metropolitan areas, and contributed to a further refinement of the interview guides. A 13th metropolitan area was used to test the interview guide.

The study team identified factors influencing a region's consideration of ITS. These factors can be categorized into five groups:

- Transportation system conditions
- Institutional issues affecting local transportation system management
- Budget and procurement
- Community factors
- Information needs

Transportation system conditions: Repairing aging infrastructure, managing traffic congestion, and addressing environmental conditions such as winter weather or poor air quality determine the nature of transportation conditions in a region in relation to ITS deployment.

Institutional issues: Questions on how the local transportation management organizations and individuals work together address the level of cooperation across agencies in the area, the perceived relationship between economic development and infrastructure investment, and the presence of a local "champion" for ITS.

Budget and procurement: Questions on budget and procurement that address the issues of whether the amount and source of funds and characteristics of the procurement process affect purchase decisions for advanced technologies.

Community factors: Local perceptions and attitudes can play an important role in decisions, particularly if the factual basis for decision-making is unclear. These questions address general attitudes toward new technology and experience with it.

Information sources and needs: For ITS deployment, transportation decision-makers must be fully and accurately informed of applicable ITS components. These questions address both written sources and contact with individuals with first-hand experience and expertise.

Data collection interviews were conducted in twelve representative metropolitan areas. The City of Boston was used as a pilot site to test and refine the hypotheses and interview guides. An interview guide is reproduced in Appendix B. Results from the Boston review have not been integrated into this study at the level provided by the other twelve sites. The following section describes the site selection process.

Site Selection

Sites were chosen from a list of the 75 largest metropolitan areas in the United States.[2] A number of criteria were used to select areas for site visits including:

- population size
- population growth

[2] These metropolitan areas are being surveyed on an annual basis in order to track deployment progress in meeting the Secretary's metropolitan deployment goal. The full baseline survey is being implemented during the summer of 1997. Information used in site selection was taken from an earlier survey completed in the spring of 1996. San Juan, Puerto Rico, has been added as a 76th surveyed site since the effort began.

- population growth rate
- level of ITS deployment
- geographic distribution
- transit availability and use
- presence of toll facilities or ports
- age of infrastructure
- air quality non-attainment status
- other qualitative characteristics

Many of these criteria are surrogates for transportation needs. Population growth leads to traffic congestion. The age of the infrastructure may indicate of the need for infrastructure replacement or renewal. Other criteria are measures of deployment opportunity or experience, regionally and statewide.

Metropolitan areas hosting major ITS field operational tests such as Minneapolis, Houston, and San Francisco, were eliminated from consideration, as were several atypical areas including Los Angeles and New York because of their size, and Atlanta because of the 1996 Summer Olympics. These areas would not be representative of a typical metropolitan area, that is, an area that is not deploying ITS because it has received federal ITS funds. The regions that were finalists for ITS Model Deployment Initiative awards (San Antonio, Phoenix, Seattle, and New York) were similarly eliminated from consideration. The remaining metropolitan areas were grouped by population growth rate and current level of ITS deployment. From this stratification, five pairs of areas were selected along with two individual cities, resulting in twelve regions selected for site visits. The sites selected and paired were:

- Buffalo, New York and Rochester, New York
- Charleston, South Carolina and Portland, Oregon
- Columbus, Ohio and Indianapolis, Indiana
- Dallas, Texas and San Diego, California
- Kansas City, Missouri and Memphis, Tennessee

In addition, Philadelphia, Pennsylvania and Salt Lake City, Utah were selected, but were not paired with any other areas. The pairing was done for comparison purposes to isolate factors. Table 1 contains a summary of the rationale for inclusion of each site and reasons for pairing sites.

Interview Guides

Interview guides were developed in parallel with site selection. Questions were organized in seven areas to explore ways in which deployment and purchase decisions were made and how to influence them, and to explore the five influence factor categories:

1. situational and institutional context *(transportation system conditions and institutional issues)*
2. other related issues *(transportation system conditions and institutional issues)*
3. budget, planning and finance *(budget and procurement)*

Table 1. Metropolitan Area Selection Rationale	
Metropolitan Areas	**Selection Rationale**
Buffalo, NY and Rochester, NY	These two cities were selected because, despite being in the same state and approximately 70 miles apart, they have different levels of ITS deployment. Both are low growth cities, but Buffalo has a reportedly moderate level of ITS deployment while Rochester has very little. Comparisons between these cities might illuminate local factors that contribute to ITS deployments because these areas share the same State Department of Transportation (NYSDOT) and FHWA/FTA regions.
Portland, OR and Charleston, SC	Portland and Charleston were chosen as two port cities with reputations for placing high value on quality of life issues. Tourism is a large contributor to the economy for each site. While Portland is a city with a relatively new transportation infrastructure, the infrastructure that supports Charleston is quite old. In addition, Portland has a high population growth rate and Charleston a low one. Charleston has a very small (<50) public transportation bus fleet, while Portland provides very extensive, multimodal transit service. Charleston is characterized by low ITS deployment and Portland is characterized by high ITS deployment.
Columbus, OH and Indianapolis, IN	Columbus and Indianapolis are two medium sized Midwestern cities with medium population growth rates. Transportation system characteristics are quite similar. Columbus, in particular, was chosen for its location in a "Home Rule" state. Within the corporate boundaries of the city, the city, rather than the state, has principal jurisdiction. Both are state capitals with different levels of ITS deployment. Columbus has deployed more ITS applications than Indianapolis.

Table 1. Metropolitan Area Selection Rationale (continued)	
Metropolitan Areas	**Rationale for Selection**
Dallas, TX and San Diego, CA	This pair was chosen for being large, high population growth cities in the Sunbelt, with similar freeway and grid roadway patterns. Dallas has a great deal of ITS deployment, and San Diego has a moderate, but growing level.
Memphis, TN and Kansas City, MO	This pair was chosen for their locations in the central area of the nation, medium size population and moderate growth rates. Kansas City was thought to have a relatively high degree of ITS deployment, while Memphis has a low level of deployment. Both areas are located in multi-state regions which allowed for an examination of multi-state decision making on ITS deployment.
Philadelphia, PA	Philadelphia was selected for its high transit presence, aging infrastructure, level of national political influence, and unusually low level of ITS deployment in a city of its size. The area has both low economic and population growth.
Salt Lake City, UT	Salt Lake City was chosen for geographic distribution, as well as the fact that it has a very high population growth rate and severe winter weather conditions, but low reported ITS deployment. Although not a factor for selection, this area is preparing for the 2002 Winter Games. This region is also characterized by a high level of in-migration that brings in new ideas and experiences from other parts of the nation into the decision making process.

4. purchasing procedures *(budget and procurement)*
5. experience with advanced transportation technologies or ITS projects *(community factors)*
6. awareness of ITS and information sources *(information needs)*
7. experience with the U.S. DOT ITS Program *(information needs)*

Separate interview guides were developed for:

- Federal Highway Administration
- State DOT
- State Police
- Metropolitan Planning Organizations (MPO)
- Port Authority
- City Transportation Departments
- Transit Authority/Public Transportation Agencies

Interview guides varied by agency and position of interviewee. The guides ensured that the interviewers gained appropriate information from the inteviewees, but there was not a requirement for asking each question. The focus was to understand the environment in all levels of government and types of agencies in which the respondents operate, the string of events that led to awareness of an advanced technology or ITS solution, the motivation for recommending purchase of either ITS or advanced transportation technology, and the process which led (or did not lead) to deployment (or integration) of ITS products.

Site Visits

Sites were visited during August, September, and October, 1996. Following each visit, interview notes were compiled and a quick summary of important information was distributed to all other interview teams for use in future site visits. All twelve site visits were summarized in a final report that served as the primary data source for analysis to answer the basic marketing research study questions. The factors that emerged from this analysis provide a basis for developing ITS marketing strategies targeted at state and local transportation managers.

1.4 Report Organization

Chapter II, Site Visit Findings, reports on the findings from the interviews at the twelve sites, and relevant information learned during the test run in Boston. The information is organized to address the ITS deployment "influence factors" and the seven central marketing questions discussed earlier in this chapter. In closing, Chapter II summarizes the findings suggesting that there is an association between certain observable influence factors and the approximate speed with which a metropolitan area is deploying an integrating ITS infrastructure.

Chapter III, Conclusions and Recommendations: A National Strategy for Marketing ITS Infrastructure, takes the findings reported in Chapter II and describes a marketing strategy that could be pursued by U.S. DOT to accelerate ITS deployment and integration among the 75 targeted metropolitan areas.

The report is organized so that readers with different interests can go directly to the sections that have the greatest relevance to them. A private sector ITS integrator or application company may choose to skip to the second chapter for greater insight into their customer population and possible marketing approaches. A U.S. DOT staff person responsible for managing the ITS public awareness campaign may choose to read only the second part of Chapter II, and Chapter III. It is recommended that U.S. DOT staff with direct management responsibility for metropolitan area ITS deployment programs read the entire document.

II. SITE VISIT FINDINGS

2.1 Introduction and Purpose

This chapter presents site visit findings as they relate to ITS purchase and deployment decisions:

- What regional factors influence, are preconditions, or are otherwise associated with the speed with which ITS are being deployed and integrated within metropolitan areas?
- What transportation issues concern local and state transportation agencies most, and what marketing strategies are best suited to informing them about the benefits of ITS?

Certain issues consistently emerged as regional factors influencing the speed with which ITS are being deployed and integrated locally and by the state:

- Transportation Needs
  - traffic congestion
  - weather conditions
  - infrastructure repair and replacement
- Institutional Factors
  - support of state elected and appointed officials, and the state DOT
  - regional cooperation among agencies
  - support of local elected and appointed officials
  - presence of local champions
- Budget and Procurement
  - sufficient transportation budget
  - opportunity to include ITS in larger project
  - dedicated funding
  - problems with procurement
- Community Factors
  - attitudes about technology
  - economic vitality related to ITS infrastructure
  - incident as catalyst
- Access to ITS Information
  - access to and use of published information
  - travel for decision-makers
  - access to others with first-hand experience
  - active membership in professional organizations
  - relationship with U.S. DOT division and regional office

The degree to which these factors are present (or absent) in the region appear to predict the speed with which the region is deploying and integrating ITS into its transportation system. Section 2.2 of this chapter presents findings related to those regional factors considered most influential with ITS deployment.

Section 2.3 presents transportation issues by organization. In this way, it is possible to understand the challenges of ITS deployment from the perspective of the individual decision

influencers within the deploying agencies. This information then forms the basis for the development of outreach strategies to address their concerns and inform them about those benefits of ITS most relevant to their concerns. The decision-makers and deploying agencies discussed in section 2.3 are:

- elected and appointed state officials
- elected and appointed local officials
- MPO
- state transportation agency
- local (city and/or county) traffic engineers
- transit properties
- toll authorities
- airports
- water ports

2.2 Regional Deployment Factors

The market can be broken down into the following groups: market leaders, lead adopters, late adopters, and uncommitted. Market leaders are "risk taking" individuals or organizations that are willing to adopt technologies rapidly. Lead adopters are the next to adopt new technologies and services and are generally influenced by industry "opinion leaders" including innovators. The late adopters are generally more skeptical and cautious toward adopting innovation and/or may not be experiencing a need for the services and benefits that ITS provides. Finally, the uncommitted may be extremely suspicious toward innovation and prefer better established solutions.

In order to see whether the regional factors that emerged in interviews were in fact related to the rate of ITS deployment, and thus usable as benchmarks to segment other metropolitan areas, the twelve metropolitan areas were reviewed and ranked along three dimensions that were considered to be the determinants of the speed of ITS deployment:

1. overall ITS implementation "momentum"
2. amount of ITS planning activities completed or underway
3. amount and level of ITS currently deployed (relative to the region's needs)

Current deployment assesses how much ITS technology is in place. Planning considers the extent of past and current planning for ITS. Momentum rates the likelihood that current planning or other activities will lead to deployment in the near future and takes into consideration projects that are in the active pipeline for deployment. The results of this three dimensional ranking are presented in Table 2, sorted first by momentum, then by planning, and last by deployment, because future actions are more important than past. The division by market segment was determined by the three dimensional ranking.

This table, with its ordered ranking, is used throughout this section to compare regional factors to market segments. The corresponding segments are shaded in Table 2 and subsequent tables.

Table 2. METROPOLITAN AREAS in STUDY RANKINGS by ITS ACTIVITIES			
Metropolitan Area	**ITS Momentum**	**ITS Plans**	**ITS Deployment**
Dallas	High	High	High
Portland	High	High	High
San Diego	High	High	High
Salt Lake City	High	High	Low
Kansas City	Moderate	High	Low
Columbus	Moderate	Moderate	Moderate
Rochester	Moderate	Moderate	Moderate
Buffalo	Low	Moderate	Moderate
Indianapolis	Low	Moderate	Low
Philadelphia	Low	Moderate	Low
Charleston	Low	Low	Moderate
Memphis	Low	Low	Low
Rankings by Market Segments:	**Market Leaders**	**Lead Adopters**	**Late Adopters** / **Uncommitted (no shading)**

An important point to keep in mind in classifying by metropolitan area is that the regions are not internally homogeneous. There are multiple levels of government and jurisdictions within each metropolitan area. For instance, local transportation professionals in the Portland area are very well informed about ITS, while lower-level state workers have much lower access to information. Center cities may have different needs and priorities than outlying jurisdictions. In Buffalo, the state agencies are moving ahead with plans for ITS implementation on the interstate and New York Thruway, while the city has barely enough funds to keep its current traffic signals functioning.

Transportation Needs

Transportation investments are driven by a need to solve a transportation-related problem. The site visit findings suggest that the types of transportation needs that influence the decision to deploy ITS include infrastructure repair or replacement, traffic congestion management, and management of weather-related problems. These needs are associated with different types of regions. Table 3 summarizes the transportation needs mentioned in connection with ITS deployment in each metropolitan area. Regions with higher levels of deployment, plans and momentum tended to express a greater need for managing congestion. Places with medium or low levels noted greater need for infrastructure repair and replacement. Weather conditions were motivators for some places with low levels of deployment, plans or momentum. The decision of a region to address congestion with ITS, as opposed to investing in infrastructure repair also appears to correlate strongly with population and economic growth. This last point is discussed in the community factors section.

Need to manage traffic congestion

Traffic congestion has become a nearly intractable problem in many metropolitan areas. High growth areas, in particular, experience this problem because travel tends to increase at a rate at least as great as population and economic growth. Concurrent to economic and population growth is commute patterns that are expanding, becoming multidirectional (traditionally inbound to the central business district (CBD) from suburbs, now increased suburb to suburb commutes) and increasing the peak periods. Physical and legal limitations on the ability to expand roadway capacity has led some of the higher-deployment areas to pursue ITS traffic management solutions to traffic congestion. For example, in Portland, where there are "greenbelt' restrictions on the city's growth, and in Salt Lake City where there are topographic limitations to urban sprawl, ITS infrastructure is being used to move the traffic throughput level from the existing inefficient levels to the design or practicable levels. In San Diego and Dallas, where there are both tremendous population growth and few (if any) limits on urban expansion, ITS infrastructure is being deployed in parallel with new road construction and transit investments. Lower-deployment areas, such as Indianapolis, may consider ITS for specific corridors that are experiencing congestion.

Table 3. Rationale for Consideration or Deployment of ITS Applications--Transportation Needs

	ITS Use		
Metropolitan Area	**Manage traffic congestion**	**Manage response to weather conditions**	**Infrastructure repair and replacement**
Dallas	X		
Portland	X		
San Diego	X		
Salt Lake City	X	X	
Kansas City			X
Columbus	X		
Rochester		X	
Buffalo	X		X
Indianapolis	X		
Philadelphia	X		X
Charleston		X	X
Memphis			X
Rankings by Market Segments:	**Market Leaders**	**Lead Adopters**	**Late Adopters** / **Uncommitted** (no shading)

Need to manage response to weather conditions

Another problem that some cities use ITS to solve is the effect of bad weather, both fog and icing, on particular transportation facilities. Weather detection systems tied to maintenance control centers where the information can be disseminated and appropriate action taken are found on roads, bridges, and airport runways in Rochester. This narrowly-defined use of ITS can be

attractive to a broad number of areas because it addresses problem spots without requiring ties to a major project or extensive coordination.

Need for infrastructure repair and replacement

Replacement of deteriorating infrastructure competes with ITS projects, drawing funds away. In older cities, such as Philadelphia, Buffalo, Kansas City and Memphis, there is a tension between the purchase of new technology and conventional repairs or replacements of existing infrastructure. In regions with deteriorating infrastructure, its repair is reported as a greater priority than addressing traffic congestion or other transportation system problems. Commitment to infrastructure repair also has greater political support. Consequently, cities with backlogs of reconstruction and repair projects tend to have less ITS, and less interest in pursuing plans for future ITS deployment.

Nevertheless, aging or deteriorating infrastructure requires upgrading and/or replacement, presenting an opportunity for some ITS investment. Transit systems commonly take advantage of the need for replacing communication or fare collection systems to investigate upgrading to more advanced technology. Philadelphia and Memphis are replacing their old signal systems with state-of-the-art traffic signal control systems. In the case of Philadelphia, a major motivation of improvements to their signal heads is the resultant energy savings. Regular highway system repairs or upgrades can also incorporate ITS elements. Frequently, loop detectors, variable message signs, ramp metering, and video cameras are included in roadway and bridge reconstruction projects. The Kansas DOT has already begun installing fiber optics for future technology connections as part of its major reconstruction of I-70 and other major regional freeways. However, as several of the state transportation engineers pointed out, adding ITS to reconstruction projects can lead to system components being installed according to maintenance priorities and schedules and not necessarily in a manner consistent with an integrated deployment plan. This may result in the implementation of technologically incompatible systems which can greatly limit future expansion options.

