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TravInfo Field Operational Test Institutional Evaluation Final Results

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**California PATH Working Paper
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Institutional Evaluation
Final Results

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ABSTRACT

This paper documents the final analysis of a three part series of institutional evaluations of the TravInfo Field Operational Test from its inception in 1992 through its completion in 1998. The Field Operational Test was performed over a two-year period from September 1996 to September 1998. Funding for the TravInfo evaluation was from the Federal Highway Administration with a matching grant from the California Department of Transportation (Caltrans).

The institutional evaluation examined TravInfo's unique concept of open-architecture and its collaborative public-private partnership to broadly disseminate traveler information and foster a commercial market for privately offered advanced traveler information services. Despite many challenges, the field test was completed, and at its conclusion TravInfo was deployed as an integral part of the Bay Area transportation infrastructure. The lessons learned from the field test will be of value to sponsoring agencies and the TravInfo partners as well as to those public agencies that are interested in implementing similar systems. TravInfo's primary successes have come in developing a network of public and private professionals, who have collaborated on the projects in a variety of venues.

Key Words: Traveler Field Operational Test, Institutional Evaluation, Advanced Traveler Information System

EXECUTIVE SUMMARY

This paper documents the final analysis of a three part series of institutional evaluations of the TravInfo Field Operational Test from its inception in 1992 through its completion in 1998. The Field Operational Test was performed over a two-year period from September 1996 to September 1998 with funding from the Federal Highway Administration and a matching grant from the California Department of Transportation (Caltrans).

TravInfo is a regional traveler information system in the San Francisco Bay Area. TravInfo's goal is to broadly disseminate accurate, comprehensive, timely and reliable traffic information and multi-modal travel options to the public in the Bay Area through a public-private partnership. The TravInfo Field Operational Test was structured around a commitment to collaborative partnerships between and among public and private participants. The TravInfo system was built on an open-architecture concept, which makes its regional database easily accessible to all parties interested in disseminating traveler information through privately offered products and services.

The institutional evaluation is one of the four intended TravInfo test elements. The other elements were technology, traveler response, and transportation network performance evaluations. The network test was not performed because of the lack of traffic data to realistically measure the changes in traffic flow during the field test.

The institutional evaluation measured the performance of TravInfo's public-private partnership at the organizational level. It examined how well TravInfo's institutional organization worked to achieve its objectives, what benefits the project partners were able to gain from the field test, and what institutional challenges they had to overcome.

The institutional evaluation was performed using various data sources from observations, focus group discussions, a series of in-person, telephone, and mail-back surveys with project participants over the project's lifetime.

Travinfo's organizational structure was unique, because of the high degree of openness in the public-private partnership. TravInfo meetings were conducted as open forums to encourage the entrepreneurial participation of members of the advanced traveler information system industry as well as the active participation of local public agencies. The ultimate responsibility for TravInfo, however, lay with the public sector, in the form of the Management Board, whose members came from the three regional transportation agencies, the Metropolitan Transportation Commission, Caltrans District 4 and the California Highway Patrol's Golden Gate Division. The Metropolitan Transportation Commission led the TravInfo Field Operational Test. The private sector participated through the Advisory Committee, which was open to all interested parties. During the field test, it evolved into the Information Service Providers Forum. In addition, the Board appointed a 15-member Steering Committee to advise it.

The TravInfo organization underwent few fundamental changes. The Management Board, Steering Committee and Advisory Committee/Information Service Provider Forum essentially maintained their roles, though they evolved as the project moved from design to operation. The majority of the initial participants stayed with the project until the field test was completed. The project team had strong leadership from both the public and private partners.

Observations

The TravInfo organization was effective in appropriately utilizing public and private sector talent. By placing the Metropolitan Transportation Commission, which is the Metropolitan Planning Organization for the nine-county Bay Area, in a leadership role, the project recognized the importance of consensus building. TravInfo also benefited from having many talented individuals participate.

Perhaps the most significant attribute of the TravInfo field test was its engendering of partnerships among public and private parties. The project helped foster constructive relationships among the three principal public participants, and the benefits carried over into other joint ventures. Many of TravInfo's private participants went on to form alliances with one another, and their positive experience with TravInfo led them to take part in other Field Operational Tests and Model Deployment Initiatives around the US.

As was the case with other federally supported field tests of this type, the TravInfo partners encountered many challenges. Two major setbacks were insufficient coverage of the Bay Area transportation network by the data supplied to TravInfo's Traveler Information Center and an inefficient system design that required the Traveler Information Center to be considerably more dependent on manual operations than expected. The first setback was the result of a delay in the development of Caltrans' Traffic Operations System, which was to be the major data source for TravInfo, because of a state executive order temporarily prohibiting sole-source contracts, including the one TravInfo had, for computer-related work. The second setback, the greater reliance on manual rather than automated operation as originally planned at the Traveler Information Center, resulted in high labor costs and heavy dependence on operator performance.

Lessons Learned

From the institutional point of view, it was necessary to adjust the public and private partners' differing expectations of TravInfo in order to work toward the common goal of disseminating accurate, reliable, timely and multi-modal information to Bay Area travelers. The public partners expected to make TravInfo available for better congestion management, while the private partners expected to test and market products that would make a profit. It took a long time to reconcile their differing objectives.

In addition, the field test's goals were ambitious and unrealistic to achieve within the time allotted. Although TravInfo's organization was effective, the consensus-based partnership caused TravInfo to be slow at making critical decisions. While productive at some levels, the project approach during the field test was not flexible enough to quickly respond to obstacles that arose unexpectedly, such as the delays in the development of Caltrans' Traffic Operations System due to the state executive order and the consultant's delivery of a system not fully compliant with design specifications.

In the project planning phase, the TravInfo project relied on the best-case scenario for both system design and implementation. It did not consider worst-case scenarios to develop possible alternative courses of action. Such risk assessment strategies and contingency planning are vital to moderating the potentially negative consequences of unforeseen events. However, the project team was wise to respond to the situation by retaining an expert who could advise them on all facets of technical and management issues.

Perhaps the greatest value of the TravInfo field test comes from sharing the experiences of it with others. Since it was the first to test the concepts of open architecture and open partnership, it has a wealth of new findings. The partners gained knowledge of building

successful partnerships through, among other things, better understanding of different points of view and improved communication. In addition, many TravInfo private partners were actively involved in tests and model deployments of advanced information systems in other parts of the country, which brought invaluable experience to the TravInfo project. At the same time, their role in TravInfo gave them national recognition. At this juncture, new partners could bring some fresh objectivity to TravInfo.

The long-term benefits of TravInfo will be of more value to the partners than the short-term benefits of the field test. Beyond the economics of the information system, the partners learned the value of making firm commitments to collaborative partnerships.

The TravInfo's public-private partnership provided a strong regional stewardship for an infant program and in the process pioneered a unique, open public-private partnership dedicated to a regional system built on the same philosophical commitment to openness through its open-architecture. The experience benefited the Bay Area as a whole, both through an improved transportation system and the presence of a new, vigorous institutional collaboration. The private sector benefited from having a venue in which to test advanced information products.

TravInfo's primary successes lay in developing a network of public and private professionals who collaborated on advanced traveler information system projects in a variety of settings and in providing a platform for different organizations to network and form partnerships. These networks and partnerships are the most significant and unique outcomes of the field test and promise to result in many innovative traveler information services and products beyond the telephone or Web site services.

Finally, the major challenges of the TravInfo Field Operational Test were notably similar to those of other Field Operational Tests. Among them were setting ambitious project

goals that were unattainable within the limited time reserved for the field test; underestimating the extensive time required to develop mutual understanding and trust between participating parties; underestimating the uncertainty of the consumer market for commercialization of traveler information products and services; having inadequate information about how to put a consumer value on the information being provided; defining appropriate roles for the parties involved; and appreciating the importance of having enough time and funds to place the product and convince people to use it.

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1. INTRODUCTION

This working paper documents the final analysis of a three part series of institutional evaluations of the TravInfo Field Operational Test. The first part of the institutional evaluation examined the TravInfo's public-private partnership for the start-up of the project from 1992 – 1993; the evaluation results were documented in the working paper published by California PATH in February 1995 (1). The second part of the institutional evaluation examined the project partnership for the development of the TravInfo system from 1994 – 1995; the results were reported in the PATH working paper published in 1996 (2). This working paper documents the final phase of the partnership performance from 1996 until the completion of the field test in 1998.

