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Author

Deakin, Elizabeth

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**Mainstreaming Intelligent Transportation
Systems: Findings from a Survey of
California Leaders**

Elizabeth Deakin

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Berkeley, CA 94720

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**University of California
Transportation Center**

2614 Dwight Way
Berkeley, CA 94704-1782
Tel: 510/642-4749
Fax: 510/643-5456

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Chapter 17

MAINSTREAMING INTELLIGENT TRANSPORTATION SYSTEMS

Findings from a Survey of California Leaders

Elizabeth Deakin

Department of City and Regional Planning/UC Transportation Research Center

This paper investigates factors affecting ITS implementation as a "mainstream" transportation planning activity. It draws upon interviews with 51 leaders from a cross-section of jurisdictions and agencies in California. The interviews revealed that the vast majority of elected officials and senior staff are familiar with ITS. However, they are irritated by ITS literature, which they view as heavily promotional and full of jargon. Many believe that ITS is being implemented fairly quickly overall and that ITS elements that are not proceeding well suffer from institutional problems or market weaknesses. Respondents do not see a problem in fitting ITS projects into mainstream transportation planning processes, but complain of a lack of good information on ITS benefits and costs. Many are concerned that ITS evaluations have been less than arm's-length, and focus too heavily on system benefits rather than traveler benefits. Many believe that the private sector should be left to implement certain ITS applications, but they also think that earmarked funds for ITS applications would speed implementation of other measures. Respondents suggested that the state DOT should lead by example, implementing ready-to-go technologies on its own facilities and within its own agency. Stronger partnerships with local government and other state agencies, developing mutually beneficial, multipurpose applications, were also recommended. Finally, respondents urged that future ITS work should pay more attention to legal and institutional issues and provide a clearer sense of "next steps." The findings should be of use to state and local organizations with an interest in encouraging ITS implementation.

1. INTRODUCTION

Intelligent Transportation Systems (ITS) are the subject of considerable research and development across the U.S. and in other developed countries. Millions of dollars have been invested in technologies to improve traffic operations, increase safety and security, improve transit reliability, lower public and private costs of fare and toll collection, and produce a variety of other social, economic, and environmental improvements in transportation systems and services. (1)

The California Department of Transportation (Caltrans) has been a leader in investing in ITS. For the past 17 years, Caltrans has sponsored both research and demonstration projects ranging from adaptive traffic control and mobile surveillance to real-time traveler information systems. (2) Like the federal government and many other states, Caltrans is now interested in commercializing ITS advances, where appropriate, and in "mainstreaming" ITS as part of the transportation planning process—that is, planning and implementing ITS not as a separate R&D program but as a regularly considered, important alternative in planning, designing, and managing transportation systems.

To date, however, ITS implementation has not been as routine as Caltrans would like. ISTEA and TEA-21 gave metropolitan planning organizations (MPOs) significant responsibilities for project development and selection across the country; California law, some of it predating ISTEA, gave even greater decision authority to the MPOs and to county transportation agencies. (3) In addition, significant responsibility for state projects has been delegated to Caltrans' district offices. Hence, project development and programming require collaboration among multiple offices and levels of government. Inclusion of ITS technologies and approaches depends, in turn, on staff and decision-makers amongst all of the involved organizations understanding what ITS can contribute and believing that it is worthwhile.

Several of the MPOs in California have been active in promoting various ITS technologies, and several California cities likewise have been early implementers. (See, e.g., 4, 5, 6, 7) Overall, however, ITS implementation has been spotty, and slower than the Caltrans ITS sponsors would have liked. In addition, ITS elements have been added to certain projects only to be dropped when funding ran short, or have been given relatively low priority for implementation.

This paper investigates some of the factors affecting ITS implementation by exploring the perspectives on these new technologies with California decision-makers in state, regional, and local agencies, as well as with key opinion leaders in the private and nonprofit sectors. The paper summarizes the methodology used to conduct the research, presents the findings, and distills out the key points and suggestions for future directions. Better understanding the issues ITS raises among these decision-makers is a first step toward developing a more robust California strategy for mainstreaming ITS. The

findings also should be of use to other state and local organizations with an interest in ITS implementation, revealing barriers to ITS as well as opportunities for enhancing ITS acceptance.