Institutional factors

Institutional relationships within every region vary. However, a number of institutional influences appear to be related to ITS adoption, including support of state and local elected and appointed officials, leadership from the state transportation department, regional cooperation among agencies, good experience with ITS and other interjurisdictional projects historically, and the presence of a local ITS champion. Table 4 summarizes the institutional factors present or absent by metropolitan area.

Support of state elected and appointed officials and state DOT leadership

The support of ITS by state officials and state DOT leadership influence the rate of ITS deployment both for projects on state facilities (highways), and for local projects where state expertise, leadership, and funding could help. The State DOT provides leadership in high deployment and momentum cities, such as San Diego and Dallas, but where state level support is lacking, such as in Memphis and Charleston, adoption of ITS proceeds at a slower pace. In other

areas, such as Buffalo, the State DOT and political establishment offer sometimes inconsistent and competing messages that slow momentum, but allow planning to continue. In Philadelphia, mixed messages also enable some planning to occur, but little actual deployment. Instead, state ITS efforts are directed to other parts of the state.

Table 4. Rationale for Consideration or Deployment of ITS Applications--Institutional Factors

	ITS Use			
Metropolitan Area	**Support Of State Elected and Appointed Officials**	**Support Of Local Elected and Appointed Officials**	**Regional Cooperation Among Agencies**	**Presence Of A Local Champion**
Dallas	X	X	X	X
Portland	X	X	X	
San Diego	X	X	X	X
Salt Lake City	X	X	X	
Kansas City	X		X	X
Columbus	X	X	X	
Rochester		X	X	X
Buffalo		X	X	X
Indianapolis		X	X	X
Philadelphia			X	
Charleston				X
Memphis				
Rankings by Market Segments:	**Market Leaders**	**Lead Adopters**	**Late Adopters**	**Uncommitted** (no shading)

State political support can be complicated by the requirement to balance competing rural and urban interests. For instance, the Oregon DOT needs to demonstrate ITS benefits for rural areas in order to garner the required support for Portland deployment initiatives. State support and funding for ITS in Salt Lake City has been delayed by state representatives from rural districts in the legislature who are more concerned with rural interests in the state.

Regional cooperation among agencies

Regions where transportation and related agencies do not work together well are the least likely to adopt ITS. To be most effective, many ITS projects require interjurisdictional cooperation among multiple transportation agencies for planning, funding, procurement, implementation, and operation and maintenance. Many parties are involved, and established forums for discussion are necessary. Of the twelve sites, those with the highest level of ITS deployment and momentum were the best organized. These areas also demonstrated a minimum of inter-agency and inter-jurisdictional tension.

Single agency procurements, where other organizations are neither involved nor affected, can occur without cooperation, but the outcome can be improved through consideration of other agencies or jurisdictions. For instance, an airport or toll facility may fund procurements out of its own revenues, requiring no other decision-makers. Yet, even with toll roads, which generally procure automated collection systems, there is a strong incentive to make these systems compatible with other toll roads in neighboring states or facilities. At the time of the interview, the Dallas airport was considering deployment of an electronic toll and parking payment system, and there was expressed interest in making the system compatible with the existing tollway payment system. The Delaware River Port Authority (DRPA) has been using AVI technology for 26 years on the bridges under their control in the Philadelphia metropolitan area. Although they do not need to coordinate their purchases with other agencies, and they do not accept federal dollars in order to avoid any strings attached, the DRPA is now coordinating with numerous multi-state agencies and phasing in the E-Z Pass Electronic Toll Collection System.

Support of local elected and appointed officials

Support of local or regional elected and appointed officials is crucial for metropolitan area projects of any size. In Dallas, the support of a County Judge was key to the success of several very large scale ITS initiatives in the region. Elected county support has been central to the installation and maintenance of advanced traffic signal control systems in greater Rochester. Elected and appointed officials in Portland support implementing ITS in the downtown area to maintain constituent mobility, reduce congestion, and increase overall accessibility to downtown businesses and cultural attractions. Most areas, except those with the least deployment, planning, and momentum, have secured support from their local politicians.

One of the concerns expressed by several unsupportive local appointed officials is that ITS is a highway project designed to increase throughput, a goal they find inappropriate to an urban environment. In regions where the state is using ITS enhancements to enforce a "highway" goal in an urban environment, the conflict can cause the city to ignore those ITS solutions which could be applied to enhance urban life. Another concern attributed to elected officials, and discussed later, is their concern that any type of advanced electronic technology may backfire, and weaken their political support in the community.

Presence of local champion

The Dallas County Judge, cited above as a strong ITS supporter is an example of one strong and well-informed voice who can have a wide influence and serve as a focal point for innovation. The presence of a strong ITS champion can be a significant positive influence in a region, but there is no pattern to which areas, high- or low-deployment, have one. The majority of high-deployment ITS regions have one or multiple champions, and in regions with little ITS, an individual often provides the impetus for the few systems that are successfully deployed. The findings of this study suggest that champions are not a necessary precondition for regional ITS deployment. While champions were identified in a number of sites, there were others, such as Salt Lake City and Portland, where much is being accomplished through a consortium of agencies working comfortably together. In Kansas City, "friendly rivalry" between the MoDOT and KDOT administrators has led to the emergence of a KDOT District official as the local

champion. This is largely because the MoDOT champions were busy with the deployment of the statewide fiber optic "backbone" and the early deployment plan and subsequent ITS program in St. Louis.

Budget and Procurement

Budget and procurement factors highly influence ITS deployment momentum. Regions with sufficient financial resources generally are better positioned to implement ITS than regions with limited resources. Regions with limited resources can add ITS elements to larger projects to leverage available resources to the maximum extent possible. Budget and procurement factors related to the rate of ITS adoption include an overall sufficient budget for transportation, opportunities to include ITS in a larger project, and dedicated funding for transportation (including Congestion Mitigation and Air Quality funds). Table 5 summarizes budget and procurement factors for each metropolitan area.

Sufficient transportation budget

Funding for ITS can come from three types of sources: federal, state, and local. Regions determine priorities for Federal funds in their Transportation Improvement Plans, with the state DOT dominating in many cases. State elected and appointed officials control the budgets of state agencies, and the allocation of state funds across the state and among different types of investments is driven by their concerns. Local funds are allocated to traffic as part of the local government budget process, and consequently there is competition across all local government services for the funds. Police, education, and other local services are often higher priorities than traffic signals. Although in some cases these other services could use ITS technologies, it is uncommon for them to do so. For instance, school budgets may include money for school buses, which could use transit management systems with vehicle location. Because federal and state funds tend to be greater than local funds, the state has a major voice in determining metropolitan area transportation investments. Transit usually has the most constrained funding of any transportation agency in an area.

In regions with a coordinated ITS plan that responds to well-articulated local needs, funds can usually be assembled from a variety of local, state, and federal sources. By contrast in areas where ITS priorities are vague, uncoordinated or non-existent, funding is often cited as a major impediment. For example, in Rochester, where they had been denied funding for a much larger transportation improvement plan (one that included several ITS components), they found other ways to fund those components of the plan that they felt to be most critical to the community. In San Diego, the MPO is a leading proponent of the ITS program. However, state transportation budget laws require that projects be budgeted for a 20 year period, greater than the normal three year Transportation Improvement Program requirements. Although fairly successful, the San Diego Association of Governments and California Department of Transportation staff have had to make major efforts to locate additional ITS funds.

In cities that are experiencing economic growth, and thus population and congestion growth, officials are more attuned to the problem of managing mobility, and local government and the business community are actively involved in transportation system improvement decisions. This

activity can take the form of lobbying for increased funds. In Dallas and San Diego, the community has established business and government organizations that work together to identify opportunities to maximize the efficiency of the network.

Table 5. Rationale for Consideration or Deployment of ITS Applications--Budget and Procurement

	ITS Use		
Metropolitan Area	**Sufficient Transportation Budget**	**Opportunity To Include In Larger Project**	**Dedicated Funding (Including Cmaq)**
Dallas	X	X	X
Portland	X	X	X
San Diego	X	X	X
Salt Lake City	X	X	X
Kansas City	X		
Columbus	X	X	X
Rochester	X		X
Buffalo		X	X
Indianapolis	X		X
Philadelphia		X	
Charleston			X
Memphis			
Rankings by Market Segments:	**Market Leaders**	**Lead Adopters**	**Late Adopters**	**Uncommitted** (no shading)

More important than simply getting funds to install ITS is finding money and staff to continue to operate and maintain it. Because of the management and operational aspects of ITS, staffing needs are much greater than for roadway construction projects. Operations and maintenance costs may also be high (or unpredictable) enough to affect future deployment decisions, even in places with significant deployment, such as San Diego. Part of the concern about ITS is that the budget for ITS operations may be in the same line item as maintenance costs for the current physical infrastructure. Although ITS may be hard to categorize along with capital, operating, or maintenance in places such as Philadelphia, where maintenance takes a high priority, ITS competes with maintenance.

Opportunity to include in larger project

Major construction, such as rebuilding and widening I-15 in Salt Lake City, or expanding the Dallas area highway system, opens the door to incorporating new technologies in a much larger budget project. High price tag projects can include ITS technologies that would look too expensive if introduced separately. This strategy is used most effectively where there are large projects underway, however it is also used in smaller projects, such as the replacement of traffic signal systems, where the additional increment of cost that allows the system to support more

advanced signal timing functions is small relative to the overall cost of the system. For a 10% increase in project costs, the Kansas City Area Transportation Authority was able to include a vehicle location system within its radio system upgrade project. In Philadelphia, the Traffic and Incident Management System project began as a plan to transform the metropolitan portion of I-95 and I-476 into a 21st century highway, involving not only highway reconstruction and realignment, but numerous ITS applications. Along with other project additions, such as environmental enhancements, the inclusion of the ITS technology backfired, partially responsible for raising the initial $600 million estimate to a final design cost of $2 billion. The project was significantly scaled back with only a few ITS technologies considered with the reconstruction. However, the Philadelphia Traffic and Incident Management System planning did allow regional agencies the opportunity to become better acquainted with ITS technologies. Some individuals added that major projects provide an opportunity to increase the level of office technology with the addition of new computers or mapping systems, included within the project price under project management.

Dedicated funding

Dedicated funding, either for an agency or for a category of projects, improves the likelihood of ITS deployment through reducing competition for funds. Many areas with air quality problems are able to use Congestion Mitigation and Air Quality (CMAQ) funds for ITS deployment, particularly traffic signal and transit improvements. CMAQ funds can only be used on projects for which an air quality benefit can be demonstrated. As a result, major road projects do not qualify, and ITS projects with air quality benefits can more easily compete for funds. Dallas, Memphis, Buffalo and Salt Lake City all use CMAQ for ITS projects. Missouri CMAQ funds are controlled by the state and primarily designated for the St. Louis metropolitan area. In other areas, such as Gresham, a suburb of Portland, a special local curb cut fee[3] provides the resources for ITS initiatives.

Agencies or regions with dedicated revenue streams and ample resources compete for funds less often with traditional projects, and consequently are more easily able to procure ITS. Agencies most likely to be in this position are toll roads and airports. Indeed toll roads are in the forefront of certain kinds of automated toll collection systems such as the Delaware River Port Authority. In San Diego County, a $1 fee on each vehicle registered is mandated to be used for highway call boxes and motorist aid, which are directly tied to the California Department of Transportation and California Highway Patrol Traffic Management Center.

Community Factors

Community factors that appear to influence the rate of ITS adoption include a positive attitude toward technology, and the occurrence of a significant incident with an ITS solution. Table 6 summarizes the community factors in ITS deployment by metropolitan area.

[3] Charged owners who request the addition of curb cuts from their property.

Managing information about technology

It can be difficult to gain full agency acceptance of new technologies. While some engineers and technicians at the staff level may express positive attitudes about ITS, they may be unable to

Table 6. Rationale for Consideration or Deployment of ITS Applications--Community Factors

	ITS Use	
Metropolitan Area	**Managing Information About Technology**	**Incident As Catalyst**
Dallas	X	
Portland	X	
San Diego	X	X
Salt Lake City	X	
Kansas City	X	
Columbus	X	
Rochester	X	X
Buffalo	X	
Indianapolis	X	X
Philadelphia		X
Charleston		X
Memphis		X
Rankings by Market Segments:	**Market Leaders** **Lead Adopters**	**Late Adopters** **Uncommitted** (no shading)

convince higher-level officials and/or elected leaders of its efficacy. Some of the local traffic engineers and transit staff reported that there is insufficient benefit-cost and other performance data available to support an ITS argument. This perceived deficiency may be the result of not presenting the benefits data available in a tangible, comparable and believable manner. The lowest ITS planning and momentum exists where the proponents of advanced technologies have been unsuccessful in managing information about technology to positively affect decision-makers.

The public nature and high cost of infrastructure investment can inhibit risk-taking, so unless the advocates of ITS systems can demonstrate that the systems perform better or are lower cost alternatives, managers may prefer solutions that have been successful for them in the past. In Philadelphia, they avoid "bleeding edge" technology, where their experience has been that projects that are the first of their type either cost a good deal more than anticipated or do not work when first installed. Memphis likewise preferred to use technology well established elsewhere or fully federally funded. On the other hand, transportation engineers in Salt Lake City have demonstrated differences in performance of traffic signal systems to the elected officials who control funds. By clearly showing the benefits and limitations of improving signal timing and coordination, they have been successful in winning political support for new technology.

Getting decision-makers to go to locations where ITS technology in the field has proven to be instrumental in enabling ITS planning and budgeting to move forward in Kansas City.

The ITS acronyms used in most presentations and publications also appear to work against the program. Many of the transportation managers found that the acronyms made ITS appear unnecessarily complex, more like a "Star Wars" project, and off-putting to non-technical decision-makers.

Incident as catalyst

Public awareness and pressure to address safety problems increases when an incident or a series of incidents occur. This effect appears to be especially important in areas where there is otherwise a low amount of ITS deployment momentum. In several cities, very high profile accidents were the catalyst for ITS. Some events led to a search for improved communications among public safety agencies and the traveling public, focused on incident management systems, variable message signs, or roadside call boxes. Other events prompted interest in more sophisticated traffic controls, such as emergency vehicle signal pre-emption, or controls at railroad grade crossings.

- A tire fire in Philadelphia closed major highways and arterials. The NJDOT loaned variable message signs to PennDOT until the fire and incident ended. The use of the VMS and cooperation shown by the NJDOT led to PennDOT's interest in obtaining some VMS for future incidents and the development of regional incident management cooperation between Pennsylvania and New Jersey.
- A rape along the freeway in San Diego created public demand for roadside call boxes, with special funding devoted to their installation and maintenance.
- In Rochester, a school bus accident led to increased interest in incident management.
- The mayor of a suburb of Memphis called for active controls at all railroad grade crossings after the deaths of two teenage boys in a collision between a train and their car.

The incident works as a catalyst by causing transportation and incident management groups to work together toward a shared goal. In several regions, the enforced working group discovered that they had common transportation and safety concerns beyond the immediate problem they had been convened to address, and chose voluntarily to continue working together toward the accomplishment of that broader goal. The decision to incorporate ITS solutions into the incident and safety management program occurs as the group considers all of the available tools and techniques that can most reliably integrate previously independent operating systems.

Access to Information

Access to information by all levels of transportation and planning staff affects the rate of ITS adoption in a region. Several different means of obtaining information were explored, including written information, active membership in professional organizations, access to others with ITS experience, information provided by FHWA field offices, and travel for first-hand observations. While some combination of these means of gathering information seems essential, the availability and relative importance appears to vary both across metropolitan areas and types of

organizations. While professionals in all areas are members of professional organizations, the level of active participation in an organization, as well as the availability and use of other sources of information vary across metropolitan areas. State DOTs, local traffic engineering offices and MPOs seem to rely upon information more from professional organizations, in which they are members, than on reading other publications that they may receive. Transit agencies seem to rely more on transit publications than attendance at professional organizations; the American Public Transit Association (APTA) was cited most frequently as a source of information. Table 7 summarizes three types of access to information by metropolitan area.

Table 7. Rationale for Consideration or Deployment of ITS Applications--Access to Information

	ITS Use		
Metropolitan Area	**High Access To Written Information**	**Travel For Decision Makers**	**Access To Peers With ITS Experience**
Dallas	X	X	X
Portland	X	X	X
San Diego	X	X	X
Salt Lake City	X	X	X
Kansas City	X	X	X
Columbus	X	X	X
Rochester		X	
Buffalo			X
Indianapolis		X	X
Philadelphia			X
Charleston			
Memphis			
Rankings by Market Segments:	Market Leaders	Lead Adopters	Late Adopters / Uncommitted (no shading)

Written information

Access to written information, and value placed on reading and staying up to date varies across agencies and levels of government. On average, there is better access to written information in areas with greater levels of ITS deployment and momentum, but there may be agencies or staff levels in the area with little or no access. For instance, although Portland has a lot of ITS activity and metropolitan area transportation professionals seemed well informed, several staff in the state DOT had very little access to information about ITS.

Because of time limitations, the attention given to articles depends on whether they catch the manager's eye. Often, managers read cover articles and scan remaining material. If a subject of interest is on the cover of a publication it is more likely to be examined. In general, managers and others read those publications which they felt to be most credible, such as the American Public Transit Association, the Institute of Transportation Engineers (ITE) and the Transportation Research Board (TRB) publications. The internet, while often mentioned as a

source of information, does not appear to be readily available in the workplace. In most cases, internet research was conducted at home.

Ability of decision makers to travel for first hand experience

Along with access to information, interaction with others who have actually procured and operated ITS is a major adoption factor. Many of the cities that have moved toward adoption have been involved in FHWA "scanning tours" where high level decision-makers are taken to visit installations in other cities. These tours seem to contribute to the overall credibility of ITS by removing it from the realm of theory to the actuality of operation. Tours were mentioned as positive forces in San Diego, Kansas City, Salt Lake City, Dallas, Columbus, and Portland.