TravInfo is a regional advanced traveler information system in the San Francisco Bay Area. The project is aimed at widespread dissemination of real-time information on traffic conditions and multi-modal travel options throughout the Bay Area. TravInfo differs from other federally funded field operational tests at that time in two respects. On an organizational level, it was structured around a commitment to vigorous, collaborative partnerships between and among public and private participants. Operationally, the system was built using open architecture, which makes its database easily accessible to all parties interested in developing and testing advanced traveler information systems. The goal of the TravInfo field test is to collect, integrate and broadly disseminate timely and accurate multi-modal traveler information through a range of products and services, with different prices and capabilities, to meet consumer needs. The project was initially conceived in 1992, funded by the Federal Highway Administration's Field Operational Test (FOT) program in 1993, and began operation in September 1996. The field test was completed in September 1998. The California Department of Transportation (Caltrans) provided a matching grant for the field test.

A fundamental premise of the TravInfo project is that a public surveillance and database system, designed to open-architecture standards, would stimulate private sector innovations in advanced-traveler-information-system (ATIS) technologies and, ultimately, their deployment (3). A unique aspect of TravInfo is its open-access database that allows companies to retrieve the data and re-package it for ultimate dissemination to the public, both through the publicly offered Traveler Advisory Telephone System and through products developed by information service providers. The TravInfo's objective is not only to provide benefits to Bay Area travelers, but also to stimulate the deployment of privately offered traveler information products and services. The FHWA intends to make the results of this test accessible to others across the nation who may wish to engage in similar enterprises. To achieve this aim, California PATH was commissioned to perform an independent evaluation of the test.

The institutional evaluation is one of the four intended test elements for the TravInfo project. The other evaluation elements are *traveler response*, *technology* and *system performance* (4, 5). The system performance evaluation could not be performed because of the lack of accurate and reliable data to analyze changes in travel time. The institutional evaluation examined the effectiveness of the institutional relationships among the public and private sector partners. The technology evaluation dealt with the level of maturity of the technologies needed to execute TravInfo's goal of disseminating accurate, timely and reliable traveler information in a useful format. The traveler response evaluation examined travelers' receptiveness to and the market demand for different kinds of advanced information-based products. The network performance evaluation was intended to examine TravInfo's influence on the Bay Area transportation system. This element of evaluation was later dropped because there was not enough data available to test the changes in traffic flow.

Institutional Evaluation Objectives and Measures of Effectiveness

The success of TravInfo will depend significantly on the effectiveness of the partnership, including its ability to guide a large and complex project as well as its ability to fairly resolve inter-organizational conflicts. Therefore, the focus of the institutional evaluation is on describing how the organization functions and an assessing its strengths and weaknesses.

Specific objectives of the institutional evaluation were to:

- 1) Assess the effectiveness of the organizational structure and the management approach in meeting project goals and schedules.
- 2) Measure the extent to which the TravInfo organizational structure facilitates active involvement and cooperation among public agencies and between public and private institutions.
- 3) Document the effects of TravInfo on the ATIS industry, including new business opportunities, changes in organizational philosophy, and the ability to develop products along common interface standards.

Institutional Evaluation Methodology

By its nature, the institutional element does not lend itself to quantitative measures of effectiveness. Instead, the focus was on documenting the institutional history of the project, identifying problems encountered, methods used for resolving problems, chronology of major decisions, and changes that took place in the organization over the duration of the Field Operational Test. The institutional history was developed through a combination of periodic interviews, direct observation at meetings, and review of project documentation. Comparisons

between individuals' initial perceptions, and their perceptions later on in the project were made through interviews and mail-back surveys with the project partners.

Data used for the institutional evaluation were collected through a series of interviews and mail-back surveys and focus group meetings with key participants. In summer 1993, the initial survey was conducted with the TravInfo public and private partners mostly through in-person and telephone interviews using a survey instrument and, in some cases, the instrument was mailed to the partners for their responses (Appendix A, survey instrument). Using the same survey instrument and the method, the second wave was conducted during the summer of 1994. A similar response rate was obtained. The third wave survey was conducted during the summer of 1996 shortly before the field test began. In November 1998, shortly after the field test was completed, a focus group meeting was held among the partners to assess their perceptions of the TravInfo field test. Additional ad-hoc interviews were conducted during the field operational test.

Section 2 provides the general background of the TravInfo institutional organization. The institutional history of the project is documented in Section 3. The lessons learned from the project are presented in Section 5 and conclusions are drawn in Section 6.

2. BACKGROUND

TravInfo was conceived in 1992 during a period of large-scale, federally funded field tests of advanced traveler information systems that communicated to travelers exclusively through intelligent navigation products. The major projects at the time shared the feature that federal funds would be used to finance the distribution and testing of in-vehicle navigation products within a “closed system.” Within these systems, traffic surveillance data would only be disseminated to the devices provided by the field test projects.

While the “closed architecture” approach offered considerable advantages from the standpoint of the product test, it soon became clear that the public sector could not possibly sustain the costs of developing and distributing navigation products to regionally influence travelers’ decisions to alter their trips. A philosophy that traveler information might be disseminated through an “open architecture” system arose; hence, any company that tapped into a database through a standardized interface could sell products.

In the Bay Area, this approach received active support from the Metropolitan Transportation Commission (MTC - the region’s metropolitan planning organization), California Department of Transportation (Caltrans), Intelligent Transportation Systems (ITS) research organizations throughout California, including the PATH Program in the Institute of Transportation Studies at the University of California and the burgeoning advanced transportation information industry, especially map database vendors such as ETAK and consultants such as SRI and JHK (which later became part of TransCal). Local government public works departments also embraced the idea as a way to exploit data they were already collecting and to have travelers use them to make more efficient use of the existing transportation infrastructure. All these parties were among the original participants in TravInfo.

The “open architecture” philosophy was well represented in the “National System Architecture for Intelligent Transportation Systems” program, which began in 1993. Creating an interface for traveler information, which would allow people to seamlessly obtain information as they travel from place to place, was a centerpiece of the call for proposals for this program. Open architecture was the central theme of the TravInfo project.

Under the open architecture concept, TravInfo would serve as the integrator of information, which would come from diverse data sources (primarily other public agencies), and be made available to diverse entities (primarily private) for dissemination. The data could be disseminated by three different means: 1) travelers could use a “baseline” automated telephone information system, 2) “Value-added-resellers” (later called Information Service Providers, or ISPs) could access data from a land-line data server, and 3) mobile products could access information from a wireless data broadcast system. TravInfo itself would not create the information products that use the database – that would be the responsibility of private “partners.” Likewise, TravInfo would not be responsible for data collection – that would be provided by various public and private participants.

The essential contribution of TravInfo was to centralize and “fuse” data sources and to provide standardized access. Public agency participants viewed this as advantageous because they would only need to supply data to one client, TravInfo, rather than adapt to the needs of various information service providers. Likewise, the information providers considered it an advantage to have a single source for all their data. There was also some hope that a project of this sort might lead to the establishment of national standards, which would further stimulate the market for traveler information systems. Finally, compared to the other advanced traveler information systems of the time, the TravInfo partners saw cost savings through its automated data collection and transmission and by shifting the costs of developing and marketing end-user devices to the private sector.

TravInfo was proposed through the Federal Highway Administration’s (FHWA) Field Operation Test (FOT) Program of 1992 as a \$2.5 million project. The Metropolitan Transportation Commission (MTC, the region’s MPO) would be the lead agency, but funding would pass through the Caltrans New Technology Division. Caltrans would coordinate the TravInfo Field

Operational Test with other tests around the state, in order to create a comprehensive evaluation of Intelligent Transportation Systems technologies. The project was proposed to include a public-private advisory body, and a management board with three voting members, representing Caltrans District 4 (Bay Area), MTC, and the California Highway Patrol (CHP). Various other agencies would provide ex officio members. PATH was named in the proposal as the project evaluator (an evaluation was required under the FOT program), and SRI was named as a technical advisor. TravInfo was intended to perform six tasks (3):

- Collect and integrate accurate information on travel conditions, and provide all interested users with open access to the data.
- Utilize and evaluate both infrastructure and non-infrastructure based methods of collecting information on travel conditions.
- Provide for broad dissemination of information through a wide variety of channels, and encourage private entrepreneurial innovation to respond to market demands for this information.
- Actively encourage growth and development of technologies for information collection and dissemination along a migration path that leads to real-time information on modal options and routes.
- Establish an open ATIS testbed for evaluating both the technological performance and market response to various entrepreneurial initiatives in travel information-based products and services.