2. RESEARCH METHODOLOGY

The research project began with a detailed literature review of ITS technologies and functions, their benefits and costs, and implementation experiences to date. Background papers were prepared for a number of key technologies and applications, and were reviewed by an advisory committee established by Caltrans. (The background papers are posted at www.uctc.net/mainstream.) Two meetings of the advisory committee, one held at the start of the project and a second held after the background summaries were prepared, were organized to discuss ITS implementation issue and review and expand a set of hypotheses on possible reasons for ITS's mixed reception (Table 1.).

Interviews were then scheduled with decision-makers, senior staff, and opinion leaders throughout the state. In the interviews, the respondents were asked to discuss their familiarity with ITS in its various forms, what they think about ITS's usefulness in addressing transportation problems, and the pros and cons of ITS applications as they see them. They also were asked for their perspectives on the implementation of ITS technologies, and whether they had particular interest in or problems with them. Respondents were asked for suggestions on what would make implementation more likely or have it occur at a faster rate than at present. Finally, respondents were asked whether they were aware of any examples of ITS implementation that they thought to be particularly noteworthy, either as successes or as failures. Respondents were also given the opportunity to raise additional topics and issues if they so chose.

The objectives of the interviews were as follows:

- To assess respondents' knowledge of ITS as well as their sources of information;
- To obtain respondents' views on near-term applications as well as longer-term possibilities;
- To explore respondents' views on ITS benefits and costs;
- To discuss implementation, including whether respondents felt it was faster or slower than expected;
- To explore possible reasons for slow implementation, including understanding of the opportunities, fit with the planning and funding processes, level of support, concerns about particular proposals, or other factors that the respondents may have identified; and
- To identify cases that respondents see as particular successes or particular failures. TRB 2003 Annual Meeting CD-ROM Original paper submittal—not revised by author.

Table 1 Possible Reasons for Slow Implementation of Intelligent Transportation Systems (Hypotheses)

Information	Fit with Existing Planning and Funding Processes	Impacts
Many of the public officials and staff members responsible for transportation plans and programs are only vaguely familiar with ITS technologies.	Commonly available planning and evaluation tools do not address ITS very well if at all, so analysts don't know how to incorporate ITS options into their evaluations.	Some ITS technology suggest central control over facilities and services that currently are controlled separately, raising political and institutional issues that have not been addressed.
ITS research and development has been carried out by technology specialists who are not usually involved in policy development, and do not know how to effectively communicate their findings to decision-makers.	Current planning regulations, e.g., for air quality plans or CEQA mitigation, do not address ITS or are unclear about how it figures in.	Insufficient attention has been paid to consumer conveniences, environmental benefits, and neighborhood enhancements that ITS could provide, e.g., multi-purpose transportation and parking cards, emissions monitoring devices, neighborhood permit parking cards.
There is relatively little information on the costs and benefits of the various ITS options.	Few regional or local agencies have developed staff positions with specific ITS responsibilities.	Concerns persist that ITS technologies for autos and highways enhance auto use and in so doing have adverse impacts on transit use, lead to more emissions and energy use, further support sprawl, and harm the central city and older suburbs.
Planners and analysts need training on ITS, but it is not readily available either in university curricula or in continuing education and training courses.	Prior commitments represented by long-range plans and multi-year programs crowd out ITS options.	
The image of ITS that many public officials have is fully automated guideways and vehicles, options that are seen as too far in the future to be worth analyzing as part of ongoing planning efforts.	It's not clear what funds a region or locality could or should use for ITS projects.	
Public awareness of near-term ITS options is low.		

Each interview was conducted in accordance with a protocol that included a set of open-ended questions in the form of an interview guide.¹ Respondents were all senior state, regional, and local officials (elected officials, elected and appointed board members, senior agency staff) and leaders of other key interest groups including environmental groups, automobile clubs, and business leaders. All were from the State of California. The respondents were identified through the author's own knowledge as well as through publicly available sources such as the Internet and government directories. The intent was to obtain a reasonably representative cross-section of information and opinion, rather than to poll a fully random sample of officials and interest group representatives.