Lower level staff often have extremely limited ability to travel. One of the ironies of municipal and DOT structure in an era of very restricted public budgets is that personnel whose duties include keeping up to date with information in their industry have severely restricted access to that information. In many offices, travel was completely prohibited except for driving within a limited distance. This restriction has led to innovative ways of obtaining information and contact with knowledgeable peers, including inviting vendors for demonstrations on a regular basis (even when there is no intent to buy), accepting high staff turnover so that new up-to-date staff can be hired frequently, relying heavily on consultants, and taking advantage of touring technology demonstrations by the FHWA, Public Technologies, Inc., or other organizations. Tighter budgets and distances between cities tend to encourage this type of information gathering. More routine ways of keeping up-to-date through contact with local peers and membership in professional associations are discussed below.

Contact of transportation professionals with local peers with experience in ITS

Access to other individuals with first-hand experience in use of new approaches or products can be an important factor in the selection of such methods or items for use locally, both through exchanging information, and in some cases through actual loan of equipment. Transportation professionals in the Buffalo area described the Ministry of Transport Ontario as a major source of learning about ITS, from use of ITS in the Toronto area. As noted above, during a tire fire that shut down major roads in the Philadelphia area, staff at the New Jersey DOT lent variable message signs to help direct traffic. The relationship that staff in the two agencies had developed through the I-95 coalition allowed this cooperation to occur and led to additional cooperative opportunities.

Regional Deployment Factors Summary

Certain patterns emerge from the regional deployment factors to distinguish the four market segments from each other. Table 8 (page 26) summarizes the influences discussed in this section by market segments.

Market leaders and lead adopters share many characteristics. The main difference appears to be timing. Market leaders have had long standing support from state elected and appointed officials and have had opportunities to include ITS technologies in larger projects. By contrast, lead

adopters have only recently gained that support, and may or may not have been able to include ITS technologies in other projects. To move lead adopters to the point of market leaders, they need help and information about carrying out ITS projects, such as specific procurement issues.

In addition, they would benefit from increasing their contacts across the nation, particularly in order to solidify their state-level support.

Late adopters differ from market leaders and lead adopters in several critical ways. While they have the support of their local elected and appointed officials, they do not have support at the state level. Since the state is crucial in funding ITS and transportation in general, without state-level support it is very difficult to proceed with most ITS projects. In addition, these metropolitan areas may not have sufficient transportation funding on a local level, so infrastructure repair and replacement takes priority over improvements. There is lower access to information than in the other market segments, both in terms of written information and travel for decision-makers. These sites often need an incident as a catalyst to deploy ITS.

The two crucial actions to take to increase deployment among late adopters is to help these metropolitan areas gain support of their state elected and appointed officials and to increase the information they have available. Convincing state officials of the benefits of ITS could help loosen some of the budget constraints limiting deployment. Increasing information through scanning tours, travelling road shows, and funneling written information through the FHWA Division offices could increase interest and the knowledge to move forward. Information on how ITS could be implemented while repairing or replacing current infrastructure could be especially valuable.

Uncommitted metropolitan areas are quite different from areas in the other three segments. They have lower need for the types of improvements offered by ITS, not much money or support from state or local officials and very little information. Because of their lower needs and substantial barriers, less effort should be devoted to this segment than the late and lead adopters. Specific information on technologies that would be implemented to upgrade current systems (traffic signal control, transit communications and fare payment) or to address spot problems (ice or fog detection) could find interest.

2.3 Transportation Issues by Organization

This section discusses ITS purchase influences by each participant in the decision-making process, ranging from the elected and appointed officials through staff in each type of transportation or planning organization, including:

- state elected and appointed officials
- local elected and appointed officials
- metropolitan planning organizations
- state departments of transportation
- local traffic engineers
- transit
- toll authorities

Table 8. Rationale for Consideration of Deployment of ITS Applications--Summary by Market Segment

	Regional Deployment Factors				
Market Segment	**Transportation needs**	**Institutional Factors**	**Budget and Procurement**	**Community Factors**	**Access to Information**
Market Leaders	• Manage traffic congestion	• Support of state elected and appointed officials • Support of local elected and appointed officials • Regional cooperation among agencies	• Sufficient transportation budget • Opportunity to include in larger project • Dedicated funding	• Manage attitudes toward technology well	• High access to written information • Travel for decision makers • Access to peers with ITS experience
Lead Adopters	• Manage traffic congestion • Manage weather conditions	• Support of state elected and appointed officials • Support of local elected and appointed officials • Regional cooperation among agencies	• Sufficient transportation budget • Possible opportunity to include in larger project • Dedicated funding	• Manage attitudes toward technology well	• High access to written information • Travel for decision makers • Access to peers with ITS experience
Late Adopters	• Manager traffic congestion • Manage weather conditions • Infrastructure repair and replacement	• Support of local elected and appointed officials • Regional cooperation among agencies	• May or may not have sufficient transportation budget • Possible opportunity to include in larger project • Dedicated funding	• Mostly manage attitudes toward technology well • Incident as catalyst	• May have travel for decision makers • May have access to peers with ITS experience
Uncommitted	• Manage weather conditions • Infrastructure repair and replacement	• Minimal support and cooperation	• Insufficient transportation budget • No opportunity to include in larger project • Dedicated funding	• Incident as catalyst	• Lack of access to information

- airports
- ports

Organizing information in this fashion clarifies how to reach each segment with the appropriate message. There is a spectrum of organizations, ranging from the more public and political through the more private. Consequently, there are issues pertinent to all organizations in one part of the spectrum, but not relevant to other organizations. Where there are clusters of organizations with the same or similar issues, it will be noted in the discussion.

Three categories of issues will be discussed for each participant or organization:

1. critical messages
2. needs for information
3. sources of information

By considering transportation needs, institutional issues, the budget environment and concerns about technology, where appropriate, the information and messages that need to be conveyed can be made clear. Then, by identifying credible sources of information for each organization, the best methods for reaching individuals in those organizations can be selected.

State elected and appointed officials

State elected and appointed officials need ways to demonstrate tangible benefits to the electorate. For this reason, state elected and appointed officials tend to favor building roads. Road projects are thought to be demonstrable improvements that are visible and obvious to the electorate, bring federal tax dollars into the state, and create jobs. To sell ITS to this group, the approach would need to give them ways in which they could demonstrate equivalent or higher tangible benefits to the electorate.

The information that would be convincing and useful to them would be the successful experience of comparable states.

As with other elected and appointed officials, this group is influenced by the general media, the national associations they belong to and whose conferences they attend, their peers, state-level business and manufacturing associations, and the opinions of informed and astute senior transportation managers in their own transportation department(s). State officials interact with state DOT management and staff and local elected and appointed officials.

Local elected and appointed officials

Local elected and appointed officials are primarily interested in the economic vitality of their communities, and see transportation as subservient to or as a way of accomplishing that goal. They are aware that traffic congestion and decreased mobility have the dual impact of limiting economic growth, and adversely affecting their community's quality of life. In cities that are experiencing economic growth, and thus population and congestion growth, officials are more

acutely attuned to the problem of managing mobility, and local government and the business community are actively involved in transportation system improvement decisions. In cities with a stagnant or declining economic base, there is little support from local elected officials for spending local funds on ITS when the limited tax dollars they control could be directed toward maintenance of basic infrastructure, lowering crime, or improving education.

The messages to which most city leaders would be most responsive include ITS as a money-savings investment, a tool with which they can improve the quality of life of their constituents, and as a cost-effective approach to improving mobility for the people, goods, and services which is requisite for a healthy business climate. In several of the cities visited, the senior transportation officials did not think that ITS was an urban transportation solution; they thought that it only speeded motorists more quickly through the urban core. A special urban ITS vision would help these officials to appreciate that ITS can be used to improve access to city businesses, services, and culture. Local ITS success stories could illustrate this urban ITS vision. Seeing or reading about use of ITS in comparable cities could encourage deployment.

As with their state counterparts, local officials are influenced by general media (e.g., "Good Morning America" and "60 Minutes"), their peers, their local Chamber of Commerce, the national associations they subscribe to and whose meetings they attend, and by well-informed, astute, senior transportation managers within their own transportation department. Associations cited most frequently include the National Conference of Mayors, ICMA, and the National League of Cities. Bringing peers and presentations to the city, and bringing officials on scoping tours of other cities have been cited as an especially effective way of bringing officials from a general level of awareness to a position more committed to ITS solutions. Because economic development and transportation are so closely related, it may also prove useful to field ITS panels at the national Chamber of Commerce events, and to publish tailored articles in the national Chamber and other private sector associations' media.

Metropolitan Planning Organizations

MPOs usually consist of a board of local elected and appointed officials, who make decisions about allocation of funds across a region, and a staff that supports the board through providing analysis of the proposed projects. The concerns of the elected and appointed officials were discussed above. This section is concerned with the staff of the MPO.

MPO staff are very concerned about the economic vitality and growth of their metropolitan area. In areas with poor economies, such as Buffalo, they focus on the economy of the region, and the role that transportation plays. They tend to work with the current situation in the area, as a whole, addressing current and projected transportation needs to keep the economy viable. MPOs generally tend to be focused on congestion and getting people to their jobs, whether they are doing a traditional or reverse commute, suburb to suburb, or transit dependent.

The MPO staff needs better cost-effectiveness and benefit/cost information and tools to help them evaluate ITS projects versus traditional projects. The MPO planning process involves comparing projects from different agencies with each other and choosing a set that will receive funds. In the forum of the MPO, ITS competes with lane building projects. Transit projects

compete with non-transit projects. MPO staff in several cities, including Buffalo and Kansas City, noted that states tend to control the major investments, with planning focusing on freeways rather than transit or commercial vehicles. The MPO in Portland noted that it is hard to measure ITS effects, especially compared to highly-visible lane building projects. Since funding gets allocated based on that comparison, better information is critical. This issue was also raised in Philadelphia, Charleston, Dallas, Kansas City and San Diego, showing that MPOs in both places with very little or very much ITS feel the need for better information on the criteria they use to evaluate projects.

MPO staff obtain information from, and are influenced by, a wide variety of organizations and written sources. Unlike other organizations, there is no one dominant information source. Among organizational sources, the FHWA, ITS America, and ITE were cited most often, but not by a majority of interviewees. MPOs seem to try to cover most organizational sources mentioned frequently by staff in other organizations, but because that increases the number of relevant sources, MPOs are spread thinner. The American Association of State Highway and Transportation Officials and the American Public Works Association are the only organizational information sources mentioned a significant number of times by staff in other organizations that MPOs did not mention. MPOs noted a variety of publications as sources, but none were mentioned consistently across sites. MPO staff seemed very positive about bringing traveling presentations and hands-on demonstrations to metropolitan areas, but more from the perspective of educating elected and appointed officials, and exposing local engineers in other organizations to technologies, than because these road shows provide useful information to them.

State Departments of Transportation

State Departments of Transportation are responsible for building and maintaining safe and efficient highway systems, as well as assisting with some local responsibilities. For instance, TennDOT is designing and installing the new traffic signal control system in the Memphis central business district. In some cases, state DOTs are concerned with economic development to the extent that they try to improve access to the downtown or other important destinations. For the most part, however, state DOTs are concerned about how the highway system functions, including state facilities that go through metropolitan areas. Consequently, the ITS applications that appeal to them the most address congestion and safety issues. Some state transportation departments have implemented weather detection systems to help them manage bridge or road conditions for safety reasons. System improvements made possible by ITS compete for funds with maintenance requirements.

State DOTs have a wide range of information needs, including:

- better cost-effectiveness and benefit/cost information
- examples of cooperative agreements for operations
- how to do design-build contracts, where appropriate
- standards and specifications for ITS technologies

State DOTs need better cost-effectiveness and benefit/cost information for ITS to compete successfully for funds with other priorities or solutions. In San Diego, the perception is that ITS is held to a higher benefit/cost standard than road building, stacking the deck against ITS projects.

The operational aspect of ITS is new to state DOTs, including cooperation and coordination issues related to using ramp meters or variable message signs and staffing transportation management centers. Since these technologies and systems affect both the highway and local road systems, cooperation is necessary to make them work well without simply transferring the problem to another jurisdiction's system. In Kansas City, there were procurement problems with both the capital and operating expenses for an interstate ITS project. The Kansas share of the Kansas City Metropolitan Transportation Operation Center ($14 million) has already been allocated; however, the transportation operations center will be built in Missouri. Arranging for funds to be expended across the border has presented a procurement setback that will be worked out. Even cooperating across multiple agencies, it requires innovation and creativity to staff the transportation operations centers from the early peak congestion hours into night. For instance, in Buffalo, a transportation operations center housed in the NYSDOT division office may be monitored by night shift staff at the Peace Bridge. Where such cooperation can be arranged, staffing needs are reduced.

Procurement regulations are cited by some as a serious challenge to acquisition of up-to-date technology. Design-build contracts have been used by some state DOTs, such as Utah DOT, and have the advantage of allowing technology decisions to be made at the last minute. They have the disadvantage of requiring more work up front, and more monitoring. Design-build contracts, which attempt to address the rapid pace of technological change, create additional complications. More work needs to be done up front for these types of contracts to write the requests for proposals well and address all of the possibilities that may arise. For places, such as Columbus and Indianapolis, where design-build contracts are not allowed, there is a risk that the technology used will be obsolete by the time it is installed, although some states have very successful ITS deployments with traditional procurement methods.

There are many professional associations and other organizations that state DOT staff consider to be credible sources about advanced technologies. In order of mentions:

- Institute of Transportation Engineers
- Federal Highway Administration
- American Association of State Highway and Transportation Officials
- ITS America (including both national and state chapters)
- Transportation Research Board
- American Society of Civil Engineers

Some publications are also used, including Traffic Technology and ITS World, but they were mentioned less frequently than the organizations. Few state personnel have access to the internet through their computers at work, but a significant number subscribe at home. In some jurisdictions, junior engineers shared computers at work. Approximately 20% of all state level transportation staff mentioned the Web as a source of ITS information.

The most effective change agents are the local chapters of national associations. Most state transportation staff cannot travel out of state to attend meetings, and, regular attendance at the regional ITE meeting is considered by peers to be an indicator of a serious transportation engineer. Once the state DOT has become convinced of the advantages that ITS enhancements can provide, then the state ITS America chapters (or other state-wide equivalent) take on greater importance, as they provide a state level focal point for the airing and debate of potential ITS projects.

Local traffic engineers

Local traffic engineers have a function to perform under very tight budget constraints, and with some misperceptions of the role of ITS. In that context, it is valuable to emphasize how ITS can be applied to their responsibilities to yield cost-effective solutions.

Local traffic engineers are responsible for keeping traffic flowing smoothly and safely on city streets. Their major concerns are related to congestion, and maintenance of the equipment they have in place. Since they answer to local elected officials, they may also implement strategies related to improving the local transportation system to increase economic development, or particular safety strategies to respond to a widely publicized incident. The mayor of a suburb of Memphis announced that all railroad grade crossings would be protected by active devices after a fatal accident occurred at one crossing. Despite the city traffic engineer's belief that there are a number of crossings where the traffic volume does not justify that sophisticated a solution, he needed to proceed with the Mayor's plan.

Several city transportation managers commented on the need for a better-articulated urban ITS program that made a clear connection between the economic and livability goals of the city and the ability of integrated ITS components to enhance inner-city mobility and accessibility. City of Philadelphia representatives noted that they would love to utilize ITS applications for economic development within the downtown area, but believe that the traditional infrastructure is so far behind in maintenance, that they cannot feasibly consider technological alternatives without first improving the visual landscape (potholes, bridges).

Local traffic engineering offices have very tight budgets for both capital and operating expenses. Local traffic engineers tend to implement advanced technologies when they are buying (or replacing) equipment that they would have gotten anyway. It is common for budgets to be built around maintenance, so when traffic signal systems need replacing, the engineers buy the most up-to-date equipment that they can. Local traffic engineers sometimes think that ITS only applies to highway technologies. While they automatically pursue advanced signal controllers

when they need replacements, they do not necessarily associate those advanced technologies with ITS, or with the opportunity to further coordinate signal timing with ramp metering.

In addition to the messages noted above, local traffic engineers have a variety of information needs, including:

- interagency cooperative agreements
- procurement issues
- experience of other local governments

Cooperation with other agencies is very important for local traffic engineering offices. Local traffic engineers coordinate with other local traffic engineering jurisdictions, state DOTs, transit, and emergency response providers. Ramp meters and variable message signs affect both the highway and local road systems, so cooperation with the state DOT is necessary to make them work well without simply transferring the traffic problem to the other jurisdiction's system. Analogous cooperation issues arise between local traffic engineers and transit agencies with transit preemption of traffic signals. Salt Lake City's plans for updating their transportation system included extensive coordination among UDOT, the city, and transit property. The city needed to be involved in plans for traffic management on the freeway, as well as coordinating with the transit property for transit preemption for a new light rail line.

Procurement can create problems. A low bid procurement process, sometimes required by local governments, can produce incompatible technologies over time. Unfamiliarity with the technologies creates a need for more information on developing specifications.

The engineers interviewed mentioned a need to know more about the experience of other places with the technologies.

Local traffic engineers use the Institute of Transportation Engineers as their main and most credible source of information about technology. ITS America was cited about half as often. While some other publications were mentioned, such as ITS World and Civil Engineering News, vendors were the main source of information besides the organizations noted above. Few city personnel have access to the internet through their computers at work, but a significant number subscribe at home. Approximately 20% of all city level transportation staff mentioned the Web as a source of ITS information.

Once local traffic engineers have become aware of the benefits that ITS can offer to their city (usually through ITE publications and regional meetings), information about the ITS experience of other, similar cities is particularly valuable. This can be accomplished through peer-to-peer programs, scanning tours, or any other organized program that matches the expressed interests of the cities' transportation community with the experience of a similar city.

Transit

Transit agencies are most concerned about reducing operating costs, and maintaining or increasing their ridership. While the state DOT and local traffic engineers discuss how to alleviate traffic congestion, transit agencies cite its impact on increased transit ridership. For instance, the transit agency in Salt Lake City attributes increasing ridership on express buses from the suburbs to noticeably worsening congestion on the highways. Maintenance of infrastructure and equipment is important, both for safety reasons and because poor maintenance leads to the perception of poor security, and therefore a loss in ridership.