- Evaluate (1) the market demand and effectiveness of different information-based products, (2) the public's access to and use of different kinds of information, (3) changes in individual travel behavior and transportation system performance, and (4) different inter-agency cooperative efforts (public-public, public-private).

The project was proposed to commence at the start of 1993, with a fully functional baseline system by April 1994, and operation continuing until the end of 1995. The baseline system was planned to include the following elements:

- Integrated Geographic Reference, Traffic Operations Information and Public Transit Information databases, with data coming from California Highway Patrol, Caltrans and other local agencies.
- Interactive traveler advisory telephone system.
- System for broadcasting real-time traveler information on a regional basis by FM radio sideband or similar technique.
- To the greatest extent practical and feasible, data integration methods that automate and lighten operator burden.

The project was proposed at a cost of \$4.2 million, including \$2.5 million in federal funds and \$1.7 million in local "hard match" funds. A significant portion of the hard-match was associated with funding to develop a regional transit phone number. Additional enhancements were proposed as follow-on activity, to be funded separately.

As part of the field operational test, a Traveler Information Center was created. Its data were intended to be disseminated through three basic means; the Traveler Advisory Telephone System, an automated reporting service which travelers from all the area codes in the Bay Area could reach by dialing a single phone number, 817-1717; a data server that information service providers could link to over a landline connection; and a wireless broadcast that would send information to service providers and individual devices over the air. Although they originally supported the idea of TravInfo supplying the wireless link, private vendors later expressed concern that it would lead to unfair competition from the public side, so this concept was abandoned early in the TravInfo development process.

The TravInfo's Traveler Information Center is pivotal to the process. Operated by public agencies, it collects and processes data from a host of public sources. It was put into operation in September of 1996, at the start of the field test. The field test was completed in September 1998.

TravInfo Organization and Management Philosophy

TravInfo's organizational structure is unique, because of the high degree of openness that was practiced by the public-private partnership. TravInfo meetings were conducted as open forums as part of the philosophical commitment to casting as wide a net as possible in order to encourage entrepreneurial activity in the advanced traveler information system industry.

The ultimate responsibility for TravInfo, however, lay with the public sector, in the form of the Management Board, whose members came from the three transportation agencies in the region where TravInfo was deployed, the Metropolitan Transportation Commission, headquartered in Oakland, Caltrans District 4, also based in Oakland and covering the nine Bay Area counties, and the California Highway Patrol's Golden Gate Division, in Vallejo.

The private sector participated through the Advisory Committee, which the Board set up and opened to all interested parties, and the Advisory Committee's 15-member Steering Committee, the majority of whose Board-appointed members came from the private sector. The Advisory Committee and its Steering Committee had no direct authority to set policy but were active advisers to the Board. By the start of the field test, the Advisory Committee had evolved into the Information Service Providers Forum, which was still guided by the Steering Committee.

The Management Board set policy for all TravInfo field test activities, reviewing and approving procedures for how the test was conducted and registering service providers and giving them access to the databases. In addition, the Board oversaw the installation of additional traffic surveillance devices, devised the plan for deploying TravInfo and coordinated public agencies' policies around advanced traveler information systems. The Board retained consultants to develop and operate the TravInfo system housed in the Traveler Information Center and market the TravInfo Traveler Advisory Telephone System. It also retained SRI, Inc. to advise on technical elements of the TravInfo project.

Day-to-day supervision of TravInfo fell to a fulltime project manager, who operated under the policy direction of the Board. During the field test, the Board oversaw the operation of the TravInfo Traveler Information Center and the phone advisory system, while the project manager supervised consultants and directed the installation and operation of TravInfo overall, acting as liaison to the Advisory Committee and making progress reports to the Board.

The Management Board met monthly until the end of the field test. The Steering Committee met monthly until the TravInfo Traveler Information Center began operation in September 1996, when it scaled back to every two or three months for the duration of the field test. The Advisory Committee/Information Service Provider Forum met every three months.

An Evaluation Oversight Team was formed early in the process to serve as a basic communications link between the PATH evaluators and the TravInfo project partners and to track the progress of the evaluation. The oversight group was comprised of representatives from public agencies and transportation practitioners and academics from various institutions and chaired by a representative of the Federal Highway Administration. It convened once a month.

3. PROJECT HISTORY

One of TravInfo's primary objectives was to test a unique partnership of public and private institutions as they operated in a remarkably open relationship to meet a challenging goal: implementing the first major regional advanced traveler information system to make data generated from public sources accessible to and usable by all comers, public or private. Achieving that objective rested heavily on the success of the collaboration of the public and private sides, which makes the performance of their relationship central to the evaluation of how TravInfo performed in the field test overall.

During the six years from TravInfo's inception in 1992 to the completion of the field test in 1998, the institutional character of TravInfo has gone through several distinct phases. Important decisions were made along the way prior to and during the field test. The actions taken by the partners will ultimately affect the outcome of the TravInfo field test.

October 1992 – September 1994: the Division of Responsibilities Between Public and Private Sectors

In 1992, TravInfo was selected as a federally funded field operational test. The Management Board, made up of representatives from the three regional transportation agencies — the Metropolitan Transportation Commission, Caltrans District 4 Office and the California Highway

Patrol's Golden Gate Division — began meeting at the end of that year. Initially, the Board focused on signing its cooperative agreement with Caltrans for disbursement of federal funds. The partners' central concerns were organizing the project team from the public sector participants and setting up the Advisory Committee in which the private sector, along with public agencies not necessarily represented on the Management Board, would have a voice. It began meeting in April of 1993. In June, the cooperative agreement with the Federal Highway Administration was signed.

At first, the Advisory Committee was viewed as a self-organizing body, which would have a strong role in defining its mission and selecting its leaders. Under this premise, the first Advisory Committee meeting was attended by over 200 people representing a wide range of private companies and public agencies. Because the sheer number of participants made its operation unwieldy, the Advisory Committee soon centered on its Steering Committee, whose 15 members — the majority of whom were from the private sector — were appointed by the Management Board. The Steering Committee in turn set up a series of working groups to better focus members' efforts.

In the summer of 1993, the Board retained a private consultant to design the TravInfo system, which was to be housed and operated in the Traveler Information Center. The TravInfo system would retrieve data from the existing sources and disseminate traveler information through the telephone advisory system to the public and also to provide access to various entities, including information service providers, research institutions and any non-private organizations through a land-line server. Around the same time, the Steering Committee delegated tasks to several working groups, whose assignments included developing an outreach program for private sector participants, assessing the state of advanced traveler information system technologies and working closely with the consultant on the design of the information center. The working groups

reported back to the Steering Committee, which in turn made recommendations to the Management Board. The working groups identified critical issues and made recommendations to the Steering Committee for resolving some of the technical issues, especially on the TravInfo system design and a program to outreach potential private and public partners.

The December 1993 meeting of the Steering Committee marked a turning point in the institutional relations between the public and private sides. The private partners expressed the concern that TravInfo might take business away from them, rather than give them more. The private sector concern was that if TravInfo pre-processed data to the point where private companies could add little value and then made it widely available through means such as the wireless Data Broadcasting System, direct modem links to individuals and a detailed automated phone reporting system, private services would be squeezed out. As a result, the Management Board eliminated the wireless system from the TravInfo design and agreed not to provide any transportation data directly to the public, other than through the 817-1717 telephone system.

May 1994 – August 1995: Issues about the Usability of the Traffic Surveillance Data

TravInfo was originally conceived to be flexible and capable of operating with minimal surveillance infrastructure. Nevertheless, the system architecture became increasingly reliant on Caltrans to provide traffic surveillance data through its Traffic Operations System (TOS) to support the Traveler Information Center's database since no other sources could provide vehicle speed and traffic volume data. Under development since 1990, the Traffic Operations System was expected to be fully operational and able to support TravInfo by the end of 1994. In October of that year, in response to problems with a computer system at the Department of Motor Vehicles, a California state executive order was issued to temporarily prohibit sole-source

contracts for computer system development throughout state government, which put a halt to the Traffic Operations System work.