For public officials, potential respondents were identified by first selecting their political jurisdiction or agency and then identifying the persons holding particular titles (council member, supervisor, board member, department head, etc.) The initial sample of local governments was selected based on size of jurisdiction (50,000–250,000; 250,000 and higher) and location of jurisdiction (region of state, urban, suburban, rural), to obtain a sample that reflects the state's composition and diversity.

Regional agencies were selected to include both the large urban areas and the smaller ones. Their managers then were selected for a possible interview based on their title and position. A similar process was used for state agencies, where staff members from transportation, energy, and air quality agencies were selected for possible interviews.

Interest groups interested in ITS issues were identified by reviewing the literature and seeing what groups had participated in ITS forums or published articles or reports on ITS. From this list, a set of organizations was identified. Web sites and other published sources were used to identify individuals for possible interviews.

In total, 12 elected officials, 25 planning and engineering staff members from local (city and county) jurisdictions, 10 regional agency staff, 10 state staff members, and 10 members of interest groups were identified for possible interviews. All of these individuals were asked by letter, fax, and/or phone to participate in the interviews. Of the 67 persons contacted, 51 agreed to an interview. Nine were elected officials, 10 were planning staff, 10 were engineering staff, 7 were regional agency staff, 6 were state agency staff, and 10 were representatives of environmental, business, and auto or trucking interest groups. The other 16 persons initially contacted either did not respond to three separate requests (11, including three elected officials, three regional agency staff members, two state agency staff members, two local engineers, and one county planner), or refused to be interviewed (five, including two state agency staff members and two local engineers who stated that they were too busy to be interviewed, and one planner who stated that he was not interested in the topic.) Table 2 summarizes the sample statistics.

Interviews were conducted both in person, 24, and by telephone, 27. All interviews took place at the time and location or manner preferred by the

subject. No interviews were taped, although the author took detailed notes including direct quotations during the interviews. Because there was some potential risk that in the course of an interview a respondent might make statements about individuals, projects, or agencies that if revealed could be embarrassing, respondents were promised confidentiality and were promised that their identity would not be revealed.

The interviews ranged in length from 35 to 90 minutes, with most interviews taking about one hour.

Table 2. Interview Sample

	Elected Officials	Local Gov't Planners	Local Gov't Engineers	Regional Agency Staff	State Agency Staff	Interest Groups	Total
Initial Sample	12	12	13	10	10	10	67
Interviewed	9	10	9	7	6	10	51
Not Interviewed		3	2	4	3	4	16
Too Busy			2		2		4
No Interest	3	1	2	3	2		11
No Response	3	1	2	3	2		11
Response Rate	75%	83%	69%	70%	60%	100%	76%

3. FINDINGS INFORMATION ABOUT INTELLIGENT TRANSPORTATION SYSTEMS

The interviews began with a discussion of the respondent's understanding of Intelligent Transportation Systems. Contrary to initial hypotheses that many would be only vaguely familiar with ITS, all the respondents said that they were either reasonably familiar with these new programs and technologies ("as familiar as I am with standard transportation programs and technologies," as one elected official put it) or were very familiar with them. The programs and technologies that came to mind first when thinking of ITS differed by the agency and title of the respondent. Elected officials mentioned automated highways, smart cards for tolls and transit payments, and advanced traffic management systems. Planners mentioned advanced traffic signal equipment, bus rapid transit, toll tags, and smart cards. Engineers and regional agency staff were more comprehensive, typically listing seven or eight categories of ITS using nomenclature and abbreviations from the ITS National Architecture. (8)

All of the local engineers and state and regional agency staff had learned of ITS as part of their professional programs; some had also studied ITS as part of their graduate education. (Education in ITS was reported primarily by individuals under 40, although four middle-aged respondents said they had first learned of these technologies in the 1970s and saw the current programs as "the latest round" of work on new technologies.) In contrast, local planners had most commonly learned about ITS from their engineering or regional agency counterparts, by participating in project reviews for local and regional agencies, where proposals for ITS occasionally came up, or through publications, especially Transportation Research Board papers.