Transit has the tightest budget constraints of any agency. In addition to external competition for funds in the MPO, there is internal competition for funds among technology, maintenance, and service levels. As a result, transit authorities implement advanced technologies when they are buying equipment that they would have gotten anyway. In a similar vein, the risk aversion to new technologies is written into the procurement procedures in some locations. In San Diego, the transit authority is required to buy "service-proven technology." Much ITS technology is so new that it does not qualify.

Transit agencies will not implement advanced technologies unless they save money or generate increased revenue. There is interest in Advanced Vehicle Location (AVL) to the extent that it can improve operational efficiency and save money, and electronic fare collection for the same reasons. However, transit in Salt Lake City started building their own radios rather than spend the extra money to buy commercially available communication systems that provide greater functionality than they need. They've even started making a profit selling the systems they build to other transit agencies in the same position.

Information to lower the cost of investigating and investing in new systems would be valued by transit agencies:

- standards
- boilerplate specifications
- model interagency agreements
- experience of other systems in addressing problems with unions

Transit authorities would appreciate more information on standards or actual specifications for systems. Several interviewees in Buffalo and San Diego mentioned the need for help in writing specifications. One transit authority suggested that putting together some boilerplate specifications that could be modified as needed would save a lot of time and rework, as more agencies look into new technologies.

Transit authorities cooperate at times with local traffic engineers to secure transit preemption of traffic signals. There can also be conflict between the two organizations, however, when the

needs of one conflict with the priorities of the other. For instance, in Memphis, a former city traffic engineer opposed plans for new transit shelters because advertisements on the sides of the shelters would obstruct the line of sight of traffic coming into intersections.

Transit systems have run into problems with unions as a result of the introduction of new technology. Transit systems implementing AVL get objections from unions about being watched all of the time. The transit authority in Buffalo addressed the concerns by noting that schedulers would have better information about how long it really takes to do a route, thereby allowing them to adjust unrealistic schedules.

Transit agencies rely most on the American Public Transit Association for information, but ITS America and a range of publications contribute. Metro, Railway Age, Mass Transit, and Passenger Transport were the publications mentioned most often. As with city and state employees, few had access to the internet at work, but a significant number mentioned that they had Web subscriptions at home.

Toll authorities

Toll authorities compete with free facilities partially on the basis of better service. Less congestion on freeways, and minimal waits to pay tolls encourage consumers to use the roads. In Philadelphia, a staff person at the toll authority noted that customer satisfaction was a motivation for making investments. In Buffalo, a New York Thruway staff member mentioned that his agency was more oriented than NYSDOT toward providing good service to the traveling public in terms of scheduling maintenance when there would be less traffic.

Certain types of information could be very helpful to toll facilities considering ITS:

- interagency agreements
- experience of other authorities, especially with union concerns

Depending on the location of the toll facility, there may be a great deal of coordination with other transportation organizations, or very little. For instance, in Buffalo, the New York Thruway and the NYSDOT freeways in the area are intertwined. As a result, in recent years there has been an increase in coordination between the two agencies. In Rochester, there are no other facilities near the New York Thruway, so cooperation with other organizations is minimal.

Although toll authorities have their own source of revenue, and hence no external competition for funds, they still have internal competition among differing priorities. Like other organizations, there is a certain amount of risk aversion to new technologies on the part of the organization. In addition, unions at toll authorities are concerned about electronic toll collection eliminating jobs.

Airports

Transportation issues at airports center around logistics and traffic on the grounds of the facility. Because airports operate relatively independently of other agencies in metropolitan areas, they may be a source of traffic and congestion, but once the traffic leaves their facility, they no longer consider it their problem. They may, however, be concerned about the interface between their facility and the surrounding transportation systems. Airports also have an interest in using technology to manage their facilities during poor weather because it allows them to remain open safely in a wider range of weather conditions.

Airports have their own sources of funds, separate from the competition for other traffic and transit money. So there are fewer external limitations on spending money according to internal priorities.

In this context, certain information could be valuable to airports. Airports have a general concern over where they fit into the ITS support scheme. Several airports that are located in proximity to toll authorities that have instituted ETC are interested in coordinating with the toll authority to meet their own needs to automate parking and fee payments. Learning about the experience of other airports in similar situations, as well as cataloging the relevant technologies could be helpful.

Ports

Transportation issues at ports, center around logistics and traffic on the grounds of the facility and at the interface of the port and the local transportation system. Ports may have conflicts between truck and train traffic, as loading trains can cut off truck access to or egress from the port. Most ports consider ITS/Commercial Vehicle Operations (ITS/CVO) cargo handling the only relevant part of ITS.

Ports, like airports, are a source of traffic and congestion for metropolitan areas, but do not have responsibility for solving those problems. Unless they have greater responsibilities than the actual port, or there are political or logistical reasons to work cooperatively with the bordering jurisdiction, there is very little incentive for them to cooperate with other transportation organizations or to be involved in ITS planning. Despite interest by the MPO in including the port in ITS planning, the San Diego port did not want to get involved. The Kansas City river port had a similar attitude. The Memphis river port had not even heard of ITS. The exception to this trend was the port of Philadelphia, which is one of the leading organizations for ITS in the metropolitan area. They have toll bridges, on which they are using electronic toll collection, and they are using ITS/CVO technologies in the port itself.

Because ports manage the property within their boundaries, and have their own sources of funds, they can more easily spend money according to internal priorities.

Transportation Issues by Organization Summary

The organization by organization discussion above was presented to give two types of information:

1. information and messages that could influence deployment decisions
2. how to reach decision-makers in each organization

Table 9 summarizes the messages, information and best manner of reaching decision-makers in each type of organization.

National organizations' regional meetings and workshops are key to reaching both state and local engineers, while transit agencies rely more on written information. Because travel is limited at lower staff levels, bringing information and people to the local areas is crucial for technical staff. Higher level decision-makers benefit greatly from seeing the technology in action in other cities. Working relationships across metropolitan areas foster greater interest in adopting technologies found in the more advanced city.

Table 9. Messages, Information and Effective Outreach Venues

Organization	Critical Messages	Information Needed	Effective Outreach Venues
State elected and appointed officials	"ITS has tangible benefits: demonstrable improvements that are visible and obvious to the electorate, bring federal tax dollars into the state, and create jobs"	Comparative success stories	American Association of State Highway and Transportation Officials, and (where they are qualified) their own senior transportation staff
Local elected and appointed officials	"ITS is a money-savings investment, a tool with which mayors can improve the quality of life of their constituents, and a cost-effective approach to improving mobility for the people, goods, and services which is requisite for a healthy business climate"	Comparative success stories	General media, their peers, local Chambers of Commerce, national associations (National Conference of Mayors, International City/County Management Association, and the National League of Cities), and well-informed, astute, senior transportation managers within their own transportation department
Metropolitan Planning Organizations	"ITS is a cost-effective means of solving transportation problems related to the economic growth and livability of the metropolitan area"	• Cost-effectiveness and benefit/cost information • Evaluation tools for comparison purposes	Most organizations and publications cited by other transportation organizations, especially FHWA, ITS America and ITE
State Departments of Transportation	"ITS is a cost-effective means of improving highway system performance, especially with respect to congestion and safety"	• Cost-effectiveness and benefit/cost information • Examples of cooperative agreements for operations • How to do design-build contracts • Standards and specifications for ITS technologies	Local chapters of national organizations such as ITE, FHWA, American Association of State Highway and Transportation Officials, ITS America, Transportation Research Board and the American Society of Civil Engineers. Publications including Traffic Technology and ITS World
Local traffic engineers	"In the experience of many cities, ITS can be an affordable way of upgrading their current traffic signal control systems, while improving coordination across jurisdictions, in order to address traffic flow, safety, and economic development issues"	• Other cities' experience with the technologies • Procurement issues, such as specifications • Model interagency agreements	ITE publications and regional meetings, peer-to-peer programs, scanning tours, or any other organized program that matches the expressed interests of the cities' transportation community with the experience of a similar city

Table 9. Messages, Information and Effective Outreach Venues (continued)

Organization	Critical Messages	Information Needed	Effective Outreach Venues
Transit	"ITS can save money through improved operational efficiency or reduced fare evasion"	• Standards • Boilerplate specifications • Model interagency agreements • Experience of other systems in addressing problems with unions	American Public Transit Association, ITS America and a range of publications, such as Metro, Railway Age, Mass Transit, and Passenger Transport
Toll authorities	"ITS can save money by reducing personnel while improving customer service through reducing delay at toll booths and providing better information about incidents"	• Interagency agreements • Experience of other authorities, especially with union concerns	The International Bridge Tunnel And Turnpike Association
Airports	"ITS can help manage facilities to address bad weather conditions, as well as improve groundside logistics and offsite/onsite traffic flow"	• Relevant technologies • Experience of other airports with technologies and coordination	AAE and ACI meetings and publications, Aviation Daily, Airports (weekly), Aviation and Space Technology
Ports	"ITS can help facilitate logistics and offsite/onsite traffic flow"	• Relevant technologies • Experience of other ports with technologies and coordination	The MPO, MARAD, Waterways Journal (for shallow water ports), Marine Log and Marine News (for deep water ports), and trade associations such as the National Waterways Conference, American Association Of Port Authorities, and the American Waterways Operators

III. CONCLUSIONS AND RECOMMENDATIONS: A NATIONAL STRATEGY FOR MARKETING ITS INFRASTRUCTURE

3.1 Introduction and Purpose

The goal of this research project has been to learn how to influence metropolitan regions to deploy and integrate ITS infrastructure products and services. To that end, two research hypotheses were formulated and explored, using a series of marketing questions to focus the inquiry:

- Who are our ITS infrastructure customers?
- What are their needs?
- How are these needs met by our product?
- What obstacles prevent potential customers from purchasing, deploying, and integrating ITS applications?
- What is the best way to reach our customers? What media? Which publications? And, what message?
- What action should they take once they become aware of the benefits our products provide?
- How best to organize limited financial and staff resources to accomplish the greatest level of ITS awareness, commitment, purchase, and deployment?

The first research hypothesis asserted (and the interviews confirmed) that, in any given metropolitan area, there are a number of transportation managers, planners, engineers, and elected and appointed officials who influence ITS deployment decisions, and that purchase decisions are dependent upon a number of critical "customers" concluding that the investment is worthwhile. Section 2.3, Transportation Issues by Organization, provides insight into who these customers are, what motivates them to consider transportation investments, and how to reach these individuals and influence their opinions positively toward ITS infrastructure deployment and integration.

The second research hypothesis asserted that, in each metropolitan area, there are a variety of transportation and institutional factors that influence the speed of ITS adoption, and that these factors, once identified and understood, can be used to evaluate other metropolitan areas , and used in a marketing strategy to assist in accelerating ITS deployment nationally. Section 2.2, Regional Deployment Factors, identifies these factors and discusses their relevance to the metropolitan areas' various stages of ITS deployment.

This final chapter reframes the report's findings as the basis for an ITS infrastructure marketing and communications strategy, and makes specific recommendations in response to the two final marketing research questions:

1. What action should potential customers take once they become aware of the benefits ITS products provide?

2. How best to organize limited financial and staff resources to accomplish the greatest level of ITS awareness, commitment, purchase, and deployment?

What action should potential customers take once aware of the benefits ITS products provide? Decisions to purchase large, complex, expensive systems are not made on the basis of one article or meeting. Customers must move through a sequence of stages (Figure 1) beginning with an awareness of the product's relevance to their needs, progressing to an evaluation phase in which they actively seek more information about the product or service, and finally into a commitment phase when the customer is decidedly working toward an acquisition. Each communication or marketing activity must serve the goal of moving the customer from one phase to the next. Generally the second and third phases are the longest, and demand the most intensive outreach and communication activities. Once a customer, or agency, begins to work actively toward an acquisition, a new set of practical deployment, maintenance, operations, and facility management challenges must be addressed. While noting that these are critical deployment challenges, and an important part of the U.S. DOT deployment support program, this paper will not address these particular challenges in any depth.

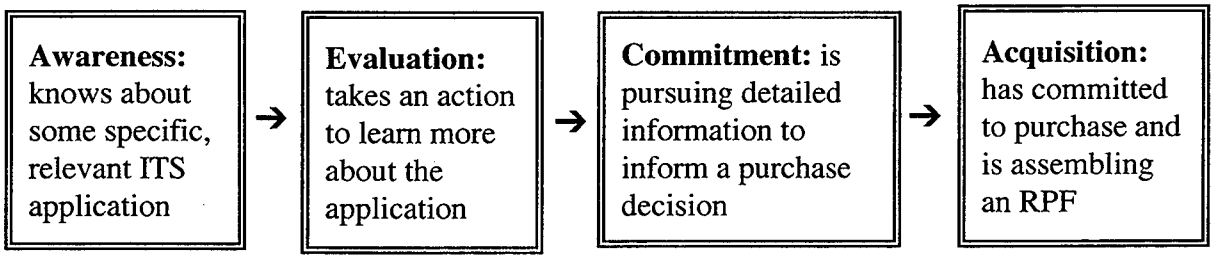


Figure 1 - ITS Adoption Stages

In a fully developed marketing strategy, different activities are developed to move the decision-maker through each of these stages, and to provide support to the customer following product purchase. For example, a traffic engineer may learn about ITS through an article in a journal. Because the article addresses a problem that is one of his agency's priorities, he will follow up on the article by phoning for more information. At the next regional Institute of Transportation Engineers meeting, the discussion on ITS solutions will be much more relevant to him, and he will actively participate in the discussion to explore his colleagues opinions and experiences. He enters the active, or evaluation, phase when he contacts a vendor or colleague for more detailed implementation-related information or a demonstration. After further discussion within his agency and with his superiors, he will begin pursuing information that will enable him to make a more complete acquisition recommendation. Different communications media are better suited for these phases of commitment, and each should be carefully designed with the goal of moving the customer into the next phase of the purchase commitment.

How best to allocate limited financial and staff resources to accomplish the greatest level of ITS awareness, commitment, purchase, and deployment? Even the best endowed corporations must approach their market in stages, focusing first upon those

customers who are the most likely purchasers of their products, and then using the momentum of those early purchasers, move along the product-adoption scale to those customer segments who may have less pressing need for the product, or are less adventurous in their purchase decisions. Building from the four segment adoption model established in Chapter II, this final chapter will describe how to utilize this strategy in the context of the U.S. DOT ITS deployment effort.

The overall marketing challenge addressed in this report suggests that the Department sort its metropolitan customers into adoption categories, as in Table 10 below, and within each category, examine the specific outreach, education, and communication that the metropolitan areas' decision-makers require in order to move from lesser awareness levels to a purchase and deployment program.

Table 10. ITS Customer Adoption Categories

Market Leaders:	**Lead Adopters:**	**Later Adopters:**	**Uncommitted:**
• Sustained high or moderate population growth • significant network congestion and constraints on physical expansion • well-maintained existing infrastructure • state and local political support • sufficient transportation budget or dedicated funding • well-established inter-agency working groups • strong transit authority • significant installed base of ITS applications • well informed managers and staff, with high access to ITS information	• High or moderate population growth • increasing network congestion and constraints on physical expansion • well-maintained existing infrastructure • state and local political support • sufficient transportation budget or dedicated funding • well-established inter-agency working groups • some installed ITS applications • strong transit authority • well informed managers and staff, with high access to ITS information	• Low population growth • tolerable congestion levels • constrained transportation budget • limited political support • some experience with inter-agency working groups • competing infrastructure repair needs • some well informed staff with good access to ITS information • ITS applied along with replacement of old equipment, such as signal systems • other ITS applications considered as a response to an incident or accident	• No population growth • limited or sporadic network congestion • high infrastructure repair needs • insufficient transportation budget • ITS applied along with replacement of old equipment, such as signal systems

3.2 A Service Organization: Structured for Marketing Success

Many large companies which manufacture, sell, and service consumer products have organizational structures designed specifically to accomplish the diverse tasks which their success depends upon. In its simplest form, the organization has three levels related to marketing (Table 11):

1. A central corporate office that develops and directs the overall marketing strategy, manages the national communications program, manages any national sales incentives program, and develops sale/service tools, supports the regional and division sales and service departments.
2. Regional offices that translate overall corporate goals into specific marketing plans that are tailored to their regions.
3. Division offices that are the sales and service liaisons to the customers, providing (or coordinating the provision of) the varied forms of educational, sales, and product support materials.

Table 11. Levels of Organization

National Office	Regional Offices	Division Offices
Marketing strategy • Competitive deployment incentive programs • Market segmentation, resources targeting, and deployment goal-setting Awareness campaign • Journal articles • Panels and workshops • Speakers bureau • Trade shows • Press conferences • Oversight of other associations' ITS awareness campaigns Regional Coordinators • Liaison between field offices and national strategy • Development of field support tools, such as peer-to-peer workshops, scanning tours, and related training and technical assistance programs • Technical support to national initiatives • Monitors field activities for new innovative ITS applications	Marketing plans • Annual marketing plans for targeted areas • Monitoring of actual vs. planned • Local adjustments to national plans, as needed Awareness campaign • Notify national office of need for speaker or panel at regional conferences, such as ITE, or ITS America • Notify national office of press release or press conference opportunity • Notify national office of journal article opportunity, or innovative ITS applications Deployment tools • Tailor national materials to local context • Provide feed-back to national office on tools' efficacy • Recommend development of new tools as needed	Marketing activities • Become more closely involved with the deployment-related activities of the targeted metropolitan areas • Monitor information needs • Arrange delivery of appropriate education and technical assistance activities • Help to convene interjurisdictional forums as appropriate • Recommend individuals for scanning tours • Recommend individuals as speakers for other regions • Provide feedback to regional and national offices on progress of plan vs. actual • Provide feedback to regional and national offices on efficacy of materials

The three layers of this organization are linked by the two-way flow of relevant information. National goals are set with input from the regional offices, who have both specific information about the readiness of their region's customers, and have a realistic appreciation of the resources required to accomplish those goals. The division offices are the closest to the customers, and provide feedback to the national office on the relevance and utility of the sales and service support tools; these staff know first when the national plan is working, and have practical suggestions when adjustments or new tools are required.