The executive order marked a major turning point for TravInfo. Its most immediate effect was to delay the TravInfo schedule considerably. Over the longer term, the order forced the Board to limit its traffic surveillance system, which generated much of the data for the information center, to an already deployed, smaller Traffic Operations System, which covered 250 miles of freeway versus the 500 originally envisioned. The Board decided that waiting for the full-scale surveillance system would have pushed the start of the field test beyond a date acceptable to the Federal Highway Administration. Caltrans agreed to transfer to the Metropolitan Transportation Commission the funds that were to have been used to build the full-sized Traffic Operations System. The Commission, as TravInfo's lead agency, agreed to develop an Interim Freeway Surveillance System (referred to as "mini-TOS"), as the reduced Traffic Operations System was known, which it would eventually turn over to Caltrans for maintenance and operation. (This was done in early 1996.)

The interim system processed inductive loop data from field devices and put it in a format that could be entered into the TravInfo database. Additional data included incident data from the California Highway Patrol's Computer-Aided Dispatch system and freight companies' probe vehicles. The project partners envisioned that the full-scale Traffic Operations System would also incorporate information from closed circuit television cameras, ramp meters and Caltrans' regional transportation management center, making it a comprehensive traffic management and information tool. The Board and Steering Committee meetings were dominated by the issues concerning the executive order and further development of the Caltrans' Traffic Operations System. These issues are documented in the institutional evaluation working paper, phase two results (2)

May 1995 - August 1996: Contract Compliance

By May 1995, with the seeming resolution of the contractual and design issues for the Traffic Operations System, the project focused on ramping up for operational testing. The design consultant working on the TravInfo system delivered a detailed scope of work, a schedule, and a budget that anticipated it would start formal operation in August. For a variety of reasons, including unwarranted optimistic estimates by the consultant and delays with the Traffic Operations System, by July, the consultant's expenditures had far exceeded the estimated internal budget. Consequently, the consultant found that the information center design was not a business opportunity over the near term and scaled back work on the project. These events were a major setback.

The system design consultant continued to develop software for the TravInfo system through April 1996, when acceptance testing began. In the meantime, in January 1996, the Board retained a private firm to operate the Traveler Information Center. The acceptance testing began before a formal test plan was approved. Despite evidence of significant problems, the consultant requested on-the-spot acceptance. The Board resisted, which led to protracted negotiations between the two sides. In August, a year later than anticipated, the Board granted conditional acceptance for the system, though acceptance testing continued for three months after start of the field test in September 1996. Another issue was the ownership of the intellectual property rights to the TravInfo software, which was resolved with a contractual agreement which gave the Board all rights for the use and improvement of the system and granted ownership to the consultant who designed it.

These setbacks placed the project 28 months behind the proposed date when baseline operation of the TravInfo Traveler Information Center was to have begun. Design and implementation

lasted 35 months, 19 months longer than originally proposed to the Federal Highway Administration.

During this period, contracts for operating the Traveler Information Center and marketing TravInfo were executed, and the Traveler Advisory Telephone System was completed. The Steering Committee became less active, but still maintained a strong presence. The Management Board kept the Steering Committee fully apprised of contractual issues, though negotiations were done by Board staff. At this time, the Board also set up registration requirements for participating service providers who were to provide information about product development and testing in exchange for access to the database.

**September 1996 - September 1998:
TravInfo Operation and the Field Test**

The delay to develop a full-fledged Traffic Operations System spurred two significant shifts in the TravInfo partnership. First, the Management Board became more prominent in setting project direction, eclipsing the historic influence of the Steering Committee, which was clearly not designed to address the Traffic Operations System. Second, it forced TravInfo to move beyond merely integrating data from existing sources to actually collecting data, a role that it continues to play.

The TravInfo field test officially began operation in September 1996, highlighted by a ribbon-cutting ceremony at the end of the month. The field test was officially ended in September 1998. In the early phase of the TravInfo field test, the dominant issues were: 1) determining whether a second site would be created to test interoperability, 2) resolving contractual issues with the Traveler Information Center system design consultant to get access to source code to enable the system to be maintained, 3) enhancing the traffic surveillance system. The Board decided not to

build the second test site. The original system design consultant continued to provide maintenance of the information center, and a software engineer was retained in-house to maintain and improve the system. The Management Board continued to work on enhancing the traffic surveillance system.

After it took over TravInfo from the designer, the Board discovered that the data generated from the Interim Surveillance System's loop detectors were not reliable because of multiple technical problems associated with the hardware, software, communications network and wiring. That in turn compromised the ability of the Traveler Information Center to make full reports. In addition, technical problems kept the Traveler Information Center from having an automated link to the highway patrol's computer-aided dispatch data, a major source of traffic information. In addition, the advertising campaign for the Traveler Advisory Telephone System, the main public gateway into TravInfo, proved to be severely underfunded and, thus, ineffective.

In September 1997, the loop detector problems were assigned to a working group consisting of Caltrans, the Metropolitan Transportation Commission, the information center's operations consultant and some Steering Committee members. Although the group worked diligently for many months, no significant improvement was made.

In an attempt to fill the gaps in surveillance data caused by these shortcomings, the Board retained a consultant to install 20 microwave radar surveillance units at locations critical to TravInfo. They were equipped with wireless modems to send data to the information center. The Board also hoped to convert existing call boxes into "smart" ones that could also feed data to the information center. However the microwave radar devices were incompatible with the interim surveillance system, and suffered from malfunctioning power supplies that required redesign and reinstallation.

These operational problems consumed much of the attention of the Management Board and Steering Committee. Other areas they addressed were improving other aspects of the surveillance system and the performance of the information center and exploring TravInfo's interoperability with other public projects with an eye to its eventual full deployment.

From early 1998 to June of that year, a working group met regularly to develop a deployment plan. It was adopted by both the Board and the Steering Committee in July 1998, with a recommendation by the Board that TravInfo continue to operate after the end of the field test.

In September, the Board and Steering Committee adopted a statement of principles to guide TravInfo operation beyond the field test. An Executive Board, with the same voting members as the Management Board, was created to address broader policy questions, while a smaller group would focus on administrative details.

Recognizing that TravInfo's data was not comprehensive or accurate enough to be useful to most commercial information providers, the Board recommended that TravInfo be operated as a public service, on an "as is" basis for another nine to 18 months, continuing to disseminate data and participating in the development of a statewide asset management plan. The board decided to apply for public funding through the region's mainstream mechanisms rather than seeking either dedicated federal intelligent transportation system funding or private sector contributions.

The Board would use those nine months to develop a strategic plan and resolve key issues about TravInfo's future. It hoped to determine what data were available about key congested corridors and how TravInfo's operating system could be made to produce output that was more attractive to information service providers. Although the commercial market for advanced traveler information systems had not matured as expected, the Executive Board decided to continue to

provide public resources to foster one and pursue other ways TravInfo could be disseminated through such devices and products. The Board would also develop performance measures to evaluate the deployed TravInfo system.

October 1998: Conclusion of the Field Operational Test

As the project moved from the field test into a fully deployed system, TravInfo's mission was changed from testing the theories to actually becoming a Bay Area transportation system at the conclusion of the field test in September 1998. On October 1, 1998, TravInfo was deployed as an integral part of the Bay Area transportation infrastructure. The project's overall goal remained the same, but several new principles were adapted to guide the post-field operational phase. The Management Board would continue to serve as the Executive Board with the Metropolitan Transportation Commission being the lead agency.

The Executive Board would focus on TravInfo as a public service, providing comprehensive, accurate, reliable, multi-modal travel information. TravInfo would continue operating the system “as is,” with improvements of the system as necessary until the Board retains a “system manager”. It would continue to collect, integrate, and broadly disseminate accurate traveler information to the traveling public at large. Public funding would be sought to support TravInfo operations through regional funding mechanisms and the FOT administrative framework would be maintained until the Board could address key issues about TravInfo’s future.

Although the commercial market for ATIS products and services was uncertain, the Board would continue its support and provision of public resources for creating a commercial ATIS market. However, the Board would scale back its effort to support private sector projects until the TravInfo system could be stabilized, since it recognized that data coverage and accuracy of the

current surveillance systems were not adequate for most Information Service Providers. The Board would develop performance measures to evaluate the deployed TravInfo system. The Board's decision on its approach was probably a step in the right direction considering the TravInfo data coverage issues and limited public resources to support the private projects indefinitely.

4. INSTITUTIONAL EVALUATION RESULTS

This section discusses the results of the institutional evaluation. Data were gathered from observations at meetings of the Management Board, Steering Committee, and Advisory Committee/Information Service Provider Forum. Additional data were from interviews and mail-back surveys with core project participants.