Elected officials, in contrast, said they had learned about ITS mostly from news media (news articles, professional press) and to a lesser extent, from presentations or memos from staff. They all felt that if they wanted more information they would be able to get it from either their own staff or regional agency staff. One pointed out that the elected officials who serve on transportation agency boards get briefings and information packets that get them up to speed on transportation options, although he also said that these packets tend to lack details on markets and costs.

Based on their knowledge of the options, almost all of the respondents listed private sector freight operations, using logistics, global positioning systems, and telecommunications for real-time dispatching and tracking as the most important short-term application of ITS. Advanced traffic signal systems timing and intersection controls were the second most commonly mentioned as important short-term application of new technologies. The majority also listed automated toll collection, smart cards for transit, consumer route-finding systems (on the Internet, built into some vehicles, or for handheld computers), and GPS and other systems for tracking buses and adjusting schedules.

State and regional staffers and local engineers also mentioned traffic operations centers, ramp metering, weigh in motion, and automated commercial vehicle safety checks, and but no one else did.

For long-term applications, most respondents believed there would be substantial improvements in the technologies that they mentioned for short-term application. For example, 35 of the respondents felt that advanced signal systems would become ubiquitous and would be better integrated with transit operations. Another 31 of the respondents expressed the hope that eventually multi-purpose smart cards would be available. Several expressed frustration at how long it was taking for smart cards to be implemented in the U.S., noting that they were ahead of the U.S. in several countries overseas. As one elected official put it, "It's a shame that we are getting different technologies for tolls and for transit. Of course, it took 10 years to get either of them going here, which itself is shameful. It probably would have taken twice as long if they had tried to make the same thing work for tolls and transit. Eventually, though, I think the public is going to demand that they have a single smart card that can pay for parking, tolls, and transit. Why not?"

Fifteen of the respondents mentioned fully automated guideways and vehicles as the options that they believed ITS experts expected to see in the future, though several also noted that federal funding for these programs had been cut. Most of the respondents were skeptical about these strategies, commenting that they did not personally think these options would be around for a very long time, except perhaps in limited applications like airport transit systems. Four questioned whether automated guideways would really work, saying that they had not heard a clear explanation of how the added traffic carried on such facilities would be accommodated getting on or off locally owned streets and arterials.

Asked how informed they thought the public was concerning ITS, respondents were divided. Most elected officials thought the public had pretty good awareness of available and upcoming options, including toll tags, smart cards, GPS route-finding systems, traffic advisories available on computer, commercial vehicle operations management, and so forth. Planners and interest groups representatives also agreed that many members of the public were interested in technology and wanted to try such things as smart cards. State and regional officials, in contrast, felt that citizens were not very knowledgeable about ITS. Pressed for examples, several mentioned a lack of public interest in traffic management systems as their reason for believing the public is ill-informed about ITS.

A number of the respondents, and in particular elected officials, interest group representatives, and planners, commented on the quality of the information available on ITS. They characterized most of the available information as "too technical" and "way too long". Many also thought the literature was too promotional. As one planner put it, "they list a large number of benefits but it is hard to find cost information, or any sense of 'compared to what'?" Twenty of the respondents specifically commented on the lack of believable, dispassionate evaluation of the ITS options.

While most of the respondents felt that they had a reasonably good understanding of ITS, most also complained about the use of jargon to describe the options. As one elected official put it, "The technical people continually use initials to describe their work. They don't seem to understand that when they do this with a general audience, it is anesthetizing. They should be instructed to speak and write in plain English. These are not difficult concepts, and they shoot themselves in the foot by continually using these abbreviations." A regional agency official commented, "The term 'architecture' is proving to be a mistake. We are finding that people outside the group discussing it think we are talking about building things, structures. It should have been called guidelines or framework, not as glorious sounding, but more informative." An interest group representative said, "It's alphabet soup. It doesn't communicate."

Ten of the respondents, including six elected officials, felt that there was particularly poor information about public investment strategies for ITS—either what needed to be done in the public sector or what it would cost.