The FHWA's structure closely mirrors that of a sales and service company, and so is properly organized to take on the marketing task that ITS metropolitan deployment requires. While FTA has fewer field staff, it is expected that their expertise, contacts, and understanding of ITS transit

infrastructure requirements will be an integral part of any deployment plan developed with representatives of a metropolitan region. The current ITS/FHWA service model, with national "incentive" programs (like the Metropolitan Model Deployment Initiative (MMDI)), national office coordinators, regional and divisional offices, is well suited to this approach in concert with FTA representatives. The current efforts to create and field practical ITS deployment and management training programs (e.g., the Professional Capacity Building program), to provide regional offices with specific ITS deployment resources such as the "tool kit," and to manage a central communications and outreach strategy addressed to the national media and associations, are consistent with the activities of this type of organization. Metropolitan deployment tracking also feeds into the market segmentation, resources targeting, and deployment goal-setting consistent with the national office role, as well as providing a resource for identifying appropriate speakers and peer-to-peer programs.

The specific recommendations of this report build from the central recommendation that, where the U.S. DOT ITS organization differs from the model described, it should consider realignment to develop an explicit national deployment strategy, assign management and support responsibilities at the three levels accordingly, and formalize a systematic, targeted national marketing and communications campaign.

3.3 Segmenting Customers: Prioritizing and Phasing Deployment Resources

Effective allocation of finite financial and staff resources to achieve optimal deployment and integration of ITS infrastructure across the targeted 75 metropolitan regions requires that the regions be segmented into categories according to their readiness to deploy, and that marketing resources be prioritized accordingly. Chapter II, Findings, presented detailed insight into the regions' characteristics that the Department can use to sort metropolitan regions into the recommended four categories. Table 8 (reprinted on page 45) provides a table of metropolitan area characteristics by ITS deployment readiness stage. With the help of region and division staff, all 75 metropolitan regions can be sorted into these four ITS deployment readiness categories. As the 75 are being categorized, it may become clear that there is a fifth segment that is intermediate between two of the currently defined set, and if this is the case, a fifth segment should be created.

Market segments mark temporal points in the deployment spectrum, with the market leaders being several years ahead of the Department in their organization and deployment activities. The remainder of the metropolitan areas are distributed along this scale at different points, with the deployment factors defining commonalities among them, enabling them to be grouped into coherent market segments. However, for practical purposes, if one of the middle two segments contains too many metropolitan areas to work with, the group can be further divided using finer segmentation criteria.

The strategy behind this approach is that market leaders provide the test bed for ITS deployment, demonstrating its benefits for those who are likely to be lead adopters. Lead adopters (like market leaders) have transportation network needs, political support, and strong relationships between jurisdictions, but began planning for ITS deployment several years later. Market leaders need architecture and standards and national support, but they do not require focused U.S. DOT

marketing and outreach activities. Lead adopters do need more focused U.S. DOT support, and should become the priority focus of the Department's regional and division deployment support efforts. Later adopters do not have as pressing a need for ITS enhancements, and will base their deployment decisions on the experience of lead adopters. Later adopters must be kept up-to- date with ITS developments from other regions through national association conferences and publications, and through periodic briefings delivered locally by experienced peers and national experts, but intensive marketing and outreach activities should be focused on the second tier segment, the lead adopters.

This does not mean that regions which are "uncommitted" and not yet experiencing need for ITS should be ignored, rather that those with the most pressing need will be addressed first. As more of the benefits of ITS become apparent through increased deployment among ready adopters, regions which have been reluctant to try ITS solutions will begin to consider product trials.

Currently, four market leaders, which successfully competed for federal ITS MMDI funds are further expanding and integrating their ITS systems to demonstrate benefits that are not measurable on smaller deployment scales. Other market leaders, such as greater Minneapolis-St. Paul and the San Francisco-Bay area, are also proceeding with ITS investment programs and federally-funded evaluations. With "corporate office" resources directed at these leadership sites, the second tier regions will benefit from more tailored support brought to them through the regional and division offices.

Once segmented, there may be uneven distribution of faster or slower adopters among the U.S. DOT regions. Several solutions suggest themselves:

- Instead of ranking all 75 cities nationally, rank cities within regions and prioritize one or two per region for focused deployment support.
- In regions that include rural areas, which have not been included as part of this study, include the rural areas in the ranking exercise, using similar ranking criteria of need, political support, and established inter-jurisdictional project experience. While rural areas were beyond the scope of this research project, and the insight gained in metropolitan areas cannot be applied to rural areas, it may make sense to include rural areas in any regional outreach and marketing strategy that the Department undertakes.
- Should rural areas be included, further research into decision-makers and issues should be pursued, as it is likely that the rural areas will require different outreach and technical assistance from the 75 metropolitan areas.

The goal is to identify and target lead-adopter regions near full deployment and emerging later-adopter regions with Departmental resources through national communications, outreach, and technical assistance programs, and regional and divisional service delivery teams. The program uses the information learned from market leader's experience to support lead and later adopters. As the number of ITS-experienced planners and engineers reaches critical mass , later adopters and uncommitted regions become more comfortable with the performance of these systems, and are able to commit to those ITS systems which are best suited to their transportation needs.

Table 8. Rationale for Consideration of Deployment of ITS Applications--Summary by Market Segment

	Regional Deployment Factors				
Market Segment	**Transportation needs**	**Institutional Factors**	**Budget and Procurement**	**Community Factors**	**Access to Information**
Market Leaders	• Manage traffic congestion	• Support of state elected and appointed officials • Support of local elected and appointed officials • Regional cooperation among agencies	• Sufficient transportation budget • Opportunity to include in larger project • Dedicated funding	• Manage attitudes toward technology well	• High access to written information • Travel for decision makers • Access to peers with ITS experience
Lead Adopters	• Manage traffic congestion • Manage weather conditions	• Support of state elected and appointed officials • Support of local elected and appointed officials • Regional cooperation among agencies	• Sufficient transportation budget • Possible opportunity to include in larger project • Dedicated funding	• Manage attitudes toward technology well	• High access to written information • Travel for decision makers • Access to peers with ITS experience
Late Adopters	• Manager traffic congestion • Manage weather conditions • Infrastructure repair and replacement	• Support of local elected and appointed officials • Regional cooperation among agencies	• May or may not have sufficient transportation budget • Possible opportunity to include in larger project • Dedicated funding	• Mostly manage attitudes toward technology well • Incident as catalyst	• May have travel for decision makers • May have access to peers with ITS experience
Uncommitted	• Manage weather conditions • Infrastructure repair and replacement	• Minimal support and cooperation	• Insufficient transportation budget • No opportunity to include in larger project • Dedicated funding	• Incident as catalyst	• Lack of access to information

This segmentation is a complex undertaking. Should the Department choose to accept these recommendations, further guidance can be provided to support the segmentation activity and tailor it to program and policy requirements.

3.4 Defining an ITS Adoption Spectrum and Targeting Decision-Makers

The commitment to purchase an expensive and complex system happens in stages. Marketing divides the purchase decision into four major decision points: awareness, evaluation, commitment, and purchase. Each of the decision-makers identified in Chapter II have to move through these four stages in order to endorse the purchase and deployment of ITS applications. Table 12 defines these stages:

Table 12. Goals of Marketing Activity and Media by Stage

	Stages			
Goals	**Awareness**	**Evaluation**	**Commitment**	**Procurement**
Marketing Activity	Create **awareness** of some specific, locally relevant ITS applications	Encourage active **evaluation** of locally relevant ITS applications	Promote **commitment** to pursuing detailed information toward an informed purchase decision	Support **procurement** preparation activities
Marketing Media	Applies ITS solutions to specific, relevant issues to get audience attention	Provides greater detail and interactive personal contact	Provides detailed locally-relevant information to inform a purchase decision	Provides specific technical assistance and manuals

Awareness begins with learning what ITS is, what it can do, and how it may apply to local needs. The necessary level of awareness varies enormously among groups of decision-makers, with elected and appointed officials only needing to recognize the relevance, basic purpose, and local benefits of a given system, while transportation professionals need to be aware of technical, financial, and operational factors.

Evaluation of ITS takes different forms among different decision-makers. Once elected and appointed officials become convinced that an ITS solution holds promise for their constituency, they delegate more detailed evaluation activities to transportation managers. Managers require a clear understanding of how a particular system would solve an identified problem, and how to purchase such a system within the context of a region's transportation priorities. For engineers and technical people, evaluation means weighing different technologies and approaches, as well as judging cost, effectiveness, and reliability.

Commitment also takes different forms depending upon the level and position of the decision-maker. For transportation managers, the commitment phase is marked by more specific deployment-impact research. It implies preliminary intent to follow through with

a procurement, should all the pieces of the system prove practicable. Such decisions frequently involve a combination of planners (frequently the MPO), transportation managers, and technical people. Together these decision-makers must develop a strategy and gather compelling evidence to include ITS in the capital program of the organization. The commitment may take several forms, such as the inclusion of the proposed procurement in the transportation budget, inclusion of a project into the regional Transportation Improvement Plan, or reaching consensus on a regional ITS plan and budget.

Purchase involves a combination of technical and managerial people who integrate the technical specifications with mandatory purchasing procedure and requirements. The purchasing decision involves several steps which vary according to location and organization, but inevitably include defining the product, evaluating options, and deciding on the optimal solution. Legal, technical, and financial considerations, such as availability and source of funding, all figure heavily in this process.

The decision-makers and their supporting staff can be defined roughly as comprising three broad segments, with common types of decision support information needs within segments across agencies and modes:

Elected and appointed officials, including mayors, city councilors, and county commissioners need to reach the commitment stage for a major procurement to be encouraged within their jurisdiction. Thus, the awareness and evaluation stages are of primary importance.

Senior managers from Secretaries of Transportation through agency and department heads are in a position to prioritize the procurement process. They must have a sufficient understanding of the system purpose, application and proposed benefits to effectively advocate before elected officials, the MPO, and their own and other agencies as necessary. Managers are also needed to ease ITS purchases through the capital prioritizing process, whether the recommended system is a stand-alone or an enhancement to an existing project.

Staff engineers and planners, who are not explicitly decision-makers, provide support to each level of decision-maker. They are clearly key to the process at every stage, but their primary importance is in identifying appropriate technology for the problem at hand, evaluating options, assessing the benefit/cost ratio of alternative investments, and specifying the particular characteristics required for the system. They are the group that needs the most detailed and technical information including field reports from other areas with actual operating experience.

Table 13 matches decision-makers by stages of commitment, and fills the chart with the specific media and outreach activities which are best positioned to get the decision-makers' attention, and encourage greater commitment to and involvement in ITS purchase and deployment. This chart recommends which media should be applied to each individual at each stage of the process. The reader will note that there is some commonality in the type of media and outreach activity

recommended for decision-makers with similar levels of responsibility, and further, that the most senior decision-makers, such as the elected and appointed officials, delegate responsibilities to their staff once they have reached the evaluation level. It is their expectation that should ITS be a worthwhile investment, following investigation, their staff will make appropriate procurement recommendations. All of the metropolitan area's decision-makers are included in this chart because optimal levels of ITS deployment and integration requires comparable understanding of ITS benefits across modes and political boundaries. Recommendations of how to apply this outreach information to each of the 75 metropolitan areas with the help of the regional and division staff follow the chart.

The media and activities included in Table 13 take two forms:

1. nationally-organized and-delivered communications and outreach, such as magazine articles, national conferences and workshops, conference panels, and ITS trade-show booths
2. nationally-organized, locally-delivered information and technical assistance, such as peer-to-peer workshops, scanning tours, expert presentations, and regional association meetings

A national ITS program office outreach and communications campaign should maintain a high level of activity directing the production of the printed media and conference activities to maintain an ongoing ITS-awareness campaign. Priority should be given to fielding panels and placing articles among the national associations most frequently cited as credible and frequently consulted sources of information. Section E., following, addresses the national awareness campaign.

The field support team at the national office, with input and feedback from the regions and divisions, should direct development of and fund the locally delivered information and technical assistance programs that support the evaluation, commitment, and procurement stages of the decision-making process. Much of this activity is already underway, through contracts for technical assistance with Public Technologies Incorporated (PTI), for example, and through the PCB effort. Section 3.6 Supporting the Next Three Phases of the Product Adoption Cycle, provides greater detail on the activities of the regional coordination team.

In the marketing program recommended in this report, the regional and division offices must know their customers, and ensure that each of the decision-makers and agencies have access to the information they need to move from a general level of ITS awareness to an ability to field a procurement. Particularly among the targeted metropolitan areas, the local DOT staff must stay close to the region's decision-making process so that the appropriate presentations, professional capacity building courses, and technical assistance can be delivered at the appropriate time to support the region's ITS evaluation and commitment stages. Section 3.7 Creating Regional ITS Service Plans, discusses these activities in greater detail.

Table 13. Best Media for Each Decision Stage and Decision-Maker				
DECISION-MAKER: Elected and appointed officials	**Awareness**	**Evaluation**	**Commitment**	**Acquisition**
Chief elected officials: Mayor, Governor, Selectmen, etc.	National association meetings, nat'l broadcast media; local newspapers; briefing from staff	Panel sessions comprised of peers and technical experts at national conferences; scanning tours	Not applicable, once committed, further activities are delegated	Not applicable, once committed, further acquisition activities are delegated
Senior appointed state transportation official	Elected official sends notice; peer panel and technical experts at nat'l meeting; article in nat'l assoc. pub.; briefing from staff	Scanning tour; briefing material from credible senior staff; regional ITS or ITE chapter	Touring experts bringing a tailored presentation into the region (such as PTI)	Not applicable, delegated to staff

DECISION-MAKER: Management level, and transportation staff	**Awareness**	**Evaluation**	**Commitment**	**Acquisition**
Senior appointed city transportation official	Elected official sends notice; panel of peers and technical experts at nat'l meeting; article in nat'l association newsletter that addresses urban economic, mobility, accessibility, and safety benefits of ITS	Scanning tour of other cities; briefing material from credible senior staff; regional ITE or state ITS chapter	Invited contractor presentations; touring experts bring briefing to region	In larger cities, delegated to staff; smaller cities and city transportation staff require direct technical assistance from state, FHWA, and experienced other cities
Transit authority executive director	APTA publications and national meetings, focus: other authorities' success stories; briefing from staff	ITS national meeting; scanning tours	Not applicable, once committed, delegates further activity to staff	Not applicable, delegated to staff
MPO executive director	AMPO meetings and publications; MPO members; other transportation magazines; briefing from MPO staff	Touring expert presentations; regional ITE and state ITS meetings	Not applicable: delegates research activity to staff	Not applicable
Senior state transportation manager	Appointed or elected official delegates action; national association conference presentation; article in ITE or ITS trade magazine that links ITS to specific problems in state highway network	ITS national or regional conference; ITE regional meeting; peer-to peer workshop; briefing from staff	Invited contractor presentations	Generally delegated to staff

Table 13. Best Media for Each Decision Stage and Decision-Maker (continued)				
DECISION-MAKER: Management level, and transportation staff	**Awareness**	**Evaluation**	**Commitment**	**Acquisition**
Senior transit manager	APTA publication articles that stress specific benefits of ITS applications as they relate to the authority's issues	Peer-to-peer exchange; touring expert presentations	Contractor presentations; cost and benefit experiences from peers	Generally delegated to staff, who seek model RFPs and contracts from other authorities
Senior city transportation manager	Appointed or elected official delegates action; regional ITE meeting; article in ITE or ITS trade magazines that links ITS to specific urban mobility, safety, or access problems	State ITS chapter meeting; peer-to-peer exchange; PTI technical assistance programs; expert presentations	Contractor presentations; cost and benefit experiences from peers	Direct technical assistance from state, FHWA, or other experienced cities; reports that contain model RFPs and contracts successfully used by other cities
Transportation staff	Association publications; regional ITE or other association meetings	Manager delegates action; Internet; peers in other regions	Contractor presentations; U.S. DOT reports and technical assistance	Experience of peers in other regions; U.S. DOT reports and technical assistance

3.5 Maintaining Awareness Levels Nationally: The National Awareness Campaign

The objectives of the national awareness campaign are:

- to ensure that decision-makers at all levels of government understand that ITS can be deployed to support the specific economic growth, mobility management, accessibility, and safety goals that are fundamental to the quality of life of their constituents
- to keep these decision-makers up-to-date with ITS benefits being discovered by their peers in other communities
- to motivate them to take the next step in the product adoption cycle toward greater ITS deployment

To accomplish these broad objectives requires the development of several differently-focused messages, use of several different media venues, cooperation from the national associations that reach the targeted decision-makers, and an annual plan for placing ITS panels into national and regional conferences, ITS articles into association and trade magazines, and the development of ancillary media (e.g., web page, brochures, reprints, etc.) that can strengthen and extend the impact of a personally delivered message.

The messages must speak directly to the problems that the decision-makers consider pressing. The decision-maker groups can be divided by the position they hold in their organization, and by

the type of organization they lead. Table 9 (reprinted on page 53) divides decision-makers according to their office and by agency, with a different message and venue for state and local leaders, and for type of modal authority. Table 12 lists the decision-makers by office, agency, and level of responsibility and provides information on how to reach each according to their stage of awareness. The national awareness campaign should focus on achieving the goal of "awareness," as described in that table, as distinct from developing the tools and local support activities that support later stages of adoption. The field organization support group in the national office will spearhead that effort.