Observations

Organizational structure

Since the start of the project, the TravInfo organization has undergone few fundamental changes. From inception to completion of the field operational test, the original governing bodies, the Management Board, Steering Committee and Advisory Committee/Information Service Providers Forum, maintained their same essential roles, though these roles evolved as the project moved from design to operation. The project had remarkable continuity within the Metropolitan Transportation Commission, the leadership and members of the Steering Committee, the project manager, the technical adviser, Caltrans, the California Highway Patrol and the PATH evaluation team.

Meetings

The project team maintained an open forum. Steering Committee meetings were structured so that members and non-members participated equally. They were scheduled monthly, complete with agendas for important issues. Contracts were discussed openly, even when some attendees had a direct financial stake.

Leadership

The project team had strong leadership and the full commitment of the partners. Strong leadership was shown in the public and private sectors and was a major development to come out of TravInfo and explains how the project was carried into full deployment. The TravInfo project manager, the Steering Committee chair and Board staff were all fully committed. The Federal Highway Administration and Caltrans' Office of New Technology and Research were highly supportive.

Major obstacles

The TravInfo project had to overcome many unexpected obstacles. It's not unusual for a field test to encounter surprise obstacles, but TravInfo was plagued with them every step of the way. The Traffic Operations System, a core component that was being developed independently of TravInfo, expected to be fully functional by the time TravInfo began operation. However, it was delayed indefinitely by the state executive order temporarily prohibiting the execution of contracts of its type. Other unforeseen developments were the design consultant's inability to deliver the TravInfo system in as highly automated a version as called for in the specifications, an ineffective marketing campaign for the Traveler Advisory Telephone System, lack of reliable traffic surveillance data from existing loop detectors and contractors' inability to deliver work on time. All these unexpected shortfalls required the additional expenditures of time and money by the project team.

Project partners contribution

The TravInfo organization put public and private sector talent to effective use.

By placing the Metropolitan Transportation Commission, the region's metropolitan planning organization, in a leadership role, TravInfo made consensus-building an important feature. It also benefited from having many talented people participate in the design and deployment of the system.

TravInfo Institutional Challenges

The project partners encountered numerous challenges to overcome many obstacles. The major institutional challenges identified by the TravInfo partners are:

Developing and testing a new concept

A project of this nature was new to the partners. When TravInfo was being designed and developed in 1994 and 1995, there was no other regional advanced traveler information system of comparable scope to learn from. Even though the TravInfo field test was unique in its open-partnership, the project partners could learn from other field test results. The Boston SmarTraveler telephone information system, which began operation in 1995 did not have any evaluation results yet. Two others in California, the Yosemite Advanced Traveler Information and TransCal were underway. Therefore, the partners could only guess at the elements involved, among them the challenges of partnerships, consultants' contracts, the maturity of the information technology and the depth of the advanced traveler information market.

Reconciling partners' different expectations

As experienced in other field tests, the public and private partners approached TravInfo with different motivations and expectations. The public side generally hoped to disseminate accurate

and timely traveler information as widely as possible to help the public by improving the traffic management system. Their expectations about how easily that would be accomplished might have varied. The private partners hoped primarily to use the TravInfo database to create value-added information services that they could sell at a profit. Although the partners agreed for the duration of the field test that the public sector should collect and fuse data, which the private sector would then disseminate, the final division of duties has not been precisely defined.

Dealing with unanticipated contracting problems

Two major contracting problems were not foreseen and caused significant delays. The state executive order temporarily prohibiting sole source government contracts delayed full development of the Traffic Operations System. The challenge was then to push the project forward so the Management Board could meet its contractual obligation to the Federal Highway Administration. The system design consultants' unexpected delays in their deliverables and their decision to scale back their involvement with the TravInfo project before completing their contract was the other major setback that could not have been anticipated. These events also discouraged the information service providers' product development and testing.

Operating an inefficient system

TravInfo's challenge was working with an inefficient system in an environment of rapidly advancing technologies. While the TravInfo system was out of date the moment it was completed, because the technology was changing at such a rapid rate. Compounding the problem, the TravInfo software was based on a system used in the military — the most economical and practical option at the start of the system's design — which was not easily modified. As a result, developing the TravInfo software took more time and effort than anticipated, and it turned out to be less effective than expected.

Dealing with insufficient database

The partners relied heavily on the Traffic Operations System, but it could not be developed in time for the field test. The TravInfo partners expected to have surveillance data from at least 250 miles of the Bay Area's 500-mile planned freeway surveillance system, under the new, expanded Traffic Operations System. That amount of data coverage was considered sufficient to support the TravInfo field test. When the new system did not materialize, and TravInfo was forced to operate with a small fraction of that coverage, the project's basic goals were compromised.

Working with local public agencies and transit authorities

Local governments and transit agencies had limited participation in the TravInfo field test. Active participation by local public agencies would have greatly helped TravInfo achieve its goal of improving transportation coordination across agencies, modes and geographic boundaries. However, few local government and public transit agencies participated in TravInfo's development, primarily due to limited resources allocated by local governments for the regional Intelligent Transportation Systems projects. In some cases, few representatives of local governments who participated in the project attended meetings on their own time. Transit agencies had a different reason: they were concerned about protecting their own brand-equity, particularly when it came to signing on to TravInfo's 817-1717 traveler advisory phone line. All allowed their customers to obtain information through TravInfo's number, but only one of the 26 transit agencies in the Bay Area, Alameda-Contra Costa Transit (AC Transit), used the TravInfo number as its only access number during the field test. Once it ended, AC Transit also adopted its own telephone service number in addition to the 817-1717 number. Another major challenge was to persuade local public works departments to integrate their databases into those of TravInfo.

Outreaching private sector participation

TravInfo could have greatly benefited from private party data sources (i.e., freight companies), especially with the Traffic Operations System's limitations, but none were willing to share what they considered proprietary information with TravInfo. They perceived their participation in TravInfo to be an expenditure that might not yield any tangible benefits to their business and might potentially result in losing their competitive edge.

Dealing with intellectual property rights

Intellectual property rights to the TravInfo system were a major concern of the partners. The TravInfo system was designed by a consultant who resisted transferring the intellectual property rights to the TravInfo system design to the Management Board. Although many intelligent transportation system projects have had to address intellectual property rights issues, there were no national standards for contracting agencies or design consultants to follow. Negotiations between the Management Board and the consultant resolved the TravInfo intellectual property issue by granting ownership of the software to the system developer, who in turn licensed it to the Metropolitan Transportation Commission to use it and make any modifications that it desired. Modifications that are considered "derivative works" revert to the software developer; if they are considered new, they belong to the Metropolitan Transportation Commission.

Major Accomplishments

Despite many challenges encountered in the process of developing and implementing the TravInfo field test, the partners were able to accomplish major milestones. Their accomplishments are:

Deploying the TravInfo project and providing a regional stewardship

TravInfo went beyond its field test phase to full operation as an integral part of the permanent Bay Area transportation infrastructure. In the process of drawing up and executing the TravInfo deployment plan, the project team provided strong regional stewardship for an infant program. As TravInfo moved into deployment, the partners laid out a strategy to improve the Bay Area transportation system through a more efficient and reliable surveillance infrastructure, broader dissemination of accurate and timely traveler information and more extensive data for private information service providers.

Creating a platform to network

TravInfo gave different organizations a platform on which to network and form partnerships among public and private participants and nurture a young industry. By focusing on delivering an operable advanced traveler information system, TravInfo stimulated development of related concepts and products in the public and private sectors. Although many products had not reached full commercialization by the end of the field test, TravInfo provided invaluable market information to guide future product development.

Working with a collaborative partnership

The true sense of partnership that TravInfo engendered among members of the Steering Committee and Management Board was clearly its unique and significant accomplishment in the public-private arena. Likewise, the project helped foster constructive relationships among the three principal public agency participants, the Metropolitan Transportation Commission, Caltrans and the California Highway Patrol. The benefits carried over into other joint ventures, such as the joint operation of the Freeway Service Patrol by the Metropolitan Transportation Commission and the California Highway Patrol and the Metropolitan Transportation Commission's work with Caltrans to enhance the regional freeway surveillance systems.

TravInfo's emphasis on open access for its partners helped create considerable interest from private firms. In spite of the shortage of reliable data generated during the field test, The Contra Costa Times, Etak and Maxwell (later bought by Smart Routes) all deployed traffic Web sites based on TravInfo data. Bay Area television stations KTVU and KPIX hoped to use TravInfo's closed circuit television images for their traffic Web pages. These and other service providers (among them, Daimler-Chrysler, Fastline and Digital DJ) tested their products using TravInfo data during the field test. The products included cellular telephones, personal digital assistance units and in-vehicle navigation devices.