4. FIT WITH PLANNING AND FUNDING PROCESSES

Initial hypotheses suggested that a poor fit with existing planning and funding processes might explain slow ITS implementation. The interviews provided mixed support for these hypotheses. About half the respondents challenged the basic premise of slow implementation, arguing that many ITS applications have taken off in the market and are well on their way to being the norm, or were already widely implemented in California or elsewhere. The others felt that implementation was hampered mostly by a lack of clear priorities for ITS investment and by a lack of funding dedicated to ITS.

Respondents who argued that ITS was, in fact, being implemented quickly pointed to the widespread use of information technologies in freight applications, consumer adoption of GPS devices and computer-based route information, automated toll collection, advanced traffic signal systems, transit smart cards, transit priority systems, and transit monitoring systems. They agreed, however, that institutional conflicts had gotten in the way in some cases. "California has put a lot of money into technology and system development, but we haven't been particularly skilled at handling the institutional issues. We were slow to get automated toll collection, way behind New York and the New England states. Labor issues and contracting problems seem to get in our way. We have spent years on an integrated fare collection system in the Bay Area but have not really faced up to the underlying problem, which is how to allocate costs and revenues, and that is a problem because underlying that is insufficient revenues for transit." Respondents who argued that ITS was not being implemented very quickly commented primarily on traffic operations centers and traffic management systems. Most of these respondents were state and local officials with responsibility for highways, and auto and trucking interest group representatives. Their diagnoses of the problem were not, however, identical.

State officials felt that the problem was largely that metropolitan regions did not give these ITS projects priority. With few exceptions, they felt that MPOs, both the elected officials on the board and staff members, lacked interest in the ITS options and were more comfortable with and interested in traditional capital projects. Two exceptions specifically noted were the Bay Area, where MTC had designated staff and funding for ITS, and the San Joaquin Valley, where an inter-jurisdictional traffic management center had been put together.

Local government officials, in contrast, thought the problem depended on the application. For traffic signal systems, they felt the issue was simply one of funding. Five of the respondents pointed to the state's Fuel Efficient Traffic Signal Timing Program (FETSIM) of the 1980s as a good example of what can be done if a program is established and funded. Under the FETSIM program, almost all of the signal systems in the state were timed with modern methods, and traffic engineers and their consultants were trained in state of

the art signal timing and learned about advanced signal equipment. Many used that knowledge even after the program ended. (9) These respondents felt that a new signal program would be welcomed. For ramp meters and traffic operations centers, the locals saw the problem as institutional and political rather than technical or financial. "Sure, we know how to do it, we can show that it would help. We already have a lot of ramp meters working. Where we don't have them are in places where the locals don't trust the state not to divert too much traffic to local streets. And a lot of times they have had experiences to point to that make them not trust the state. That's also why some locals are not so enthusiastic about a joint traffic operations center. It's a question of control, and trust."

Asked whether a lack of planning and evaluation tools was a barrier, the respondents who had an opinion unanimously disagreed. (Twelve of the respondents did not feel sufficiently knowledgeable about available methods to comment on this topic.) The respondents felt that there were plenty of methods that could be used to evaluate ITS options, and what was missing was not planning tools but basic information on costs and benefits. "If we had information that our policy board would accept, we could put it into our evaluations," said one regional agency official in a comment typical of those made on this topic. "We don't really need any more analysis methods, and we certainly don't need any requirements to use them."

Ten of the respondents commented that rather than invest in new analysis tools, they would prefer demonstration projects. Said one, "Elected officials are more easily convinced by a project that works than by a technical report or a modeling run. Show them what can be done and they are willing to listen and give it a try if it makes sense." Others added that case studies that had carefully documented benefits, costs, public reaction, etc. were very helpful, especially when written for a non-technical audience.

At the same time, many of the respondents noted that there was not enough transportation funding to go around, and even projects with considerable popular support and strong technical merit had to wait for funding. Prior commitments represented by long-range plans and multi-year programs took precedence, and crowd out ITS options. Local officials and interest group members added that projects like traffic calming and sidewalk installation and repair had plenty of public support but couldn't compete with large regional projects; it took federal legislation to make funding available for these measures, and even then they have a hard time competing unless the MPO has set aside funds for them. In this context, 15 of the respondents advocated earmarking funds for ITS, but a larger number (28) commented that giving ITS special precedence seemed unfair, especially after so many years of heavy funding. "ITS has gotten a lot of research and development money over the last 10 or 15 years," one respondent said. "It's time to start showing what all that money was good for. If these are good ideas, they should be able to compete on their own, and not need further special treatment."