The most effective venues are those that the decision-makers already use and trust. The organizations cited most frequently are included in Table 9, the venues for delivery of the information are reported in Table 12. It should be noted that at the most senior levels, particularly elected and appointed officials, the best media for creating awareness is a live presentation from a respected peer, whether at a conference or on a scanning tour. They are also significantly influenced by briefings from their own senior-level managers. At lower levels of responsibility, a conference panel with respected peers is effective, as are association and trade publications (where the headline speaks directly to their concerns), and requests or instructions for information from an elected or appointed official. This feed-back loop between senior managers and elected/appointed officials increases the power of any message and increases the likelihood that they will move, as a unit, into the next adoption phase.

The awareness requirements of lower level managers, managers in smaller organizations, and staff must also be addressed by the national awareness campaign. Because they frequently cannot travel to national conferences, the awareness campaign must reach them through publications, the Internet, their managers, and regional meetings of national organizations such as ITE and ITS America. Few of the respondents had access to the Internet at work, but a substantial number referred to using the Internet at home to research work-related issues. ITS awareness among respondents in this group was predicated on an existing high level of involvement in their work, thus they were alert to new potential solutions to their communities' transportation challenges.

Where possible, U.S. DOT presence at trade shows and among commercial exhibitions should be co-located with nationally-sponsored deployment program exhibitions, so that the U.S. DOT booth does not stand alone. Much greater interchange between conference attendees and booth staff occurs where there is already a critical mass of activity. And, the state and local ITS decision-makers (or decision-influencers) are more likely to stop at booths where they can speak with peers. This increases the opportunities for DOT staff to make direct personal contact with potential (and actual) ITS infrastructure deployers.

The message of all materials and presentations must match the listeners' interests with information on what to do next. As one of the objectives of the awareness campaign is to move the listener into the next stage of the product adoption cycle, each message should, to the extent possible, motivate the listener to become a more active evaluator of the potential benefits ITS can provide to his or her community. The message should also refer the reader (or listener) to ancillary sources of information, such as a reference to the ITS web page.

Brochures, videos, and other stand-alone media are not effective awareness tools unless they are embedded within a live panel or paper presentation and enable the decision-maker to take the information back to his or her staff for a briefing and follow-up. When used as part of a panel or other live presentation, and used to brief home office staff, they can effectively extend the reach of the message to other transportation staff in the deploying region.

Finally, as ITS deployment spreads and more substantial information becomes available, the awareness campaign must update its panels, conferences, articles, Internet material, and ancillary media. The regional coordinators must bring success stories from the field to the attention of the national staff, so that new stories are regularly introduced into the public awareness campaign. Similar information obtained through deployment tracking can also be added to the mix, with the advantage that tracking covers the full range of metropolitan areas, as well as being able to distinguish between central cities and suburban areas.

In summary, the national awareness campaign ensures that transportation decision-makers receive ITS information in their reading and conference activities, and that the information is both relevant to their needs and timely with regard to the newest ITS benefits data. This campaign:

- matches decision-makers to their most pressing interests and most reliable information sources
- develops and fields appropriate presentations and ancillary material at each event
- fields a series of ITS articles tailored to audience interest in each association publication
- maintains an up-to-date web page for the most recent information on ITS field tests, deployments, and research findings

Every piece of information must provide contacts for more information.

Table 9. Messages, Information and Effective Outreach Venues

Organization	Critical Messages	Information Needed	Effective Outreach Venues
State elected and appointed officials	"ITS has tangible benefits: demonstrable improvements that are visible and obvious to the electorate, bring federal tax dollars into the state, and create jobs"	Comparative success stories	American Association of State Highway and Transportation Officials, and (where they are qualified) their own senior transportation staff
Local elected and appointed officials	"ITS is a money-savings investment, a tool with which mayors can improve the quality of life of their constituents, and a cost-effective approach to improving mobility for the people, goods, and services which is requisite for a healthy business climate"	Comparative success stories	General media, their peers, local Chambers of Commerce, national associations (National Conference of Mayors, International City/County Management Association, and the National League of Cities), and well-informed, astute, senior transportation managers within their own transportation department
Metropolitan Planning Organizations	"ITS is a cost-effective means of solving transportation problems related to the economic growth and livability of the metropolitan area"	• Cost-effectiveness and benefit/cost information • Evaluation tools for comparison purposes	Most organizations and publications cited by other transportation organizations, especially FHWA, ITS America and ITE
State Departments of Transportation	"ITS is a cost-effective means of improving highway system performance, especially with respect to congestion and safety"	• Cost-effectiveness and benefit/cost information • Examples of cooperative agreements for operations • How to do design-build contracts • Standards and specifications for ITS technologies	Local chapters of national organizations such as ITE, FHWA, American Association of State Highway and Transportation Officials, ITS America, Transportation Research Board and the American Society of Civil Engineers. Publications including Traffic Technology and ITS World
Local traffic engineers	"In the experience of many cities, ITS can be an affordable way of upgrading their current traffic signal control systems, while improving coordination across jurisdictions, in order to address traffic flow, safety, and economic development issues"	• Other cities' experience with the technologies • Procurement issues, such as specifications • Model interagency agreements	ITE publications and regional meetings, peer-to-peer programs, scanning tours, or any other organized program that matches the expressed interests of the cities' transportation community with the experience of a similar city

Table 9. Messages, Information and Effective Outreach Venues (continued)

Organization	Critical Messages	Information Needed	Effective Outreach Venues
Transit	"ITS can save money through improved operational efficiency or reduced fare evasion"	• Standards • Boilerplate specifications • Model interagency agreements • Experience of other systems in addressing problems with unions	American Public Transit Association, ITS America and a range of publications, such as Metro, Railway Age, Mass Transit, and Passenger Transport
Toll authorities	"ITS can save money by reducing personnel while improving customer service through reducing delay at toll booths and providing better information about incidents"	• Interagency agreements • Experience of other authorities, especially with union concerns	The International Bridge Tunnel And Turnpike Association
Airports	"ITS can help manage facilities to address bad weather conditions, as well as improve groundside logistics and offsite/onsite traffic flow"	• Relevant technologies • Experience of other airports with technologies and coordination	AAE and ACI meetings and publications, Aviation Daily, Airports (weekly), Aviation and Space Technology
Ports	"ITS can help facilitate logistics and offsite/onsite traffic flow"	• Relevant technologies • Experience of other ports with technologies and coordination	The MPO, MARAD, Waterways Journal (for shallow water ports), Marine Log and Marine News (for deep water ports), and trade associations such as the National Waterways Conference, American Association Of Port Authorities, and the American Waterways Operators

3.6 Supporting the Next Three Phases of the Product Adoption Cycle: Evaluation, Commitment, and Procurement

The "corporate" office described earlier also contains a group of regional coordinators who provide support to the field, or "sales," organization. This headquarters group must develop and/or fund specific marketing activities and education tools that can be fielded locally by the region or division offices. Such activities and tools include:

- scanning tours
- peer-to-peer workshops
- technology demonstration road shows
- reports providing examples of how other agencies managed certain types of procurements
- professional capacity building workshops, advanced technical training
- direct technical assistance

The objectives of this office are to fund and/or develop activities and tools that:

- match the evaluation, commitment, and procurement needs of the metropolitan area decision-makers with properly targeted information and technical assistance
- support the regional offices' marketing and deployment plans
- respond to feed-back from the U.S. DOT field staff

There are many projects at headquarters, completed and underway, that meet these objectives. What appears to be lacking is the organization of these tools by audience and by stage of adoption. This organizing step would use a chart similar to Chart 12 as a framework to ensure that there is sufficient, appropriately targeted, material to meet the information needs of each decision-maker at each of the last three stages of the adoption cycle. Evaluation of each outreach and education activity and publication would be based on the answers to several questions:

- Does this information address the concerns and values of the decision-maker it is intended to influence?
- Does this information help advance this decision-maker group to their optimum point on the awareness continuum?
- Is it what they need to know? Is it more than they want to know?
- How easily can it be obtained?

In some cases information may be appropriate for one audience, but difficult for them to access. Alternately the information may be available, but not applicable to the intended group's needs. Many programs will suit audiences exactly, and may be candidates for expansion or wider distribution.

At the conclusion of this inventory, each existing program would be designated according to its intended audience and its distribution method. For example, a particular tour would be targeted for managers or for engineers. A particular trade show display would be targeted for elected officials and would be shown, for example, at the National Conference of Mayors (sharing space

with a regional ITS deployment booth), where accompanying brochures would be offered to take away and be passed along to transportation staff. A demonstration or traveling road show would be targeted for planning, engineering and/or technical staff. Certain articles and reports targeted at operations and maintenance people would be posted on the Internet, and publicized through association and trade magazine articles and U.S. DOT brochures.

After existing programs and materials are categorized, it will be possible to determine where gaps occur. For example, an audience may be identified which does not have sufficient programs available, or a program may exist which is not accessible to the audience for which it is intended. Similarly, there may be programs where the messages do not match the interests or needed knowledge level of the targeted audience.

Once the gaps in information, message, or delivery method are identified, they can be filled. Using the message and media criteria associated with each audience, programs can be either amended, expanded or created to meet the established needs. Thus, at the end of the inventory and evaluation process, it may become clear that certain audiences have sufficient materials, but distribution methods could be improved. By contrast it may become clear that programs for certain groups should be created or expanded.

The availability of these national ITS outreach activities and education and technical assistance materials would be publicized in all U.S. DOT regions, along with an explanation of the materials and who they are intended to reach. In this way, regional ITS specialists may use appropriate components when developing their regional ITS Service Plans.

The quality of outreach and education programs depends frequent input from the regional and division staff. As the U.S. DOT representatives who are closest to the "customers," and most frequently present when technical tours and other technical assistance are presented in the region, their opinions on the usefulness and relevance of program content must be incorporated into the program review process. Headquarters staff would continue to manage the contracts that supported information delivery by outside agencies, and regional staff would provide contract input to keep the material and the presentation up-to-date and relevant to their particular metropolitan areas. Regional and division staff would have responsibility for maintaining close relationships with the state and metropolitan agencies and decision-makers, and providing them with the appropriate decision-support material (or other tools) when needed.

3.7 Creating Regional ITS Service Plans

Each regional office should develop annual ITS Service Plans for the targeted metropolitan areas in their region. Primary responsibility for the development of these plans will be U.S. DOT staff at the regional and division level, since they are most aware of transportation needs, regional character, and local decision-making structure. ITS specialists in the regions would take the lead in organizing this activity. The objectives of the service plans are to:

- translate national deployment goals into realistic local support activities
- set tangible objectives toward accelerated ITS deployment in selected metropolitan areas
- establish accountability among the different levels of U.S. DOT staff for service delivery

Five steps toward creating and implementing the regional service plans

Creating and implementing Service Plans involve five steps: the first two are analytical, while the last three are implementation tasks:

1. identifying specific needs
2. placing decision-makers on the adoption spectrum
3. using national evaluation, commitment, and procurement decision-support materials and programs
4. acting as an information resource and clearing house
5. providing feedback to U.S. DOT headquarters' program offices

Identifying specific needs

During the market segmentation exercise, each of the 75 metropolitan areas would be categorized, using Table 8 as a guide, for ITS momentum and commitment. Before selecting any region for increased service, the area's state and local decision-makers (particularly the appointed officials and managers) should be consulted to ensure that they are amenable to participating in a more focused deployment effort. In preparation for developing the service plan, regional or division staff should schedule interviews with the decision-makers and selected staff to confirm their understanding of the area's activities and concomitant information and technical assistance needs. These interviews, backed with existing knowledge of the region and their plans, identify the specific transportation needs that decision-makers in the region want to address.

Placing decision-makers on the adoption continuum

Using the adoption continuum, it should be possible to place individual decision-makers at their current position, and compare that to their optimum decision point. For example, if a Mayor is at an early awareness stage, and thus must reach the commitment point, then the Service Plan would include specific actions to increase that Mayor's awareness and knowledge of certain locally-relevant ITS infrastructure projects. These actions by the U.S. DOT division office staff would draw upon the outreach resources available through the national office and might include a peer-to-peer tour for the city's transportation community, providing direct contacts with other Mayors both within and outside of the metropolitan area who have successfully implemented similar programs, and scanning tours. By defining the specific information needs of each decision group, a specifically tailored outreach plan would be created.

Using national ITS outreach materials and programs

The previous section outlined the types of outreach programs and materials which would be available from U.S. DOT headquarters. In developing Regional Service Plans, local U.S. DOT representatives would familiarize themselves with these materials and recommend some of them to each of the decision-maker groups as appropriate. For example, individuals would be named as candidates for U.S. DOT-sponsored tours to sites using applicable systems. Traveling road show visits would be requested and scheduled if they contain relevant information. Local experts would be identified who

could serve on panels at association meetings, be participants in traveling road shows, publish articles, and be used as experts in the media.

Acting as an information resource, conduit, and facilitator
Being aware of the national ITS materials also allows local U.S. DOT staff to be the regional clearing house for ITS information. In this role, they will be able to publicize the availability of brochures, articles, Internet sites, contact people, regional association meetings, and traveling road shows. Regional U.S. DOT staff would offer advice and experience gleaned from other regions and could offer suggestions about successful programs in use elsewhere. They could also speak and participate at regional meetings such as MPO sessions. Site visits emphasized that the free flow of information between regional decision-makers was a crucial component of successful adoption, and the Regional Service Plans would include a strong emphasis on regional and district U.S. DOT offices facilitating this communication.

While not discussed previously, using local ITS experts from targeted regions to speak at national conferences enhances the national prestige of the entire region, while increasing the credibility of the ITS expert, who is also an advocate of increased ITS deployment. In this role as information resource and facilitator, U.S. DOT regional and division staff could enhance the position of local ITS experts by increasing their visibility and credibility. The Regional Service Plan offers many opportunities to use local ITS experts as featured speakers, increase their knowledge by providing broader access to national information, and to cross-fertilize their expertise across several regions.

Providing regular feedback to U.S. DOT headquarters program offices
Finally, a structured mechanism for providing regular feedback among the regions and between the regions and U.S. DOT is an essential element of this program. Regional and division staff should report on which activities were the most successful, where improvements could be made in national materials and programs, new ideas and approaches for reaching necessary audiences, lessons learned from activities to date, and identification of unmet needs.

This feedback could occur during regularly scheduled sessions between the regions and U.S. DOT in Washington, or an annual update meeting could be arranged where all the Regional Service Plans are reviewed. In addition to the activities at the regional level, the effectiveness of the National ITS Awareness Campaign would be reviewed. An update of deployment tracking in conjunction with this review could provide context and help set priorities. Individual components would be adjusted, expanded, or eliminated according to participants' sense of their usefulness. In this way both the national and the regional programs would be mutually reinforcing and continuously evolving.

3.8 Maintaining Deployment Momentum

This final section explores the resultant issues from enacting the recommended marketing program. Once the plans and programs are in place and information delivery underway, the

marketing program should very quickly become a self-sustaining cycle of learning and teaching, listening and facilitating. Metropolitan areas that are identified first as targets for increased outreach and deployment support will develop new needs as their level of deployment increases, and areas which are currently experiencing low levels of need for ITS will begin to recognize the advantages that the applications can provide to them. At the end of two year's time, the national marketing strategy should be an integral part of the national planning and funding cycle, with a broad reach that extends to the decision-makers and staff of all targeted 75 metropolitan areas.

Updating plans annually

"The best laid plans..." Particularly following the first year of targeted deployment support, and at annual intervals thereafter, the U.S. DOT field staff should convene formally within each region to review the previous year's plans and compare them with the actual experience of the year. This is a new activity: there is limited experience predicting outcomes, certain metropolitan regions will exceed expectations, and others will discover obstacles that were unknown at the time the plans were created. What is critical is that the new knowledge about ITS deployment be captured and incorporated into the next round of plans and program investments.

Continuing to provide needed post-deployment support and information

It may also be difficult to determine when a metropolitan region has progressed from a general position of Lead Adopter to a position where less outreach and education is required. The answer depends on a variety of factors. Essentially, a region has progressed out of a targeted category when the bulk of their information requirements have shifted to post-deployment ITS infrastructure systems management and maintenance. Information to support these types of requests will (in all likelihood) have already been addressed by the national field support group in response to the requirements of the more advanced market leaders. The task of the region will evolve into one where it facilitates exchange of this new set of technical aids.

Capturing ITS innovations and developing new tools

Innovative products and services, like ITS, move through predictable adoption cycles where those individuals or organizations who are already experiencing needs that the product can address are the first customers of the product and become the market leaders. In so doing, they are the first to discover how well the product is able to achieve its promise, and as well, they are the first to discover new uses and applications for the products. As the original innovative product is being refined and adopted by an ever increasing number of less adventurous customers, the market leaders' original needs have evolved and they are experimenting with new methods for managing their requirements. It is important for the national office to keep up to date with the activities of the true ITS innovators, for it is in their activities today that the next generation of technical support programs and ITS applications will be defined.

The central field support group, in their role as direct technical support providers to the national deployment demonstration sites, will need to remain alert to the sites' evolving technical support requirements, and be able to respond with new "tools" or education and technical support programs. In the continuing process of producing workshops and contributing to panels, the cycle of technical innovation will continue, and new applications and solutions will emerge. The central field support group must capture and institutionalize this insight as it develops.

Shifting focus to introduce new users as their needs indicate

Just as there are market leaders who quickly adopt new products, there are those metropolitan regions which are not likely to make any significant investment in ITS in the near future. The reasons for this are generally related to a lack of perceived need, a lack of sufficient funding for existing visible transportation network maintenance, and a lack of political support. Nevertheless, regional or division office staff should maintain regular contact with representatives from these regions to ensure that, as their needs develop, their understanding of relevant ITS applications develops apace.

Enhancing the system

Finally, as should be evident, the challenge of applying ITS infrastructure to improve the performance of the transportation network, is an ongoing and evolving challenge. All parts of the U.S. DOT team must remain involved with their public sector counterparts at all levels of the system to ensure that needs are recognized and addressed, and new knowledge captured and incorporated into the system to the benefit of all involved. Currently integration, standards, and architecture mark the frontier of ITS infrastructure deployment. It is easy to predict that new challenges will emerge as the underlying technology evolves and the user community becomes more adept at using advanced technologies to increase the efficiency and effectiveness of the public's transportation system.