Furthermore, many of TravInfo's private participants went on to form alliances with one another, and their positive experience with TravInfo led them to take part in other field tests and model deployments of advanced traveler information systems, among them AZTech (the Phoenix Model Deployment Initiative), SmartTrek (the Seattle Model Deployment Initiative) and RAPID (a test of FM-subcarrier delivery of traveler information in Phoenix).

One alliance born out of TravInfo is a partnership between Etak and Metro Networks. It is set to roll out a nationwide, commercial advanced traveler information system that will reach approximately 75 cities by the year 2000. Both parties say it is a direct result of their experiences with the TravInfo field test. They even used the TravInfo database to try out Etak's Traffic Workstation, which processed and distributed TravInfo data through the FM subcarrier network of Differential Corrections Inc., another TravInfo participant. Wireless data from Differential Corrections were made available to other TravInfo partners, including Clarion, which in turn modified its in-vehicle navigation device and used the TravInfo database to test its technical viability in the U.S. and Japan.

Defining roles of the public and private parties

The partners took the time to define the roles for public and private participants. Although building a consensus among them took considerable time and effort, the TravInfo partners were able to define the public and private sector roles for the field test. They agreed that members should focus on what each does best. That is, the public sector should collect and integrate large amounts of data into a single database, which would be easily accessible to the private sector. It in turn was to disseminate the data by selling directly to end-users or to other information service providers, who might bundle TravInfo with other products.

5. LESSONS LEARNED

The value of the field test is to share the lessons learned from the project with others that may be interested in developing and deploying similar projects in other regions. This section is organized in five parts addressing the following topics:

- How to build and maintain a successful public-private partnership;
- How to deal with technological, financial and market uncertainties;
- How to manage delays of the project and planning/implementation issues;
- How to effectively include new ideas, new approaches and new partners;
- How to conduct an evaluation for a Field Operational Test.

Information was obtained from in-person interviews, mail-back surveys, and focus group discussions from key participants and is summarized in this section. The final phase of the institutional survey was conducted in summer and fall 1997 using the mail back method and follow up in person and telephone interviews. Additional interviews were conducted in summer and fall 1998 on an ad-hoc basis. A focus group meeting with key participants was held in

November 1998 shortly after the field test was completed. A summary of the participants views is reported in the discussion that follows.

Building and Maintaining a Successful Public-private Partnership

Expectations of public and private parties

The partners felt that it was necessary to lower their expectations while working toward a common goal. The public and private partners had different expectations from TravInfo. The public partners expected to make TravInfo available for better congestion management, while the private partners expected to test and market products that would make a profit. It took a long time to reconcile their differing objectives.

Within the public sector, each agency also had different expectations for the project's accomplishments. For example, the funding agencies expected the Board to adhere to the original project plan, although TravInfo's operational needs seemed to dictate changing directions in some ways. But the partners were able to overcome these differences and managed to hold the team together because of strong personal and organizational commitments to get the field test underway.

Institutional organization

The TravInfo organization was effective, but a consensus-based partnership was slow at making critical decisions. The Steering Committee and Advisory Committee/Information Service Provider forum were valuable to the Management Board. By participating, their members added to the Board's base of knowledge and provided a forum for resolving issues outside Board meetings. The Steering Committee contributed large amounts of time and specialized expertise, and its Chair was an effective leader. The members of the Steering Committee spent time with individual

working groups on the development of a common format for the TravInfo system. The TravInfo project manager and the Board staff were able to work effectively with TravInfo's complex organizational structure, which required strong leadership. All participants felt that the TravInfo organization was effective and did not suggest any major organizational changes.

At the same time, a consensus-based partnership was slow to make critical decisions. In addition, organizing a large partnership for monthly meetings took considerable staff time and effort. As the project was deployed, it became clear that using an open forum for discussion might not be the most efficient method for advancing tasks. In some situations, using a small core of partners with a closed system might have been more effective when designing and developing components such as TravInfo's Traveler Information Center system. Nonetheless, keeping TravInfo as an open system was a good policy in that it invited many vendors to make contributions.

Technical advisor

Retaining a technical advisor was beneficial to the project team throughout the field test. Most public agencies do not have the necessary complement of in-house experts, and TravInfo's public partners were no exception. Unlike other federally funded Field Operational Tests in California, the Board retained a technical advisor from SRI to the project team to oversee all phases of the TravInfo project. The Board and the project team felt strongly that they greatly benefited from this decision, especially because the advisor brought his necessary expertise to assist the project team from the agency point of view. Without that sort of help, agencies will not necessarily know what questions should be raised, or what technical issues should be addressed.

Project goals and evaluation objectives

The project goals were ambitious and unrealistic to achieve within the time allotted. Any new technology product requires sufficient time to be developed, tested and marketed. In the case of

advanced traveler information systems, perhaps product marketing takes much longer than the development and testing. The TravInfo project established goals not only to develop and test a baseline system, but also to deploy the system fully to have a significant impact on individual travel behavior and, ultimately, on the Bay Area transportation system.

Likewise, the evaluation objectives were as ambitious as the project goals. The evaluators initially believed that the effectiveness of the TravInfo project could be measured based on the extent to which the TravInfo goals were achieved during the field test itself. In retrospect, these expectations were unrealistic. The purpose of the federal field test was to test one type of application in terms of its design, software capability, data sources, integration and dissemination, primarily to learn what worked and what did not. The partners accepted the challenge to deploy the system fully with the optimal level of market penetration. These expectations were virtually unattainable by the conclusion of the field test.

Dealing with Technological Uncertainties

TravInfo system

A flexible system could help deal with rapidly changing technologies. Although the technology at the time TravInfo was developed might not have had many alternatives, an easily upgradable and flexible system would have helped cope with rapidly advancing ITS technologies. While the original concept for TravInfo was open and flexible, TravInfo's final design was not. TravInfo will likely require enhancements to keep up with advances in technology, if not a complete replacement of its system.

Data collection process

Streamlining the process of data collection would be effective. The TravInfo system is complex. It involves a process in which a number of problems could occur at any link in the chain, including both institutional challenges and technical obstacles. Streamlining the entire process, from fieldwork data collection to receipt of information by end users, would help eliminate some of the problems. For example, the project team tried to fill some data coverage gaps with microwave radar devices. That approach led to unanticipated problems related to the difficulty of appending a new data stream onto the existing system already deployed.

Project approach

A flexible approach to project implementation was necessary. While productive at some levels, the project approach during the FOT was not flexible enough to quickly respond to various kinds of obstacles that arose during the project. The project team isolated individual problems within the system and tried either to fix them or to add new components to the system. At times, it was necessary to step back and reevaluate the system as a whole as the project developed to make necessary corrections. For example, TravInfo was developed under the assumption that TOS data would be available for the system design. With no control over the development, operation or maintenance of the TOS, the Management Board, as a whole, could do little more than deal with individual problems as they arose since responsibility for the TOS was solely that of one public agency (a member of the Board). A clearly defined contingency plan and flexible arrangement between public agencies might have circumvented the TOS-related issues.

Risk management

Having risk assessment and contingency planning policies are vital to moderating the potentially negative consequences of unforeseen events. The partners felt that an important lesson learned from the field test is that a risk assessment of data reliability and contingency planning needs to

be made regarding the shortage of data coverage in the early phase of the Field Operational Test. The larger issue, however, was the over reliance on a separate project (leading to over reliance on one data source) over which TravInfo had no control (6).

Dealing with Market Uncertainties

Consumer research

The TravInfo field test was the tool for organized consumer research for public-private partners. Through the TravInfo field test, the partners learned that the market for advanced traveler information was uncertain. The idea of TravInfo was to allow both the public and private sectors to conduct organized market research and product testing. From the evaluation studies of the TravInfo field test, the partners were able to obtain consumer information about the extent to which Bay Area travelers obtain traffic information and change their travel behavior based on that information. However, the evaluation of the field test was not able to cover all facets of consumer research on potential advanced traveler information system products or services. The studies suggested that value-added traveler information might attract a certain segment of the Bay Area population, especially those who have long commutes or are high-mileage drivers. Thus, information service providers might target those who are time-sensitive and find market niches for that targeted population, while public agencies might provide information services targeted to broader audiences with services such as the TravInfo telephone advisory service. These studies were, nonetheless, limited in their application to the TravInfo telephone information service and privately offered traffic Web sites.