Several respondents argued that Caltrans should be spending the money under its control for ITS if it believes these are high-priority investments. "Lead by example," one respondent put it. Another put it, "Caltrans has been funding the research. If it has produced good products, Caltrans should get on with it and implement them." Variable message signs, weather advisories, automated tolls, mainline flow metering as well as ramp metering, freeway patrol services tied to detector and camera data, telecommuting, and teleconferencing for employees were some of the measures that respondents mentioned as item that Caltrans could implement on its own.

Twenty-six of the respondents felt that it was not so much funding availability per se that was limiting ITS implementation, but rather the lack of a clear picture of what would be gotten for the money. Several respondents used traveler information systems as an example. "We already have (radio traffic advisories)," one respondent argued. "They tell you what has been reported, whether it is one person who phoned in or several, they check the information with the CHP and Caltrans and tell you what they have to say ... That is pretty good. People already can get a cheap add-on for their (hand-held computer) that will give them alternate routes, if they don't know them already, and believe me, commuters figure out every alternate route in the first two weeks on the job. If we are going to keep spending public money on traveler information, somebody is going to have to make it clear what the government is going to give you that we don't already have from the private sector." Another respondent, voicing similar sentiments, added, "It is not just that we could make it better. You have to show that the added expenditures make sense at the margin, that it will be enough better that I should be willing to pay for it." Several expressed concerns that evaluations were being performed by ITS advocates; as one put it, "People who spend their days promoting new systems are not the right people to be evaluating them"

Speaking of funding and priorities, 20 of the 51 respondents suggested that at least some ITS technologies should now be left to the private sector to further develop and market. One respondent put it this way: "There are a lot of projects that have positive benefit-cost ratios. The issue is how these beneficial projects stack up against each other. And when we are looking at a field where the private sector is already active, providing us with a range of products, free to pretty expensive, I want to see some evidence that a public expenditure will produce a worthwhile added benefit. Another respondent said, "I don't want to just fund some ITS project just because there is a 'not invented here' attitude among the ITS staff. If the public sector has done a lot of work but now the private sector has moved in and taken off with an idea, great. Declare it a victory and move on to something else."

5. IMPACTS OF ITS

A third set of hypotheses considered ITS impacts as potential barriers to implementation. The interview respondents largely supported these hypotheses.

Most respondents agreed that the ITS technologies that suggest central control over facilities and services that currently are managed by separately raise political and institutional issues that have not been addressed adequately. As noted earlier, several respondents felt that disinterest in automated guideways and slow implementation of traffic operations centers and ramp meters partially reflected this concern. Along the same lines, most respondents felt that there was lingering concern that ITS programs for highways could encourage more auto use and in so doing have adverse impacts on transit use, lead to more emissions and energy use, further support sprawl, and harm the central city and older suburbs. To some extent, transit ITS projects such as Bus Rapid Transit are dispelling this concern, providing an example of how ITS can help transit, inner cities, and older suburbs.

However, most respondents felt that the biggest issues concerning ITS impacts had to do with user-side benefits and costs. All of the elected officials, all of the planners, all of the interest group representatives, all of the regional agency officials, and about half of the local engineers and state agency representatives thought that far too little attention had been paid to the consumer conveniences, environmental benefits, and neighborhood enhancements that ITS could provide.

"Why aren't we giving the consumer multi-purpose transportation and parking cards? Why aren't we even trying a demonstration project that allows a toll tag to pay for parking in major facilities?," asked one respondent. "I can only conclude that the interest in toll tags is mostly to make the facility operate better, not really to help the consumer out.... If we cared about the consumer we would get moving."

Coordination with other state programs also could be improved, as several respondents noted. One suggested linking traffic and environmental data: "...we could add remote sensing equipment (emissions monitoring devices) and combine that with vehicle identification, speed and flow measurements, and so on, and greatly improve our air programs. But there is a lot of turf here and hardly any of the ITS (work) builds this sort of environmental linkages."