APPENDIX A. TARGETED AREAS

The 75 metropolitan areas targeted by the Secretary of the Department of Transportation:

Albany
Allentown, Bethlehem, Easton
Atlanta
Austin
Bakersfield
Baltimore
Baton Rouge
Birmingham
Boston
Buffalo, Niagara Falls
Charleston
Charlotte, Gastonia, Rock Hill
Chicago
Cincinnati, Hamilton
Cleveland
Columbus
Dallas, Fort Worth
Dayton, Springfield
Denver, Boulder
Detroit
El Paso
Fresno
Grand Rapids
Greensboro, Winston-Salem, High Point
Greenville, Spartanburg
Harrisburg, Lebanon, Carlisle
Hartford, New Britain, Middletown
Honolulu
Houston, Galveston, Brazoria
Indianapolis
Jacksonville
Kansas City
Knoxville
Las Vegas
Little Rock, North Little Rock
Los Angeles
Louisville
Memphis
Miami, Fort Lauderdale
Milwaukee, Racine

Minneapolis, St. Paul
Nashville
New Haven
New Orleans
New York, Northern New Jersey
Norfolk
Oklahoma City
Omaha
Orlando
Philadelphia
Phoenix
Pittsburgh
Portland, Vancouver
Providence, Pawtucket
Raleigh-Durham
Richmond, St. Petersburg
Rochester
Sacramento
Salt Lake City, Ogden
San Antonio
San Diego
San Francisco, Oakland, San Jose
Scranton
Seattle, Tacoma
Springfield
St. Louis
Syracuse
Tampa, St. Petersburg
Toledo
Tucson
Tulsa
Washington
West Palm Beach
Wichita
Youngstown, Warren

APPENDIX B. INTERVIEW GUIDES

A Note to the Interviewer:

The following interview guides provide a point of departure for ensuring that we gain appropriate information from our correspondents in the metropolitan areas. They cannot take account of the region's unique characteristics or its existing ITI. The interviews will be enriched by framing your transportation questions with references to the region's climate, age of infrastructure, rate of population growth (or lack thereof), and specific deployed ITI systems. Check your regional profiles and note on the guide where it would be appropriate to insert regional or authority-specific questions. Also, it is not necessary to ask (or get answers to) every question. It is important to walk away from each interview feeling that you understand the environment that your respondent operates in, and what string of events created awareness of an advanced technology (or ITI) solution and motivated (or compelled) him/her to recommend purchase of either ITI or advanced transportation technology.

MPO

Requested materials: TIP (if an ITS EDP exists, we should already have it)
Respondent: Sr. Manager (or a staff person who sits at the table with the members)
Focus: Regional Overview

- Confirm agency function/activities.
- Please describe your job responsibilities, especially in terms of the decisions that you make?
- What decision-making or policy-setting bodies affect this organization?
- Who are the MPO members?
- What are the parochial interests of members?
- What are the regional transportation issues?
- Are there any distinguishing features in this region (economic, demographic, topological, etc.) that we should be aware of in establishing a context for its transportation patterns and needs?
- How do you work the TIP process to get advanced technologies into your plan?
- Does ITI/ITS, per se, ever come up as a discrete program component?
- Who is the most influential person with regards to transportation projects in the region?
- Are there examples of a major project that includes advanced transportation technologies? How was it brought through the various hurdles to funding?
- What are the expected (or, actual) benefits from advanced transportation technologies and ITI improvements? (If there have been any reports documenting benefits, request a copy.)
- What features of advanced transportation technology and/or ITI do proponents find compelling?
- What features of advanced transportation technology and/or ITI do opponents find objectionable?
- Have there been any significant events in this region that have precipitated deployment of advanced transportation technology or ITI?
- Are there any inter-jurisdictional transportation programs? Is advanced technology used to support the program?
- Has the ITS System Architecture had any impact on this region's planning?
- With regard to special ITS funds, such as EDP grants, Priority Corridor awards, or others, what explains the speed (or lack thereof) with which this region responded to the opportunity?
- Thinking within current funding levels, if the U.S. DOT wanted to promote deployment of ITI in this region, what actions would be most effective?
- What are your observations about what has motivated or prevented this region's adoption of advanced and integrated transportation technologies? Age of infrastructure? Interpersonal relationships among significant decision-makers? A lone champion? (Which is who? Interview this person.)
- From your point of view, looking at the U.S. DOT problem of accelerating the rate of deployment of the nine Intelligent Transportation Infrastructure elements without adding new funding, do you think that it can be done? That is to say, do you think that states like your client's are moving toward increased integration of traffic surveillance and management systems? If so, what would it take to increase the speed with which this is happening? If not, why not?

STATE DOT (highway)

Requested materials: Organization chart for agency (a verbal description is sufficient)
State ITS plan, if available
Executive summary of transportation budget, both operating and capital

Respondent: Senior manager

Focus: Overview of state's plans and project activities; view upward at state DOT secretary and other appointed and elected officials; view to DC and impact of national programs and policies; exploration of what is most influential in effecting state transportation investments.

Context

- Please describe your job responsibilities, especially in terms of the decisions that you make?
- What decision-making or policy-setting bodies effect this organization?
- What are the most pressing transportation, mobility, and safety problems confronting the state?
- What are the priorities of your chief administrator? Does s/he support advanced transportation technology and/or ITI?

Experience with Advanced Transportation Technologies or ITI Projects

- How would you rate the state administration's attitude toward adoption of new technology generally? (Has there been an experience with an advanced technology project that has improved/destroyed their interest in advanced technology solutions?)
- Are advanced technologies routinely considered as part of the solution to a transportation problem? (Are they more likely to be considered in response to some problems than others? Which problems and why?)
- What are the largest transportation projects currently underway in this state? Do they include advanced transportation technologies or ITI? How did the projects come into existence? (probe: Did they solve a particular problem? How was the problem identified? In response to a funding opportunity? Responding to crisis? Did you look to other states' experience with advanced technologies first?)
- Have you ever performed a field test of a new transportation technology to learn whether it would be appropriate to your climate and needs? (Details of how, why, and outcome).
- Did you purchase and deploy new systems incrementally, or all at once? Why/why not?
- Are advanced technology or ITI projects treated differently from traditional highway projects in this state?
- Where you have deployed either advanced technologies or "ITI", were the benefits of the system immediately apparent? Were they what you had expected? (If there are any papers/reports documenting the benefits of their ITI deployment, please ask for a copy)
- Have any ITI-type projects been seriously considered for funding and rejected? Why?
- How do the inter-juridictional issues between state and city (or other entity) effect your consideration of advanced technology transportation systems? (Or ITI?)

Budget, Planning, and Finance

- What issues do you consider when you are developing the capital and operating budgets?
- What is the review process for a capital budget item? For the annual operating budget?
- What is the lead time required for capital budget planning and budget item inclusion?
- What are the funding sources for state transportation, both operation and capital? Does the source change if the item is advanced technology or ITI?
- How do the restrictions that accompany these funding sources effect your deployment decisions?
- What are the trends in your state transportation budget and how are they affecting what projects you choose to pursue?
- What are the state's political priorities for funding of transportation projects? (Probe to see how an outsider might influence the selection of those priorities)
- What influence does the availability of targeted federal transportation funds with a required match have upon your transportation plans?

Purchasing Procedures

- Are advanced transportation technology purchases treated differently from other purchases?

- Are the purchasing procedures (or procurement requirements) an obstacle to acquiring new technologies?
- Whom do you consult to develop advanced technology system specifications and cost estimates?

Other Issues

- Would an existing labor agreement effect your ability to deploy and operate any advanced technologies?
- Does your existing workforce understand how to operate and maintain an advanced transportation technology system?
- Is your agency privatizing any part of the transportation system or its management?
- Does your region's air quality effect your approach to transportation?

Awareness and Information Dissemination

- Where did you first learn of ITI or ITS, as such?
- What journals do you read regularly to stay up to date with developments in your field?
- Which conferences do you attend annually to stay up to date with developments in your field?
- What are the limitations on your travel for meetings?
- Do you look to the exhibits and exhibitors for information on new highway management products?
- Do you belong to any professional organizations or associations that bring you information on new transportation solutions?
- Who else brings new information on advanced technology transportation solutions to you?
- Does your state have an ITS America chapter? Has the group had any effect on your thinking? On the group as a whole? What are your expectations of the chapter? (What benefit do you expect it will provide to you?)

The U.S. DOT ITS Program

- From your point of view, do you think it is possible to accelerate the rate of deployment of the nine Intelligent Transportation Infrastructure elements without adding new funding?
- Do you think that regions like yours are moving toward increased integration of traffic surveillance and management systems?
- What would it take to increase the speed with which this is happening?

STATE DOT (highway) (continued)

Respondent: Designated ITS Program Manager

Focus: How did the position and the program come into being? What is the charge? What are the expected outcomes?

Context

- How did this position and this office come into being?
- What is the source of funding that is supporting this office?
- What are your job responsibilities?
- Where, organizationally, is this office located? Whom do you report to?
- Is there one strong ITS advocate in this state? Who is it?

ITI Projects

- What projects are underway? What are the funding sources?
- Why were these projects developed and not others? What priorities or problems do they respond to?
- What are the expected outcomes at the completion of these projects?
- What were the obstacles to putting the project together and getting it funded?
- Which agencies are party to the projects, and what are their responsibilities?
- How are needed purchases being selected? Which agencies are making what purchases?
- What obstacles are you encountering as the project moves forward?

Awareness and Information Dissemination

- Where did you first learn of ITI or ITS, as such?
- What journals do you read regularly to stay up to date with developments in your field?
- Which conferences do you attend annually to stay up to date with developments in your field?
- What are the limitations on your travel for meetings?
- Do you look to the exhibits and exhibitors for information on new highway management products?
- Do you belong to any professional organizations or associations that bring you information on new transportation solutions?
- Who else brings new information on advanced technology transportation solutions to you?
- Does your state have an ITS America chapter? Has the group had any effect on your thinking? On the group as a whole? What are your expectations of the chapter? (What benefit do you expect it will provide to you?)

The U.S. DOT ITS Program

- From your point of view, do you think it is possible to accelerate the rate of deployment of the nine Intelligent Transportation Infrastructure elements without adding new funding?
- Do you think that regions like yours are moving toward increased integration of traffic surveillance and management systems?
- What would it take to increase the speed with which this is happening?

STATE DOT (highway) (continued)

Respondent: Department manager

Focus: Direct experience assessing problems, and identifying specific systems and technologies; practical insight into managing the state's highways; practical insight into the issues that effect the level of systems integration, or ITI, within the state's authority.

(Note to interviewer: If you haven't been able to get an interview with a more senior manager, use that interview guide. This guide is a slimmed down version for respondents who haven't as broad a purview)

Context

- Please describe your job responsibilities, especially in terms of the decisions that you make?
- What are the most pressing transportation, mobility, and safety problems that your department must address?
- What are the priorities of your chief administrator?

Experience with Advanced Transportation Technologies or ITI Projects

- Do you routinely consider advanced technologies as part of the solution to a transportation problem? (Are they more likely to be considered in response to some problems than others? Which problems and why?)
- What are the largest transportation projects currently under your department? Do they include advanced transportation technologies or ITI? How did the projects come into existence? (probe: Did they solve a particular problem? How was the problem identified? In response to a funding opportunity? Responding to crisis? Did you look to other states' experience with advanced technologies first?)
- Have you performed pilot tests of any new transportation technologies prior to full deployment? (Details of how, why, and outcome).
- Did you purchase and deploy incrementally, or all at once? Why/why not?
- Where you have deployed either advanced technologies or "ITI", were the benefits of the system immediately apparent? Were they what you had expected? (If there are any papers/reports documenting the benefits of their ITI deployment, please ask for a copy.)
- When replacing or upgrading an existing system, do you consider advanced technologies? Do you consider the possibility of integrating the new system with another transportation management or surveillance system in the future?
- Have you seriously considered any ITI-type projects for funding and rejected? Why?
- How do the inter-juridictional and interdepartmental issues effect your consideration of advanced technology transportation systems? (Or ITI?)

Budget, Planning, and Finance

- What issues do you consider when you are developing your annual and capitol budget request?
- How do the restrictions, such as matching funds, that accompany federal funding effect your decision to pursue an advanced technology or ITI project?
- What influence does the availability of federal ITS funds have upon your transportation plans?

Purchasing Procedures

- Whom do you consult to develop advanced technology system specifications and cost estimates?
- Are there any advanced technologies that you can purchase without a complex procurement?

Other Issues

- Would an existing labor agreement effect your ability to deploy and operate any advanced technologies?
- Does your existing workforce understand how to operate and maintain an advanced transportation technology system?
- Is your agency privatizing any part of the transportation system or its management? What effect do you think such a move will have upon how transportation is managed?

Awareness and Information Dissemination

- Where did you first learn of ITI or ITS, as such?

- What journals do you read regularly to stay up to date with developments in your field?
- Which conferences do you attend annually to stay up to date with developments in your field?
- What are the limitations on your travel for meetings?
- Do you look to the exhibits and exhibitors for information on new highway management products?
- Do you belong to any professional organizations or associations that bring you information on new transportation solutions?
- Who else brings new information on advanced technology transportation solutions to you?
- Does your state have an ITS America chapter? Has the group had any effect on your thinking? On the group as a whole? What are your expectations of the chapter? (What benefit do you expect it will provide to you?)

The U.S. DOT ITS Program

- From your point of view, do you think it is possible to accelerate the rate of deployment of the nine Intelligent Transportation Infrastructure elements without adding new funding?
- Do you think that regions like yours are moving toward increased integration of traffic surveillance and management systems?
- What would it take to increase the speed with which this is happening?

STATE DOT (highway) (continued)

Respondent: Project contractor

Focus: What do you buy? Why are you buying it?

Context:

- What is the purpose of your company's contract with the state?
- What is your job?

Contract:

- What were the circumstances such that your company came to hold this contract? (What was the need of the state?)
- Was this a competitive bid or a sole source?
- Who from the state provides direction to you?

Advanced Transportation Technologies and ITI Products and Services

- What systems, products, or services are you purchasing on behalf of the state?
- Why are you selecting the specific products or systems? (Relate the choice of product and its functionality to the needs the contract was developed to address)
- When you are making a purchase selection, do you consider whether it will be possible to integrate the new product with other advanced technologies in the future?

Awareness

- Where did you first learn of ITI or ITS, as such?
- What journals do you read regularly to stay up to date with developments in your field?
- Which conferences do you attend annually to stay up to date with developments in your field?
- What are the limitations on your travel for meetings?
- Do you look to the exhibits and exhibitors for information on new highway management products?
- Do you belong to any professional organizations or associations that bring you information on new transportation solutions?

The U.S. DOT ITS Program

- From your point of view, do you think it is possible to accelerate the rate of deployment of the nine Intelligent Transportation Infrastructure elements without adding new funding?
- Do you think that regions like yours are moving toward increased integration of traffic surveillance and management systems?
- What would it take to increase the speed with which this is happening?

CITY TRANSPORTATION DEPARTMENT

Requested materials: Executive summary of transportation budget, capital and operations

Respondent: Director of Transportation

Focus: Overview of city's issues as they relate to transportation; political influences that decide transportation investments; longer term investment/improvement plans; financing issues.

Context

- Please describe your job responsibilities, especially in terms of the decisions that you make?
- What decision-making or policy-setting bodies effect this organization?
- What are the most pressing non-transportation issues confronting this city?
- What are the most pressing transportation, mobility, and safety problems confronting the city?
- Who is the most influential transportation advocate in the city?
- What are her/his priorities? Does s/he support advanced transportation technology and/or ITI?

Experience with Advanced Transportation Technologies or ITI Projects

- How would you rate the administration's attitude toward adoption of new technology generally? (Has there been an experience with an advanced technology project that has improved/destroyed their interest in advanced technology solutions?)
- Are advanced technologies routinely considered as part of the solution to a transportation problem? (Are they more likely to be considered in response to some problems than others? Which problems and why?)
- What are the largest transportation projects currently underway in this city? Do they include advanced transportation technologies or ITI? How did the projects come into existence? (probe: Did they solve a particular problem? How was the problem identified? In response to a funding opportunity? Responding to crisis? How did you come to be aware that ITI or advanced technology offered an appropriate solution? Did you look to other cities' experience with advanced technologies first?)
- Have you performed pilot tests of any new transportation technologies prior to full deployment? (Details of how, why, and outcome).
- Did you purchase and deploy incrementally, or all at once? Why/why not?
- Are advanced technology or ITI projects treated differently from traditional transportation projects in this city?
- Where you have deployed either advanced technologies or "ITI", were the benefits of the system immediately apparent? Were they what you had expected? (If there are any papers/reports documenting the benefits of their ITI deployment, please ask for a copy.)
- Have any ITI-type projects been seriously considered for funding and rejected? Why?
- How do the inter-juridictional issues between state and city (or other entities in the region) effect your consideration of advanced technology transportation systems? (Or ITI?)

Budget, Planning, and Finance

- What issues do you consider when you are developing the capital and operating budgets?
- What is the review process for a capital budget item? For the annual operating budget?
- What is the lead time required for capital budget planning and budget item inclusion?
- What are the funding sources for city transportation, both operation and capital? Does the source change if the item is advanced technology or ITI?
- How do the restrictions that accompany these funding sources effect your deployment decisions?
- What are the trends in your city transportation budget and how are they affecting what projects you choose to pursue?
- What are the city's political priorities for funding of transportation projects? (Probe to see how an outsider might influence the selection of those priorities)
- What influence does the availability of targeted federal transportation funds with a required match have upon your transportation plans?

Purchasing Procedures

- Are advanced transportation technology purchases treated differently from other purchases?

- Are the purchasing procedures (or procurement requirements) an obstacle to acquiring new technologies?
- Whom do you consult to develop advanced technology system specifications and cost estimates?