Private sector's input

Private- sector research on consumer response to its products and services would help TravInfo meet its needs. The uncertainty of the commercial market for advanced traveler information

systems generally requires extensive market research on consumer behavior for product development and product testing. Without a full understanding of the market size of those who are willing to pay for information and the types of services that would attract consumers, it is difficult to estimate the consumer market for commercialized advanced traveler information systems. In some cases, information service providers lost their initial enthusiasm for developing privately offered traveler information services because of this lack of consumer knowledge.

Information sharing

Sharing information about privately conducted consumer research with the public partners would be helpful for the public sector to support privately offered information services.

It is highly desirable to share consumer information between the public and private partners.

Sharing information on privately conducted consumer research would benefit both public and private parties, especially when dealing with market uncertainty. Over the past several years, market research on advanced traveler information technologies has been performed by a large number of private firms in the U.S., as well as in Asian and European countries. However, very few information service providers were willing to share their findings with the TravInfo partners. With a better understanding of information service providers' data needs, the TravInfo public partners could gauge their efforts in terms of the type of information and the level of data coverage that would best support commercial advanced traveler information system products or services. Private sector concerns over the loss of exclusive control of proprietary information and the potential loss of a competitive edge, however, would have to be addressed to convince the private sector to share such information. The private partners' information about their potential customers and their needs would help the TravInfo public partners to determine the level of TravInfo data coverage that would adequately support information service providers' commercial products.

Marketing

Marketing was critically important to the TravInfo deployment. Both the public and private partners learned that effective marketing was essential for the TravInfo project. A more substantial advertising budget was necessary to promote public awareness of TravInfo. Early in the process, the marketing working group, comprised of Steering and Advisory Committee members, developed a TravInfo marketing plan. Later, marketing consultants were retained to assist the TravInfo project team in designing a marketing plan, using advertisements on commercial radio, billboards, and other media. The partners, however, found that the plan was not effective in promoting TravInfo. This was reflected in the call volume of the TravInfo telephone service during the field test. In order to increase public awareness of the TravInfo service, it was necessary to have a comprehensive and organized marketing plan with expert guidance. TravInfo's information service providers also recognized that an organized marketing plan for their Web sites, in some cases, would have induced more people to use their services. According to the Web site providers, public exposure to their sites was only through interviews with reporters and articles written about them in conjunction with the TravInfo project; they did not have any organized advertising campaign. Correspondingly, the surveys of Web site visitors showed that a majority of them learned about traffic Web sites through a search engine or word-of-mouth. As a result, TravInfo's potential was not fully realized. The high level of user satisfaction with the TravInfo telephone system and participating traffic Web sites implies that people would use TravInfo's services if they were aware of them and had a chance to try them. The vast majority of traffic information seekers who used the TravInfo telephone system and Web sites were repeat users. As public awareness of TravInfo improves through better marketing, more people should come to understand the benefits of calling TravInfo or visiting traffic Web sites.

Managing Schedule Delays and Addressing Planning/Implementation Issues

Alternative plans

Alternative courses of action would help deal with planning and implementation issues. In the planning phase, worst-case scenarios could have been developed and possible alternative courses of action could have been identified. During the planning phase of TravInfo, the best-case scenario was used. It was expected that the Caltrans Traffic Operations System would progress on schedule, and that system contractors would adhere to contract schedules and deliverables.

One alternative that was explored, during the system design phase, was to extend the field test schedule until a data coverage plan was fully developed and implemented, so that more detailed and timely information on traffic delays and local traffic conditions could be offered to end users. At the same time, information service providers could have assessed a market for commercialized information products. However, this approach was not feasible because the Board had a contractual obligation to the funding agencies to complete the field test within a reasonable time frame. Nonetheless, the TravInfo partners believed that they acted rightly in proceeding with the project, supporting the nation's pioneering effort in traveler information technology testing. Even though the TravInfo system was not as effective as had been anticipated, the partners believed that attempting to make it work was better than abandoning it altogether.

Potential risks

Early consideration of potential risks associated with contractors could be beneficial.

The TravInfo organization wisely relied on outside assistance in developing the system and in resolving technical issues. This process, however, required third-party relationships. TravInfo contracted out various segments of the project. When dealing with many contractors, issues need to be resolved and agreement between parties has to be reached. Furthermore, unforeseen events

can affect contractors' performance or their ability to meet their schedules. Flexibility built into the contract would have helped the project team cope with contractual problems for dealing with schedule delays and the quality of deliverables. A contingency plan could have established risk-sharing mechanisms or insurance policies, such as "performance bond" between the contracting agencies and the contractors. Streamlining contractual procedures also would allow more timely execution of contracts.

Eliciting New Ideas, Approaches and Partners

Public agency collaboration

Collaboration among public agencies would be necessary to generate new ideas and new approaches for enhancement and promotion of TravInfo. A successful regional transportation system depends on a partnership involving regional and local public agencies working together to get useful information to the traveling public in order to achieve the common goal of improving the overall transportation system. Not only is there strength in numbers through this approach, but it is likely to generate new ideas and approaches to old problems.

The TravInfo field test provides a good illustration of the benefits of such work. The three regional transportation agencies, the Metropolitan Transportation Commission, Caltrans and the California Highway Patrol, thwarted by recurring shortcomings in the Bay Area's traffic surveillance system, collaborated on ways to improve it. The Metropolitan Transportation Commission developed new ideas about how the surveillance system could be improved, while Caltrans offered its experience in and expertise of how new surveillance technologies could be developed to enhance the existing system. In addition, Caltrans' funds were secured to upgrade and correct the existing loop detector systems to support TravInfo.

Unity of public support for the regional traveler information system is as important as the deployment by private partners of commercial products and services. If public agencies deploy these technologies unilaterally, it will only confuse travelers. This is evidenced in the case of Bay Area transit services, which have little coordinated strategy.

During the field test, all transit agencies allowed their information services to be routed through TravInfo's Telephone Advisory Traveler Service, 817-1717, but they also retained their own telephone numbers. This occurred despite surveys showing that Bay Area travelers found it convenient and helpful to be able to obtain all travel-related information through the single 817-1717 number. An exception was AC Transit, which made 817-1717 the sole traveler information source for its patrons. However, at the end of the field test, the agency added its own telephone number to TravInfo's.

Exchange of valuable experiences

Sharing experience with others could develop new ideas and approaches. Perhaps the greatest value of the TravInfo field test comes from sharing the experiences from it with others. Since it was the first to test the concepts of open architecture and open partnership, it has a wealth of new findings. The partners gained knowledge of building successful partnerships through, among other things, better understanding of different points of view and improved communication.

The project also generated new ways to organize the partners behind the Bay Area's regional transportation system. For instance, the Metropolitan Transportation Commission devised a new role for itself when it took on the responsibility of overseeing the management of the Traveler Information Center. As it worked closely with Caltrans and the California Highway Patrol, it generated a new institutional perspective on the Bay Area surface transportation system. Its challenge was to have the TravInfo system benefit travelers as well as Caltrans'

traffic management system. Beyond making TravInfo economically feasible to be used by information service providers, the Board worked from the premise that TravInfo was to provide a public good.

Involvement with other tests

Active involvement with Field Operational Tests or Model Deployment Initiatives projects in other regions, to the greatest extent possible, would bring experience to the TravInfo project. While many TravInfo private partners were actively involved in tests and model deployments of advanced information systems in other parts of the country, their role in TravInfo's unique open-architecture, open-partnership structure gave them national recognition. Although some regional systems implemented elsewhere could be more effective and easier to operate than TravInfo, it provided a richer array of lessons applicable to private vendors in situations around the nation. At the same time, the TravInfo public partners led the way on architecture standards and other technology issues. Moreover, lessons learned from other projects would generate new ideas and new approaches for more effective use of resources and further enhancement of the TravInfo system.

New partners

New partners could contribute to TravInfo with more objectivity about the project. Continuity in representatives of the partner agencies and enterprises was important to the progress of the project; however, periodically bringing in new participants could generate fresh approaches. Despite outreach efforts dating back to early in the process, the TravInfo project team has not managed to add many more partners because they have difficulty seeing the benefits of participation. As TravInfo matures, it should be easier to convince new members to join.