Several local respondents suggested ways that ITS technologies could be more useful to local governments:

"We should have a demonstration program for a single transportation pass that pays for transit and parking and maybe taxis, too."

"It would be great if we had smart cards that also could serve as neighborhood permit parking cards so that we could read them electronically just by driving by the vehicles. We could enforce these programs more easily."

"There should be some way to use all this new technology to automate origin destination surveys."

"I can't get a straight answer on how many commute trips never use the freeway system at all, and for those that do, how many miles they spend on freeways versus arterials versus local streets. Couldn't all these detectorized freeways produce that information?"

"Couldn't we use these new technologies to catch speeders and other bad drivers? Couldn't part of the ITS research program be to figure out how to do that institutionally if it is legal issues that are in the way?"

These respondents suggested that ITS projects would be implemented faster "if it were a two-way street—the state should be interested in what would help us out, not just ask us to help them manage their freeways better."

6. OTHER ISSUES

Respondents were asked whether there were other issues that they would like to raise. Two issues were suggested by a number of respondents.

First, over half of the respondents commented that there was a need for more work on the institutional and legal aspects of ITS proposals. "There is a lot of good technical work but we are continually getting hung up on institutional conflicts," as one respondent put it. "Legal issues, like how to develop an enforceable agreement on ramp metering and arterial signal timing that protects local interests, could use attention," another added.

Second, 20 respondents suggested the need for both state and local strategies for ITS. One elected official's comments summarize the overall sense of frustration with existing programs and the need for direction: "I don't get any sense of priorities from the materials I see," said the official. "Some sense of the relative importance of the various strategies is needed."

7. SUMMARY AND CONCLUSIONS

Open-ended interviews of 51 leaders from a cross-section of jurisdictions and agencies have been used to explore implementation issues associated with Intelligent Transportation Systems. The interviews reveal several important points and offer direction for future work.

First, contrary to our initial expectations, the vast majority of elected officials and senior staff feel reasonably familiar with ITS. However, they are irritated by ITS literature, which they view as heavily promotional and/or technical, and full of jargon.

Second, and also contrary to expectations, there is considerable sentiment that ITS is being implemented fairly quickly, and that the ITS elements that are not proceeding quickly suffer from institutional problems or lack markets.

Third, respondents do not see a problem in fitting ITS projects into the planning process; rather, they see a lack of good information on benefits and

costs of various options. Further, in the most common view, benefits of various ITS proposals not only must be weighed against costs, but the proposals also must be weighed against alternative projects and other currently available approaches to the same issue.

Fourth, respondents are concerned that ITS evaluations have been less than arm's-length and that there are too few demonstration projects and case examples carried out by dispassionate evaluators. They are distrustful of technology and program evaluations carried out by their own proponents.

Fifth, respondents characterize available ITS literature and evaluations as focused on why the system would operate better, not why travelers would want this. They feel there is not enough user (customer) orientation in ITS programs.

Sixth, many believe that government should recognize that the private sector has assumed the leadership in some ITS applications and that government efforts should move on to focus on topics where the value added by government involvement will be greatest.

Seventh, many respondents would support special programs for ITS applications, providing funding for planning and implementation, training staff and consultants, and building longer-term capacity for using ITS technologies. Some, however, feel that ITS has already had heavy support and should compete on its own.

Eighth, many believe that government, and the state DOT in particular, should lead by example, implementing ready-to-go technologies on its own facilities and within its own agency. Many more demonstration projects also would be useful, in the respondents' view.

Ninth, many argue for stronger partnerships with local government and other state agencies, looking for ways that ITS technologies could be mutually beneficial and multi-purpose.

Finally, respondents urged that future ITS work should pay more attention to legal and institutional issues and to implementation strategies, to provide a clearer sense of priorities and "next steps."

The identification of these issues is a first step toward developing a more robust strategy for mainstreaming ITS. The findings should be of use not only to California but also to other state and local organizations with an interest in ITS implementation, as they reveal barriers to ITS as well as opportunities for enhancing ITS acceptance.

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NOTES

1. The full protocol and the sampling methodology appears on the project Web site, www.uctc.net/mainstream.

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