Other Issues

- Would an existing labor agreement effect your ability to deploy and operate any advanced technologies?
- Does your existing workforce understand how to operate and maintain an advanced transportation technology system?
- Is your department privatizing any part of the transportation system or its management?
- Does your region's air quality effect your approach to transportation?

Awareness and Information Dissemination

- Where did you first learn of ITI or ITS, as such?
- What journals do you read regularly to stay up to date with developments in your field?
- Which conferences do you attend annually to stay up to date with developments in your field?
- What are the limitations on your travel for meetings?
- Do you look to the exhibits and exhibitors for information on new highway management products?
- Do you belong to any professional organizations or associations that bring you information on new transportation solutions?
- Who else brings new information on advanced technology transportation solutions to you?
- Does your state have an ITS America chapter? Has the group had any effect on your thinking? On the group as a whole? What are your expectations of the chapter? (What benefit do you expect it will provide to you?)

The U.S. DOT ITS Program

- From your point of view, do you think it is possible to accelerate the rate of deployment of the nine Intelligent Transportation Infrastructure elements without adding new funding?
- Do you think that regions like yours are moving toward increased integration of traffic surveillance and management systems?
- What would it take to increase the speed with which this is happening?

CITY TRANSPORTATION DEPARTMENT

Respondent: Manager of Traffic, Operations, or Maintenance

Focus: Specific transportation problems and projects; specific technology integration (ITI) issues; budgeting and purchasing issues.

(Note to interviewer: This is an abbreviated version of the guide for the department manager)

Context

- Please describe your job responsibilities, especially in terms of the decisions that you make?
- What are the most pressing transportation, mobility, and safety problems that your department must address?

Experience with Advanced Transportation Technologies or ITI Projects

- Do you routinely consider advanced technologies as part of the solution to a transportation problem? (Are they more likely to be considered in response to some problems than others? Which problems and why?)
- What are the largest transportation projects currently under your department? Do they include advanced transportation technologies or ITI? How did the projects come into existence? (probe: Did they solve a particular problem? How was the problem identified? In response to a funding opportunity? Responding to crisis? How did you learn about the technology you deployed? Did you look to other cities' experience with advanced technologies first?)
- Have you performed pilot tests of any new transportation technologies prior to full deployment? (Details of how, why, and outcome).
- Did you purchase and deploy incrementally, or all at once? Why/why not?
- Where you have deployed either advanced technologies or "ITI", were the benefits of the system immediately apparent? Were they what you had expected? (If there are any papers/reports documenting the benefits of their ITI deployment, please ask for a copy.)
- When replacing or upgrading an existing system, do you consider advanced technologies? Do you consider the possibility of integrating the new system with another transportation management or surveillance system in the future?
- Have you seriously considered any ITI-type projects for funding and rejected? Why?
- How do the inter-juridictional and interdepartmental issues effect your consideration of advanced technology transportation systems? (Or ITI?)

Budget, Planning, and Finance

- What issues do you consider when you are developing your requests for the capital and operating budgets?
- How do the restrictions, such as matching funds, that accompany federal funding effect your decision to pursue an advanced technology or ITI project?
- What are the trends in your city transportation budget and how are they affecting what projects you choose to pursue?
- What influence does the availability of federal ITS funds have upon your transportation plans?

Purchasing Procedures

- Whom do you consult to develop advanced technology system specifications and cost estimates?
- Are there any advanced technologies that you can purchase without a complex procurement?
- Do you make use of consultants or contractors for purchase, deployment, or management of advanced technology or ITI?

Other Issues

- Would an existing labor agreement effect your ability to deploy and operate any advanced technologies?
- Does your existing workforce understand how to operate and maintain an advanced transportation technology system?
- Is your agency privatizing any part of the transportation system or its management? What effect do you think such a move will have upon how transportation is managed?

Awareness and Information Dissemination

- Where did you first learn of ITI or ITS, as such?
- What journals do you read regularly to stay up to date with developments in your field?
- Which conferences do you attend annually to stay up to date with developments in your field?
- What are the limitations on your travel for meetings?
- Do you look to the exhibits and exhibitors for information on new highway management products?
- Do you belong to any professional organizations or associations that bring you information on new transportation solutions?
- Who else brings new information on advanced technology transportation solutions to you?
- Does your state have an ITS America chapter? Has the group had any effect on your thinking? On the group as a whole? What are your expectations of the chapter? (What benefit do you expect it will provide to you?)

The U.S. DOT ITS Program

- From your point of view, do you think it is possible to accelerate the rate of deployment of the nine Intelligent Transportation Infrastructure elements without adding new funding?
- Do you think that regions like yours are moving toward increased integration of traffic surveillance and management systems?
- What would it take to increase the speed with which this is happening?

TRANSIT AUTHORITY

Requested Material	Executive summary of capital and operating budget, if available; anything that describes the system to a user, such as maps, fare cards, or schedules; any material describing a new advanced technology-enabled program, such as a passenger information phone line based on data from an AVL.
Respondent	General Manager or Operations Manager
Focus	What advanced technologies have they deployed and in response to what stimuli; which funds pay for what enhancements/maintenance; what are the plans for future purchases and why.

Context (may be known in advance; where known, just confirm)

- How many modes of transportation does your authority include?
- How large is the authority? (e.g., miles of track? number of buses?)
- Who uses the transit system? (e.g., their origin and destination, demographics, trip purposes)
- What are the most significant transportation problems facing this region?
- What are the most significant service delivery and management problems facing this authority?
- What events, whether planned (e.g., opening an HOV lane or a Red Sox game) or accidental (snowstorm or downturn in the region's economy), have effected the level of ridership?
- (If multi-modal) Are there unique problems in managing a multi-modal authority vs. a strictly bus-line system?
- Have changing land use patterns (changed locus of job growth and residential development) effected the authority's current service patterns or future plans? (expansion plans?)

Experience with Advanced Transportation Technologies or ITI

- Have you made any recent purchases that included any advanced transportation technologies, or ITI products?
- What problem was the purchase intended to solve?
- Was it a new product purchase (expanding the system) or a replacement purchase (either ongoing maintenance or scheduled replacement)?
- If you are engaged in a planned upgrade of your system, what services are you addressing first and why? What services will you address later and why?
- How have the decisions to purchase these advanced technology been made? Were they initiated by an operations engineer? A board member? The FTA? What was the path that the initial idea followed through the authority as it made it's way toward a final funding decision?
- Have you performed pilot tests of any new transportation technologies prior to full deployment? (Details of how, why, and outcome).
- Did you purchase and deploy incrementally, or all at once? Why/why not?
- Where you have deployed either advanced technologies or "ITI", were the benefits of the system immediately apparent? Were they what you had expected? (If there are any papers/reports documenting the benefits of their ITI deployment, please ask for a copy.)
- Have any ITI-type projects been seriously considered for funding and rejected? Why?
- Do inter-operability issues effect your consideration of advanced technology transportation systems? (Or ITI?)

Budget, Planning, and Finance

- What issues do you consider when you are developing the capital and operating budgets?
- What is the review process for a capital budget item? For the annual operating budget?
- What are your funding sources, both operation and capital? Does the source change if the item is advanced technology or ITI?
- How do restrictions (or opportunities) that accompany these funding sources effect deployment decisions?
- What are the trends in your budget and how are they affecting what projects you choose to pursue?
- What are the authority's political priorities for funding of transportation projects? (Probe to see how an outsider might influence the selection of those priorities.)

Purchasing Procedures

- Are advanced transportation technology purchases treated differently from other purchases?
- Are the purchasing procedures (or procurement requirements) an obstacle to acquiring new technologies?
- Whom do you consult to develop advanced technology system specifications and cost estimates?

Other Issues

- Has compliance with ADA, EPA, and other federally mandated requirements effected ITS deployment?
- Would an existing labor agreement effect your ability to deploy and operate any advanced technologies?
- Does your existing workforce understand how to operate and maintain an advanced transportation technology system?
- Is your agency privatizing any part of the transportation system or its management? (Probe effect on integration of ITI applications.)
- Does your region's air quality effect your approach to transportation?

Awareness and Information Dissemination

- Where did you first learn of ITI or ITS, as such?
- What journals do you read regularly to stay up to date with developments in your field?
- Which conferences do you attend annually to stay up to date with developments in your field?
- What are the limitations on your travel for meetings? (Your staff's travel?)
- Do you look to the exhibits and exhibitors for information on new highway management products? Have you ever referred back to a brochure from a conference for further information toward a possible purchase?
- Do you belong to any professional organizations or associations that bring you information on new transportation solutions?
- Who else brings new information on advanced technology transportation solutions to you?
- Does your state have an ITS America chapter? Has the group had any effect on your thinking? On the group as a whole? What are your expectations of the chapter? (What benefit do you expect it will provide to you?)

The U.S. DOT ITS Program

- From your point of view, do you think it is possible to accelerate the rate of deployment of the transit ITI elements without adding new funding?
- Do you think that authorities like yours are moving toward increased integration of management and payment systems? Increased inter-juridictional systems integration?
- What would it take to increase the speed with which this is happening? (Probe whether U.S. DOT could do anything to increase speed)

PORT AUTHORITY

Requested Material Executive summary of capital and operating budget, if available; anything that describes the system to a user, such as maps, fare cards, or schedules; any material describing a new advanced technology-enabled program.

Respondent General Manager or Operations Manager

Focus What advanced technologies have they deployed and in response to what stimuli; which funds pay for what enhancements/maintenance; what are the plans for future purchases and why; do they coordinate their programs with any other transportation agencies (such as for ETC?)

Context

- How many modes of transportation does your authority include?
- How large is the authority? (e.g., any type of measure that seems relevant: tonnage through harbor, deliveries per day) How does the size of your authority rank against others of its type in the US?
- Who are your "customers"? (e.g., their business with the port, their origin and destination, demographics, trip purposes)
- What are the most significant problems facing this port? (Probe financing, traffic congestion, management, vehicle/shipment tracking)
- What effects the level of "traffic" through this port?
- (If multi-modal) Are there unique problems in managing a multi-modal port authority?
- Have changing land use patterns around the port or changes in the regional business profile effected the authority's current service patterns or future plans? (expansion plans?)
- What is your governance? How many members? How are they appointed?

Experience with Advanced Transportation Technologies or ITI

(Please note: Ports serve many different constituencies and manage many transportation issues, including freight shipping, tourism, traffic congestion, taxis, air traffic, water traffic, buses. If a respondent is focusing on only one part of the port's business operations, probe some other areas.)

- Have you made any recent purchases that included any advanced transportation technologies, or ITI products? (If respondent provides a list, focus the next question on the most ITI-like item of the list)
- What problem was the purchase intended to solve?
- Was it a new product purchase (expanding the system) or a replacement purchase (either ongoing maintenance or scheduled replacement)?
- If you are engaged in a planned upgrade of your system, what services are you addressing first and why? What services will you address later and why?
- How have the decisions to purchase these advanced technology been made? Were they initiated by an operations engineer? A board member? What was the path that the initial idea followed through the authority as it made it's way toward a final funding decision?
- Have you performed pilot tests of any new transportation technologies prior to full deployment? (Details of how, why, and outcome).
- Did you purchase and deploy incrementally, or all at once? Why/why not?
- Where you have deployed either advanced technologies or "ITI", were the benefits of the system immediately apparent? Were they what you had expected? (If there are any papers/reports documenting the benefits of their ITI deployment, please ask for a copy.)

Interoperability and Integration

- Do inter-operability issues effect your consideration of advanced technology transportation systems? (Or ITI?) (Interoperability with customers such as shippers and with other transportation agencies)
- Have you invested in any short-range communications applications, such as infra-red or microwave? Have you any plans to do so in the next 5 years? Are many of your shippers using electronic tracking and information applications?

Budget, Planning, and Finance

- What issues do you consider when you are developing the capital and operating budgets?

- What is the review process for a capital budget item? For the annual operating budget?
- What are your funding sources, both operation and capital? Does the source change if the item is advanced technology or ITI?
- How do the restrictions (or opportunities) that accompany these funding sources effect your deployment decisions?
- What are the trends in your budget and how are they affecting what projects you choose to pursue?

Purchasing Procedures

- Are advanced transportation technology purchases treated differently from other purchases?
- Are the purchasing procedures (or procurement requirements) an obstacle to acquiring new technologies?
- Whom do you consult to develop advanced technology system specifications and cost estimates?

Other Issues

- Has compliance with ADA, EPA, and other federally mandated requirements effected ITS deployment?
- Would an existing labor agreement effect your ability to deploy and operate any advanced technologies?
- Does your existing workforce understand how to operate and maintain an advanced transportation technology system?
- Is your agency privatizing any part of the transportation system or its management? (Will this accelerate deployment of advanced technologies to improve management?)

Awareness and Information Dissemination

- Where did you first learn of ITI or ITS, as such?
- What journals do you read regularly to stay up to date with developments in your field?
- Which conferences do you attend annually to stay up to date with developments in your field?
- What are the limitations on your travel for meetings? (Your staff's travel?)
- Do you look to the exhibits and exhibitors for information on new highway management products? Have you ever referred back to a brochure from a conference for further information toward a possible purchase?
- Do you belong to any professional organizations or associations that bring you information on new transportation solutions?
- Who else brings new information on advanced technology transportation solutions to you?
- Does your state have an ITS America chapter? Has the group had any effect on your thinking? On the group as a whole? What are your expectations of the chapter? (What benefit do you expect it will provide to you?)

The U.S. DOT ITS Program

- From your point of view, do you think it is possible to accelerate the rate of deployment of the transit ITI elements without adding new funding?
- Do you think that authorities like yours are moving toward increased integration of management and payment systems? Increased inter-juridictional systems integration?
- What would it take to increase the speed with which this is happening? (Probe whether U.S. DOT could do anything to increase speed)

METRIC/ENGLISH CONVERSION FACTORS

ENGLISH TO METRIC

LENGTH (APPROXIMATE)

1 inch (in) = 2.5 centimeters (cm)
1 foot (ft) = 30 centimeters (cm)
1 yard (yd) = 0.9 meter (m)
1 mile (mi) = 1.6 kilometers (km)

AREA (APPROXIMATE)

1 square inch (sq in, in^2) = 6.5 square centimeters (cm^2)
1 square foot (sq ft, ft^2) = 0.09 square meter (m^2)
1 square yard (sq yd, yd^2) = 0.8 square meter (m^2)
1 square mile (sq mi, mi^2) = 2.6 square kilometers (km^2)
1 acre = 0.4 hectare (ha) = 4,000 square meters (m^2)

MASS - WEIGHT (APPROXIMATE)

1 ounce (oz) = 28 grams (gm)
1 pound (lb) = .45 kilogram (kg)
1 short ton = 2,000 pounds (lb) = 0.9 tonne (t)

VOLUME (APPROXIMATE)

1 teaspoon (tsp) = 5 milliliters (ml)
1 tablespoon (tbsp) = 15 milliliters (ml)
1 fluid ounce (fl oz) = 30 milliliters (ml)
1 cup (c) = 0.24 liter (l)
1 pint (pt) = 0.47 liter (l)
1 quart (qt) = 0.96 liter (l)
1 gallon (gal) = 3.8 liters (l)
1 cubic foot (cu ft, ft^3) = 0.03 cubic meter (m^3)
1 cubic yard (cu yd, yd^3) = 0.76 cubic meter (m^3)

TEMPERATURE (EXACT)

$°C=5/9(°F - 32)$

METRIC TO ENGLISH

LENGTH (APPROXIMATE)

1 millimeter (mm) = 0.04 inch (in)
1 centimeter (cm) = 0.4 inch (in)
1 meter (m) = 3.3 feet (ft)
1 meter (m) = 1.1 yards (yd)
1 kilometer (km) = 0.6 mile (mi)

AREA (APPROXIMATE)

1 square centimeter (cm^2) = 0.16 square inch (sq in, in^2)
1 square meter (m^2) = 1.2 square yards (sq yd, yd^2)
1 square kilometer (km^2) = 0.4 square mile (sq mi, mi^2)
10,000 square meters (m^2) = 1 hectare (ha) = 2.5 acres

MASS - WEIGHT (APPROXIMATE)

1 gram (gm) = 0.036 ounce (oz)
1 kilogram (kg) = 2.2 pounds (lb)
1 tonne (t) = 1,000 kilograms (kg) = 1.1 short tons

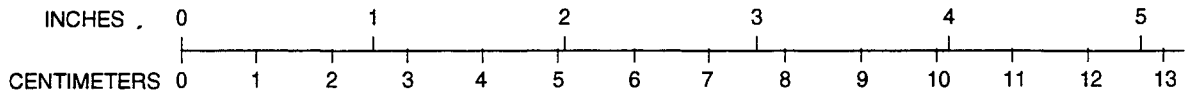
VOLUME (APPROXIMATE)

1 milliliter (ml) = 0.03 fluid ounce (fl oz)
1 liter (l) = 2.1 pints (pt)
1 liter (l) = 1.06 quarts (qt)
1 liter (l) = 0.26 gallon (gal)
1 cubic meter (m^3) = 36 cubic feet (cu ft, ft^3)
1 cubic meter (m^3) = 1.3 cubic yards (cu yd, yd^3)

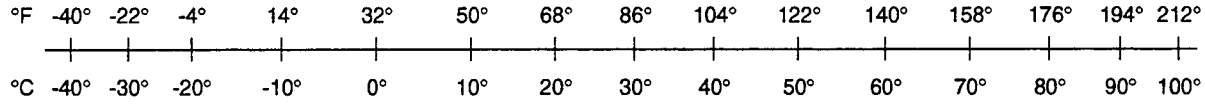
TEMPERATURE (EXACT)

$°F=9/5(°C) + 32$

QUICK INCH-CENTIMETER LENGTH CONVERSION



QUICK FAHRENHEIT-CELSIUS TEMPERATURE CONVERSION



For more exact and or other conversion factors, see NIST Miscellaneous Publication 286, Units of Weights and Measures. Price $2.50. SD Catalog No. C13 10286.

Updated 8/1/96