Conducting an Evaluation of a Field Operational Test

Evaluation plan

The evaluation plan was a “living” document and would undergo changes over time. As the project evolved, revisions to the original evaluation plan were necessary. For instance, it was hoped to evaluate how much travel time and fuel were saved because of TravInfo and how much the air quality was improved as a result. But the lack of travel time data made it infeasible to make an accurate assessment of TravInfo’s benefit to the Bay Area’s transportation system on the basis of those criteria.

Data requirements

It was also hoped to measure changes in the performance of the Bay Area transportation network, using yardsticks such as traffic throughput, average speed, average travel time, variability of travel time, traffic delay and vehicle emissions. It also would have incorporated traffic information on congestion links and overall network speeds and traffic levels before and after TravInfo’s implementation. When it was found that the needed data would not be readily available, this component of the evaluation was removed.

Long – term impacts

Further research of the long- term impact on travel behavior is necessary. Most studies of traveler behavior require at least five years, but the TravInfo field test only lasted two. Additional time would be necessary to assess consumers’ reactions as they evolve — to determine if they learn to use the information and how they adapt to it, how they make their travel decisions and how those decisions are influenced by TravInfo and how their travel behavior evolves over a relatively long period of time.

Evaluation Oversight Team

Regular meetings with the Evaluation Oversight Team were valuable. The monthly meetings with the oversight team were useful to the evaluators; communication flowed both ways. Comments from members of the oversight team on interim evaluation reports provided invaluable insights into all facets of the project's progress and the complexity of public-to-public, public-to-private and private-to-private partnerships, with the added benefit of coming from an insider's perspective.

6. CONCLUSIONS

The TravInfo field operational test experimented with a unique public-private partnership open to all parties. TravInfo's long-term vision was that the open partnership would eventually and actively encourage growth and development of advanced traveler information technologies for data collection and dissemination along a path that leads to real-time information on modal options and routes.

The TravInfo partnership provided a strong regional stewardship for an infant program and in the process pioneered a unique, open public-private partnership dedicated to a regional system built on the same philosophical commitment to openness through its open-architecture. The experience benefited the Bay Area as a whole, both through an improved transportation system and the presence of a new, vigorous institutional collaboration. The private sector benefited from having a venue in which to test advanced traveler information products.

TravInfo's primary successes lay in developing a network of public and private professionals who collaborated on advanced traveler information projects in a variety of settings and provided a platform for different organizations to network and form partnerships. These networks and partnerships are the most significant and unique outcome of the field test and might eventually

produce many innovative traveler information products beyond traffic web sites. Among the potential products are cable television outlets, digital cellular phones, personal digital assistance units, and in-vehicle navigators.

An unusually strong commitment from individual team members, parties involved in the partnership and project management, was evident in the TravInfo field test. Two critical positions, the project manager and the Steering Committee chair, were led by especially committed individuals. Project staff members also showed a great deal of determination to make the project a success. Although this level of commitment did not materialize at all organizational levels, especially with the local public agencies, it was a major strength of the TravInfo project.

The value of TravInfo is contained in the lessons learned from the Field Operational Test. The TravInfo experience can be shared with others who may develop similar systems elsewhere. The key lessons were: 1) adopting a process that is flexible to institutional and technological changes, 2) building contingency plans to manage risks at various stages of project development and implementation, 3) recognizing the opportunities and challenges of the open-partnership, 4) acknowledging uncertainties of consumer market demand for the development of advanced traveler information systems.

The long-term benefits of TravInfo will be of more value to the partners than the short-term benefits of the field test. New ideas have emerged, new approaches developed and new partners solicited, which is in keeping with the TravInfo field test key objective of developing social capital for appreciation over time. From the field test, TravInfo operators learned how to run their system better, and information service providers gained better understanding of consumers and the importance of marketing their products. Beyond the economics of the information system, the partners learned the value of making firm commitments to collaborative partnerships.

As the project moved on to the deployment stage, new challenges and new issues have emerged. The new issues were: 1) whether the project partners should continue to support data feeds, 2) whether the private sector would continue to be interested in using TravInfo data, 3) where the Traveler Information Center should be housed on a long-term basis, 4) what contracting options the Board will have, given the untested nature of granting third party access to the system consultant's software, 5) how to determine a reasonable system life-cycle cost for deployment planning and funding projections, 6) whether project partners would continue to provide in-kind matches received during the field test, 7) the degree to which the data coverage is adequate for public and private sector needs, 8) the feasibility of simplifying the Traveler Advisory Telephone System from the seven digits to four to make it easier to remember and dial, and 9) how to market TravInfo services for broad dissemination of traveler information. These issues have yet to be addressed for the deployment phase of the TravInfo project beyond the field test.

In the final analysis, major challenges faced in the TravInfo field test were notably similar to those of other such tests throughout the US. The similarities were: 1) setting ambitious project goals that were unattainable within the limited time reserved for the field test, 2) the extensive time required to develop mutual understanding of and trust between participating parties, 3) recognizing an uncertain consumer market for commercialization of the service being tested, 4) having inadequate information about how to put a consumer value on the information it was providing, 5) defining appropriate roles for the parties involved, and 6) appreciating the importance of having enough time and funds to "place" the product and convince people to use it.

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APPENDIX A

TravInfo Institutional Evaluation

Survey Instrument

Objective: Assess Effectiveness of the TravInfo Partnership
Survey Group: Management Board, Steering Committee, and Advisory Committee/Information Service Providers Forum

The goals of the panel survey are to assess TravInfo's success in overcoming barriers to joint public/private ventures and to assess the effectiveness of the TravInfo organization. Some variation of the survey will be administered on an annual basis, to assess TravInfo's progress in meeting its institutional objectives.

The interview is divided into four parts: 1) Organizational structure, 2) roles of the public and private sectors, 3) Institutional, technical, and legal barriers, and 4) Perception of TravInfo and motivations for participating. For clarity, objectives are stated first in italics, and are followed by questions pertaining to the stated objectives.

Interview Scripted Introduction

The University of California is conducting a survey of TravInfo partners, to assess the project's effectiveness in overcoming barriers to public/private ventures. Information that you provide will be used to improve TravInfo, but your individual responses will be kept strictly confidential.

Objective 1. Organizational Structure

To assess the effectiveness of the organizational structure in achieving TravInfo's goals, and to identify specific problems and successes that have resulted from the organizational structure.

- a) Do you think the TravInfo committees has a clear mission?
If yes, what is the mission, and is it appropriate?
If no, what should be the mission?
- b) What specific duties (if any) should the committees have?
- c) Should the committees have more, less or no change in authority?
- d) How effective is the committees in fulfilling their mission?

- e) How well do you believe the committees represent the interests of the public sector?
- f) How well do you believe the Advisory Committee/Information Service Providers Forum represents the interests of the private sector?
- g) Can you suggest any changes in the organization of TravInfo?
- h) How well do you think the Steering Committee represents the Advisory Committee/Information Service Providers Forum?
- i) Does the steering committee have too much, about right, or too little influence and authority?
- j) Should the Steering Committee have a voting member on the Management Board?
- k) In what ways has the organizational structure encouraged a public/private partnership?
- l) In what ways has the TravInfo organization encouraged a public/private partnership?
- m) In what ways has the TravInfo organization encouraged cooperation among public agencies?
- o) Are you aware of any conflicts that have arisen among TravInfo participants?
- p) Overall, what seems to be the greatest strength or weakness of the TravInfo's institutional organization?
- r) Can you suggest any changes in the overall organization of TravInfo?

Objective 2. Roles of the Public and Private Sectors in Implementation & Operation

To assess opinions on the roles of the public and private sectors in the implementation and operation of TravInfo.

- a) With respect to how TravInfo is implemented and operated, what should be the public sector role, and what should be the private sector role?
- b) Do you believe the current roles are appropriate, and can you suggest any changes?

Objective 3. Institutional, Technical, and Legal Barriers

To identify institutional, technical, and legal barriers for both the implementation and subsequent operation of TravInfo.

- a) In your opinion, what are the major institutional, technical, and legal barriers for both the implementation and the subsequent operation of TravInfo?
- b) What incentives would encourage development and deployment of new ATIS products and services using TravInfo?

Objective 4. Perception of TravInfo

To assess the motivations for participating in TravInfo, and perceptions of the benefits of TravInfo.

- a) What is your interest in TravInfo, and why are you involved?
- b) What is your interest in traveler information?
- c) Do you believe that TravInfo is working toward the right goals?
- d) Do you anticipate any change in your organization because of TravInfo?
- e) Do you have any concerns about providing data to TravInfo for incorporation in their real-time database?
- f) What changes would you like to see in TravInfo?